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Comparison of State Rumination Induction Procedures and Effects
Research paper

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Hetkeseisundi rumineerimise esilekutsumise meetodite ja mõjude võrdlus

Kokkuvõtte

Uurimistöö eesmärk oli piloteerida erinevate hetkeseisundi rumineerimise induktsioonimeetodite mõju ning kvalitatiivselt uurida, millised tegurid soodustavad või pärsivad rumineerimise esilekutsumist. Kasutati kolme meetodit: 1) kurb autobiograafiline mälestus koos reageeringute manipuleerimise ülesandega; 2) kurb film koos autobiograafilise mälestuse ja reageeringute manipuleerimise ülesandega; 3) kurb meloodia koos autobiograafilise mälestuse ja reageeringute manipuleerimise ülesandega. Kontrollrühmad läbisid samad tingimused rumineerimise ja negatiivse valentsi komponendita. 86 inimest täitsid veebieksperimendi ja 8 osalesid järelintervjuudes. Tulemused ei olnud statistiliselt olulised. Intervjuude põhjal ilmnes, et rumineerimise esilekutsumist soodustavad tegurid olid isiklikult olulise kurva mälestuse olemasolu, eelnev madal meeleolu ja enda hinnangul emotsionaalne tundlikkus. Takistavad tegurid olid olulise mälestuse puudumine, ülesande ajal toimunud positiivne ümberhindamine ja stiimulite tajutav madal intensiivsus. Uuringu tulemused annavad panuse rumineerimise baasmehhanismide mõistmisse ning katseparadigmade parandamisesse.

Märksõnad: rumineerimine, mõtisklemise esilekutsumine, meeleolu esilekutsumine, negatiivsete mõtete aktiveerimine, korduv negatiivne mõtlemine

Comparison of state rumination induction procedures and effects

Abstract

Study piloted effects of different state rumination induction methods and qualitatively studied what factors facilitate or inhibit rumination induction. Three methods were used: sad autobiographical memory with Response Manipulation Task (RMT); sad film with autobiographical memory and RMT; sad melody with sad autobiographical memory and RMT. Control groups had same conditions without rumination and negative valence components. 86 people completed online experiment, and 8 participated in interviews. Results were statistically not significant. Based on the interviews, factors inducing rumination were: presence of personally significant sad memory; prior low mood; and self-reported emotional sensitivity. Inhibiting factors included: absence of significant memory; positive reappraisal during task; perceived low intensity of stimuli. Results of study contribute to understanding rumination mechanisms and to improvement of experimental paradigms.

Keywords: rumination, rumination induction, mood induction, activation of negative thoughts, repetitive negative thinking

Comparison of State Rumination Induction Procedures and Effects

Rumination is a maladaptive coping strategy that people might use to regulate their negative emotions (Lyubomirsky & Nolen-Hoeksema, 1993) and is found to be one of the major risk factors for depression (Spasojević & Alloy, 2001; Tamm et al., 2024). It co-occurs with everyday depressed mood and is related to the belief system (Tamm et al., 2024; 2025a). This coping strategy involves thoughts and behaviors that focus a person's attention on their symptoms and what they believe caused them (Morrow & Nolen-Hoeksema, 1990). This may often lead to such behaviors as isolation (with a goal to reflect on negative emotions) or repeated expressions of those negative experiences to others (Lyubomirsky & Nolen-Hoeksema, 1993). This is often done as individuals who ruminate typically believe that they are gaining insights into their feelings and problems (Lyubomirsky & Nolen-Hoeksema, 1993). Thus, the core of rumination is the focus on and repetitive engagement in the negative emotional state of the individual (Nolen-Hoeksema, 1991).

According to Response Styles Theory (RST) proposed by Nolen-Hoeksema (1991) individual's engagement with their symptoms could influence the duration of the symptoms. That is, rumination often prolongs depressed mood (Morrow & Nolen-Hoeksema, 1990) instead of helping to figure out a solution to the problem, as a coping strategy might imply. For example, Treynor and colleagues (2003) overview numerous experiments and find that greater depressive symptoms are predicted by ruminative thinking style. Another study, which looked at induced rumination in people with low mood, finds that ruminating people are less likely to engage in enjoyable activities compared to those who are not ruminating (Lyubomirsky & Nolen-Hoeksema, 1993). In addition, rumination has been found to increase the occurrence of unhealthy eating behaviors (Naumann et al., 2015) as well as exacerbate alcohol use disorder (Mollaahmetoglu et al., 2021), which are comorbid with depression (Li et al., 2020; Wildes et al., 2026).

Conclusions drawn from rumination literature can be used for depression intervention developments (Watkins, 2015), although there is an ambiguity in methods used for rumination induction in experimental setting which causes major challenges for ecological validity (Rosenbaum et al., 2021). This might be dangerous if the aim is to create a coherent depression intervention and therefore must be addressed empirically.

Types of rumination

Currently, scientific literature identifies two types of rumination. First, it can be viewed in terms of a habit and is usually called trait rumination (Lyubomirsky et al., 2015). This type of rumination acts as a chronic tendency, in which individuals show stable and consistent responses to occurring negative moods (Marchetti et al., 2018). Research identifies two main typical trait ruminative responses leading to a negative mood, namely brooding and reflection (Treyner et al., 2003). Brooding is defined as a passive focus on distress symptoms and their meanings, while reflection is an active engagement in solving a problem with a goal to improve one's mood (Marchetti et al., 2018). Both responses are being accessed in majority of self-report questionnaires and are used to measure rumination in experimental setting.

The second type of rumination occurs as a state and usually depends on a situation in which the individual finds themselves. State rumination is often triggered by a temporary discrepancy between one's well-being goals and experienced well-being (Marchetti et al., 2018). State rumination is reported to have a negative effect on the mood, cognitive processes, including problem solving as well as the negative effect on the goal-oriented behavior (Lyubomirsky et al., 2015). Increased interest in studying state rumination can also be speculated as psychometric measures are being invented to access specifically state rumination (BSRI; Marchetti et al., 2018). LeMoult and colleagues (2013) suggest that individual habitual trait-like tendency to ruminate might not directly impact how much a person might ruminate triggered by a momentary event. Experimental settings are usually more focused on triggering state rumination, although current literature lacks an overview of the features that cause this effect. Therefore, it is important to understand which components of state rumination induction have an effect.

Overview of rumination induction methods

Since rumination is often linked to negative emotions (Thomsen, 2006) traditionally the idea is to induce a negative affect before rumination induction. Such ways include for example negative affect induction using music, videos or stories (Graham et al., 2018; Naumann et al., 2015; Fernández-Marcos et al., 2024), which are then often followed by classical Response Manipulation Task (RMT) (Nolen-Hoeksema & Morrow, 1993). There are also techniques aimed at internal state induction, where people are either to reflect upon negative autobiographical event from the past (Bessette et al., 2020; Ferdek et al., 2016; Heinzl et al., 2023; Nalborczyk et al., 2022; Ricarte et al., 2018) or yet unrealized personal goal for the future (Michel-Kröhler et al., 2023; Michel-Kröhler & Berti, 2023; Mollaahmetoglu et al., 2021), some of them are also

followed by RMT (Nolen-Hoeksema & Morrow, 1993). Some techniques seem to mix those two categories in such a way, where participants are introduced to a negative story and are asked to vividly imagine themselves experiencing the negative events (Grol et al., 2015; Morrow & Nolen-Hoeksema, 1990; Philippot & Brutoux, 2008). Lastly, a technique rooted in either general self-analysis or analysis of causes and/or meanings of participants' performance in a task, which are often simplified versions of classic RMT, can also be found in several experiments (Cooney et al., 2010; Dias Da Silva et al., 2018; Huffziger et al., 2012; Layous et al., 2023; Lyubomirsky, 2003; Lyubomirsky & Nolen-Hoeksema, 1993; Nalborczyk et al., 2022; Watkins et al., 2008; Whitmer & Gotlib, 2012). In addition, although null findings are rarely reported in the research literature, some studies with non-significant results have also employed varying induction techniques, such as only RMT, a sad video in combination with a negative thought generation or a physical task (Dias Da Silva et al., 2018; Fernández-Marcos et al., 2024; Moffatt et al., 2020; Nalborczyk et al., 2022).

This inconsistency of induction techniques makes it difficult to determine whether certain methods are less effective than others. Furthermore, the impact of these methods has not been thoroughly assessed as it is often decided that induction has been successful based on change in emotional state alone, without verifying if rumination has increased (Ball & Brewin, 2012; Lyubomirsky et al., 2003). Therefore, it is unclear whether inducing an emotion is sufficient as methods for inducing emotions may not necessarily be suitable for inducing rumination. This highlights the need to examine which components might be inducing state rumination.

Moreover, the current study directly builds upon Tamm et al. (2025b) who studied rumination induction in a similar sample and found that the manipulation procedure (including guided thinking combined with a negative video) had unexpected effects in some individuals (e.g., rumination was reduced in the rumination induction condition). Building on this, it remained unknown whether video and guided thinking would have separable effects on affect and rumination and what were the key factors affecting induction effectiveness. For this, a qualitative study was needed that would allow participants to fully express their experiences.

Current research

The aim of the current study is to compare the depressive state rumination induction techniques on individuals and determine which approach yields an effect. It has been reported that inducing participants to ruminate through a video stimuli before remembering a sad

autobiographical event increases rumination (Tamm et al., 2025b). It has also been reported that listening to sad music while imagining oneself in a sad situation induce a depressive mood (Morrow & Nolen-Hoeksema, 1990). Sad autobiographical memory remembrance is also reported to increase negative affect (Bessette et al., 2020). However, these approaches have been studied in isolation, and it is unclear whether combining these methods produces a stronger or more reliable effect on rumination. Therefore, in this study 3 paradigms are compared: inducing negative affect with video and an autobiographical event, inducing negative affect with sad music and an autobiographical event, and inducing a negative affect using autobiographical event only. In accordance with classical rumination induction procedure all paradigms are followed by RMT (Nolen-hoeksema & Morrow, 1993).

Both quantitative and qualitative methods are applied, therefore aiming to distinguish components of induction techniques that show an effect mainly in rumination. State affect is also considered. Based on this aim, current research paper questions are posed:

- a) Are there any effects of different induction techniques and are there any differences between different induction techniques on rumination and state affect indexes.
- b) Which features of stimuli and/or elements of the induction procedure do individuals report to have an effect in induction techniques? (qualitative question)

Due to the mixed literature described above, the questions were partly exploratory, thus specific hypotheses were not posed. This pilot-study is a preliminary attempt to estimate the effects of the selected rumination induction methods to improve the methodological approach that will be used in a follow-up experiment.

Method

Sample

A total sample of this pilot study consisted of 86 participants; 1 participant was excluded due to technical problems. Convenience sampling method was used. The sample consisted of 63 women (74,1%), 21 men (24,7%) and one non-binary person (0,01%). The mean age of the sample was 31,9 years old (SD=14,01), where the youngest participants was 16 and the oldest 63 years old. 37 participants (43,5%) were native Estonian speakers, 41 people (48,2%) indicated Russian as their native language with a self-rated Estonian proficiency on average 8 out of 10,

where 1 indicated very bad understanding and 10 indicated perfect Estonian skill. Two people (0,02%) reported their native language as *other*; one participant specified Ukrainian with a self-rated Estonian proficiency of 10. Five people (0,06%) indicated their native language to be both Estonian and Russian.

Regarding the highest educational background, two participants (0,02%) had middle school education, two participants (0,02%) had vocational education, 26 participants (30,6%) had high school education, 36 participants (42,4%) had bachelor's degree and 19 participants (22,4%) had master's degree. 27 participants (31,8%) indicated that their vision is corrected, but they can see the text of the experiment clearly.

The invitation to the experiment was distributed with the University of Tartu and the University of Tallinn mailing lists and on social media. All participants gave an informed consent to participate in this online study. Participants had an opportunity to withdraw from the study at any time and participation was completely voluntary. The study was approved by the ethics committee at the University of Tartu (kooskõlastus – 403M-16).

Materials

Montgomery-Åsberg Depression Rating Scale (MÅDRS; Montgomery & Åsberg, 1979) was used to assess the severity of depression in the participants, as well as changes in the mood, anxiety, and fatigue. In this study the Estonian version, that was previously used by other researchers (Tamm et al., 2025b) was used. A higher MÅDRS score indicates a more severe depression. In this study, the participants completed the test themselves (self-rating version, MÅDRS-S; Svanborg & Åsberg, 1994) on a provided scale from 0 to 3, where 0 indicated no change (within the given category) and 3 a drastic change (within the given category). Scale unit was 0,5. The participants were asked to evaluate how they felt over the last two weeks. This scale was used as part of the demographic assessment.

10 item Ruminative Response Scale (RRS-10; Treynor et al., 2018) adapted by previous researcher (Tamm et al., 2025b) was used here to measure trait rumination in participants. Each item was rated on a 4-point Likert scale ranging from 1 (almost never) to 4 (almost always). The total score ranges from 10 to 40 with higher scores indicating a higher tendency to have rumination symptoms. This scale was also used as part of the demographic assessment.

Anger Rumination Scale (ARS; Sukhodolsky et al., 2001) translated to Estonian and used in a previous research (Tamm et al., 2025b) was used here as one of the demographics

measurements on anger rumination. In a similar fashion the participants were asked to rate each item on a 4-point Likert scale ranging from 1 (almost never) to 4 (almost always). The scale consisted of 19 items and scoring ranged from 19 to 76. Higher scores indicated a higher tendency to have anger rumination symptoms. This pilot study did not use ARS in the current analysis, but data was needed for further studies.

State Affect Visual Analogue Scale (VAS; Lyubomirsky & Nolen-Hoeksema's 1995) was included as a brief, repeatable mood measure to assess changes in participant's mood before and after rumination induction. Participants were asked to indicate the degree of their valence, activation, dominance, anger, sadness, happiness and wellness. They were asked to move a marker up or down a vertical line representing a continuum from 0 (extremely negative affect) to 100 (extremely positive affect). This study primarily focused on reported valence and activation.

Brief State Rumination Inventory (BSRI; Marchetti et al., 2018) was translated to assess participants' state rumination before and after rumination induction. BSRI consists of 8 items (see Appendix 1) measured on Visual Analogue Scale (VAS) from 0 to 100, where 0 is "completely disagree" and 100 "completely agree". All items were forward scored on a vertical line, and the score was computed by the mean score. For this study, the BSRI statements were translated into Estonian. First, three independent experts produced separate translations, and a consensus version was established through a discussion. Next, an independent expert, who was an Estonian native speaker and psychology student unfamiliar with the scale, performed a back translation (Behr, 2017). After evaluating this version, an alternative translation was made and reviewed by an Estonian language specialist, leading to a second consensus. This reviewed version was again translated by the independent expert, and the evaluation of this translation resulted in a third consensus. Finally, a second expert assessed the meaning of each item. Once it was confirmed that the items were correctly understood, the Estonian version of the BSRI was added into the experiment.

Audio and Video material was chosen based on the previous qualitative literature overview categorisation. Based on Vuoskoski and Eerola (2012) research the piece *Discovery of the Camp* (Band of Brothers soundtrack, track 17) was chosen as a sad mood induction piece and *De l'aube a` midi sur la mer* by Claude Debussy was chosen as a neutral stimulus. Both pieces were selected to last 3 minutes and 30 seconds in the experiment. Same videos as used in previous study (Tamm et al., 2025b) were used here to induce sad and a neutral mood. The

Estonian drama movie „Klass“ (The Class, 2007, directed by Ilmar Raag) featuring a death scene (3,30min) was used to induce a sad mood. A Denali National Park video (3,30min) with the same neutral music piece was used as a control.

Autobiographical recall was used in this study, similarly to the previous study (Tamm et al., 2025) to elicit sad or neutral emotion. The protocol was used in accordance to Wright and Mischel (1982) and is often used in rumination studies. In rumination groups participants were asked to imagine a situation in which they felt the saddest. They were instructed to imagine this situation that happened to them as vividly as possible and to concentrate on their sensation, thoughts and feelings. In control groups, participants were asked to imagine an ordinary, everyday situation (like folding laundry, going grocery shopping etc). In both scenarios participants were given 6 minutes to imagine the situation and write keywords or small sentences about it into the texting field. Participants were given extra 40 seconds in the beginning to read the instructions.

Rumination induction protocol was adapted from a previous study (Tamm et al., 2025b) which was an Estonian translated version of classic depressive rumination or distraction induction by Nolen-Hoeksema and Morrow (1993). The guided thinking procedure included 14 statements that were directed at one's emotional and physical sensations, as well as statements directed at the meanings of one's emotions. In distraction condition there were 14 statements that were directed at description of places (think about your local bus station) and objects (think about an umbrella). Participants were asked to write their answers into a text box for attention control purposes.

Design and procedure

The pilot experiment used a 2x3 design: rumination vs control condition and groups who were induced first into a mood (negative or neutral) by a video paired with RMT or a music piece paired with RMT or RMT only. There were 6 groups into which the participants were randomly assigned to in Limesurvey. This design was further developed on Tamm and colleagues (2025b) procedure.

The experiment was assessed by a link to LimeSurvey (LimeSurvey) where participants first were instructed to: 1) Choose a quiet place where you can concentrate and where no one will disturb you, 2) Turn off or mute your cell phone and make sure that nothing will disturb you during the test (e.g., TV, etc.), 3) Now check that the sound on your device is turned on and that

the screen is working properly, 4) Be prepared to complete the test in one sitting (~1 hour) without taking any breaks. After this, participants were instructed to read the informed consent carefully. Participants were informed that clicking the button “järgmine” is equivalent to signing a document on paper. After this a demographic info gathering took place, which included age, gender, first language, education, eyesight, drug intake, diagnosis and device used for this experiment. Then participants had to complete a MÅDRS questionnaire (Montgomery & Åsberg, 1979), RRS-10 (Treyner et al., 2018), ARS (Sukhodolsky et al., 2001), base affect and base BSRI (Marchetti et al., 2018) and VAS (Lyubomirsky & Nolen-Hoeksema’s 1995) scales. Then, depending on the randomization, participants were given different induction. After the induction, the follow up affect and BSRI (Marchetti et al., 2018) VAS (Lyubomirsky & Nolen-Hoeksema’s 1995) scales were reported. Then participants were shown a funny compilation of cat videos to repair the mood and 3rd VAS (Lyubomirsky & Nolen-Hoeksema’s 1995) affect and BSRI (Marchetti et al., 2018) scales were reported. As this is a pilot experiment, participants were also asked to categorize working memory stimuli into verbal or visual stimuli. This is not used in the current research. After the experiment the participants were provided with a debrief, where experiment aims were described and explained. Support resources (Lahendus.net, Peaasi.ee and Estonian mental health organizations’ contact phone numbers with the facilities open hours) were provided. Participants received their MÅDRS (Montgomery & Åsberg, 1979) and RRS-10 (Treyner et al., 2018) scores compared to Estonian previous reported averages (Tamm et al., 2025b). The link to the experiment was open for 8 days.

Qualitative analysis: semi-structured interviews

After the pilot experiment semi-structured interviews were conducted with some participants, whose reported scores on the BSRI (Marchetti et al., 2018) were the most different (the highest and the lowest) from others within their group. Individual scores with individual identification number were grouped according to their assigned experimental groups. The most extreme score increases/decreases were highlighted. Additionally, no change in scores when the change was expected, for example no change in rumination condition was also highlighted. After evaluation of the scores with the supervisor 12 participants were chosen, so that there would have been at least two participants from each group (one participant whose scores acted within condition expectation and one participant whose scores did not act within their condition expectation). Participants were invited through emails that they voluntarily provided at the

beginning of the experiment. Participants were instructed to use an email that does not contain their names (in case they would not like the researchers to see this information). Participants were informed that their data was stored anonymously and confidentially and only researchers had access to the data.

8 participants replied and agreed to participate in interviews. Everyone was interviewed independently using Microsoft Teams. Interview was recorded and then transcribed to Microsoft Word. During the follow up interviews, participants were asked if they agree with the material being recorded to be further transcribed for data analysis. Participants were also informed that the recordings will be deleted immediately after data analysis and are only needed for transcriptions. Interviews lasted on average for 10 minutes 29 seconds. This was made to qualitatively assess the impact of the rumination method and identify "bottlenecks" so that the method could be improved.

The topics for semi-structured interview were as follows: 1) experiment experience description, 2) induction effect on emotional state, effect on negative thinking, 3) particularly effective components and why them, 4) what was liked in the experiment and what was not liked, 5) suggestion to improve the induction. The questions for the interview were provided in Appendix 2.

Data analysis

Quantitative analysis. To conduct the quantitative analysis a 2 (rumination condition vs no rumination) x 3 (autobiographical memory and RMT only vs film + autobiographical memory and RMT vs music + autobiographical memory and RMT) factorial ANOVA was conducted. 4 analyses were conducted in which the dependent variable was (1) the participants' BSRI score, (2) subjective rumination measurement, (3) emotion activation and (4) emotion valence. Assumptions for conducting ANOVA were checked and no data skewness and kurtosis stayed between -1 and 1. Brief State Rumination Inventory was used to assess participants' state rumination before and after rumination induction. Subjective rumination was used to measure how participants felt in a moment regarding their rumination level on a singular scale. Emotion activation measured whether participants felt high or low emotion activation. Emotion valence scale was used to assess whether participants felt positive or negative before and after induction.

The independent variable was the type of induction procedure. This included 6 groups, which completed a version of the RMT (Nolen-Hoeksema & Morrow, 1993). RMT served as the

base component across all conditions. The six conditions were structured as follows: Group 1 - recall of a sad personal memory and 14 guided thinking questions about it; Group 2 – recall of an ordinary everyday memory and 14 distraction questions; Group 3 – watching a negative scene from a film followed by a sad personal memory recall and 14 guided thinking questions about their selected event; Group 4 – watching a scene from a nature documentary followed by an ordinary everyday memory and 14 distraction questions; Group 5 – listening to a sad melody followed by recall of a sad personal memory and 14 guided thinking questions about it; Group 6 – listening to a neutral melody followed by recall of an ordinary everyday memory and 14 distraction questions.

Control variables included a measure of baseline mood before induction procedure, and trait rumination to evaluate individual differences and outliers. The study set a time limit to induction procedures, which acted as control condition.

Quantitative data analysis was conducted in JASP (JASP Team, 2025) using non-parametrical statistics, since the sample was too small to perform a parametric ANOVA and data was not distributed normally. Descriptive statistics were reported. P-values were considered significant below 0,05. For statistical analysis chosen variables were subtracted, as follows: variable score before induction was subtracted from variable score after induction. In this way the sign of the result indicated the direction (an increase or decrease in the effect). The difference was considered in subsequent statistical calculations.

Qualitative analysis. Interviews of eight participants from groups 1, 2, 3, 5 and 6 were analysed explicitly, taking quotes directly from interviews, as well as analysing it implicitly, capturing the respondents' ideas. There were two participants from group 1 (Negative autobiographical recall + RMT), one participants from group 2 (Neutral autobiographical recall + Distraction questions), two participants from group 3 (Negative film + Negative autobiographical recall + RMT), two participants from group 5 (Negative music + Negative autobiographical recall + RMT) and one participants from group 6 (Neutral music + Neutral autobiographical recall + Distraction questions).

Interviews with participants who were exposed to rumination condition and reported increase in rumination were analysed first. Interviews with three participants in total from rumination condition groups 1 (Negative autobiographical recall + RMT), 3 (Negative film +

Negative autobiographical recall + RMT) and 5 (Negative music + Negative autobiographical recall + RMT) resulted in description of factors facilitating rumination induction.

Analysis of interviews with three participants who were exposed to rumination condition but reported a decrease in rumination from groups 1 (Negative autobiographical recall + RMT), 3 (Negative film + Negative autobiographical recall + RMT) and 5 (Negative music + Negative autobiographical recall + RMT) resulted in description of factors inhibiting rumination induction. Additionally, two participants from no rumination condition from group 2 (Neutral autobiographical recall + Distraction questions) and 6 (Neutral music + Neutral autobiographical recall + Distraction questions) agreed to participate in interviews and therefore their insights also appended to description of factors inhibiting rumination induction.

Qualitative data was analysed in QCAmap (Fenzl & Mayring, 2017) using inductive coding method. Interviews were recorded and transcribed, Word documents were then uploaded to QCAmap, where thematic analysis was conducted. Texts were read and initial codes were developed, which were then analysed and descriptive conclusions were reported.

Author's contribution

Author participated in planning the qualitative and quantitative parts of this pilot-study, analysed the literature, conducted the online pilot experiment, participated in a BSRI scale translation, conducted follow-up interviews, analysed pilot-experiment data quantitatively and qualitatively and wrote this paper.

Results

Quantitative comparison of state rumination induction techniques

Descriptions of groups' averages were reported in Table 1. Groups had similar average scores with groups 6 and 1 having the highest MADRS scores when descriptively compared to the other groups. There were no statistically significant differences between the six groups in any of the rumination and affect indices.

Table 1*Description of groups and average baseline measurements before induction*

Group	Number of participants	MADRS M (SD)	MADRS, Min - Max	RRS- depression M(SD)	RRS- depression, Min - Max	VAS, Subjective rumination M(SD)	VAS, Subjective rumination, Min - Max
1 Negative autobiographical recall + RMT	17	6,18 (4,83)	1 - 22	21,88 (4,97)	12 - 32	24,35 (31,01)	0 - 100
2 Neutral autobiographical recall + Distraction questions	12	5 (2,89)	0 - 14,5	17,67 (6,02)	10 - 32	24,67 (25,66)	0 - 80
3 Negative film + Negative autobiographical recall + RMT	14	5,96 (2,89)	1 - 11	19,07 (5,09)	12 - 31	40,14 (34,88)	0 - 90
4 Neutral film + Neutral autobiographical recall + Distraction questions	16	4,97 (4,46)	0 - 18	17,5 (4,91)	10 - 28	23,75 (32,58)	0 - 100
5 Negative music + Negative autobiographical recall + RMT	12	4,46 (3,14)	0 - 10	19,92 (4,44)	13 - 26	21,25 (28,57)	0 - 70
6 Neutral music + Neutral autobiographical recall + Distraction questions	14	6,39 (3,68)	1 - 12	20 (6,60)	12 - 29	22,93 (32,41)	0 - 86

Note. Total sample consisted of 85 participants. There were no statistically significant differences between the groups.

Means and standard deviations of rumination inventory, subjective rumination, emotion valence, and emotion activation scale before and after induction were reported in Table 2. Before comparing groups against each other a manipulation check was conducted using non-parametric t-test Wilcoxon, since the data was not distributed normally (Skewness and Kurtosis did not fall between -1+1). Significant change was reported for emotion activation in 2nd and 6th groups. For groups 1 and 3 an inconsistency between two rumination scales was observed. 5th group was the only group in which a very small decrease in emotion activation happened descriptively comparing to other groups. Decrease in emotion valence was observed in all groups, suggesting an experience of negative affect across all conditions.

Table 2

Means and standard deviations of rumination inventory, subjective rumination, emotion valence, and emotion activation scale before and after induction

Group	BSRI1	BSRI2	VAS_Val1	VAS_Val	VAS_Act	VAS_Act	VAS_Rum	VAS_Rum
	M(SD)	M (SD)	M (SD)	2 M (SD)	1 M (SD)	2 M (SD)	1 M (SD)	2 M (SD)
1 Negative autobiographical recall + RMT	35,5 (28,93)	30,13 (29,42)	67,82 (26,54)	61,12 (24,33)	47,88 (26,91)	54,82 (27,49)	24,35 (31,01)	31,77 (30,85)
2 Neutral autobiographical recall + Distraction questions	22,75 (25,56)	19,48 (26,94)	73,5 (26,00)	64,17 (32,47)	48,92 (31,6)	62 (24,12) *	24,67 (25,66)	14,5 (20,06)
3 Negative film + Negative autobiographical recall + RMT	29,04 (22,57)	34,46 (19,37)	64,14 (27,16)	49,28 (18,82)	34,93 (20,11)	45,14 (20,96)	40,14 (34,88)	35,36 (34,03)
4 Neutral film + Neutral autobiographical recall + Distraction questions	26,63 (25,33)	24,53 (18,80)	64,31 (26,45)	61,94 (26,8)	46,81 (29,57)	53,75 (24,03)	23,75 (32,58)	18,88 (27,46)
5 Negative music + Negative autobiographical recall + RMT	28,95 (19,24)	30,68 (22,43)	71,83 (22,7)	62 (25,97)	49,17 (19,49)	48,08 (29,64)	21,25 (28,57)	27,17 (28,62)
6 Neutral music + Neutral autobiographical recall + Distraction questions	24,11 (24,73)	15,54 (21,44)	68,71 (25,04)	66,14 (23,78)	39,07 (19,07)	56,07 (26,46) *	22,93 (32,41)	18,71 (29,55)

Note. * Indicates $p < .05$ for paired nonparametric t-test alternative Wilcoxon as a manipulation check. Significance refers to a post-intervention state. *BSRI* – Brief State Rumination Inventory; *_Val* – emotion valence; *_Act* – emotion activation; *_Rum* – subjective rumination.

Prior to any further analyses, a post-hoc power analysis was carried out to check the suitability of the pilot sample size to detect any quantitative differences. A post hoc G*power analysis reported that the study was underpowered to detect a small effect size (Cohen's $f = 0.25$) at $\alpha = 0,05$. Since the sample was too small all the following statistical results were reported with caution. Quantitative analysis was interpreted as descriptive and group differences/similarities cannot be considered conclusive.

Table 3 showed results of two-way nonparametric ANOVA. None of the results were statistically significant. For BSRI neither rumination condition $H(1) = 2,35, p=0,13$ nor induction condition $H(2) = 0,94, p=0,62$ was statistically significant. For subjective rumination measure there was a borderline-significant result for rumination condition $H(1) = 3,8, p=0,05$ and a non-significant result for induction $H(2) = 0,32, p=0,85$. For emotion activation rumination condition $H(1)=1,98, p=0,16$ and induction condition $H(2)=0,29, p=0,87$ were not statistically significant. Rumination condition $H(1)=1,66, p=0,2$ and induction condition $H(2) = 1,02, p=0,6$ was not statistically significant in emotion valence.

Table 3

Two-way ANOVA results for brief state rumination inventory, subjective rumination, emotion activation and emotion valence

	<i>df</i>	<i>H</i>	<i>p</i>
Brief State Rumination			
Induction	2	0,94	0,62
Rumination condition	1	2,35	0,13
Subjective Rumination			
Induction	2	0,32	0,85
Rumination condition	1	3,84	0,05
Emotion Activation			
Induction	2	0,29	0,87
Rumination condition	1	1,98	0,16
Emotion Valence			
Induction	2	1,02	0,6
Rumination condition	1	1,66	0,2

Note. Kruskal-Wallis test was used as the variables were not distributed normally.

Figures 1-4 were used to visually explore trends for dependant variables changes. Brief state rumination index, subjective rumination index, emotion activation and emotion valence indexes were reported.

Discrepancy of the scales was observed as film condition was reported to increase rumination in brief state inventory, but decrease rumination based on subjective measurement (Figures 1-2). Whereas, negative autobiographical memory remembrance was reported to decrease rumination in brief state inventory index, while it was reported to increase rumination in subjective rumination scale. According to both rumination indexes adding music seemed to practically have no effect, as it stayed close to zero.

As for emotion activation (see Figure 3) it has appeared to increase the most (feeling excited, energized, surprised, stimulated) for neutral music and decrease the most (feeling sleepy, tired, relaxed, calm) for negative music when compared to other induction methods. Across rumination conditions film seemed to increase activation the most.

For emotion valence all groups scored on average below 0, which indicated decrease in emotion valence in all conditions. Adding a negative music or film to induction procedure produced the most decrease in emotion valence. Only a neutral autobiographical memory produced slightly more decrease in emotion valence than negative autobiographical memory.

Overall, results should be interpreted carefully as they showed potential trends that should be researched further. Rumination condition generally seemed to produce more negative emotions, but results stayed ambiguous regarding increase in rumination. Discrepancies between the two rumination measures and the wide confidence intervals indicated large variability in responses to induction. These exploratory patterns were not conclusive and subjective experiences of participants were explored next.

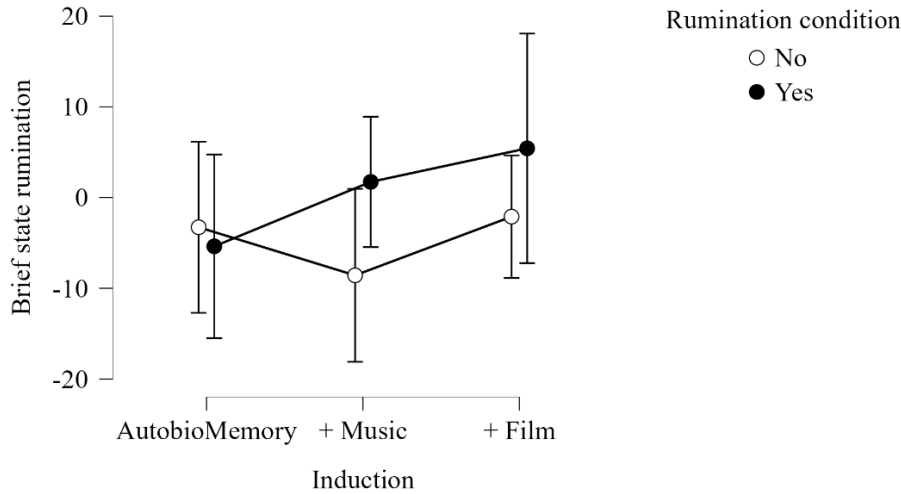


Figure 1. Explorative change of brief state rumination. Participants rated their agreement with 8 claims a scale from 0 – (Totally disagree) to 100 – (Totally agree). „+“ indicates a stimulus added before autobiographical memory remembrance in a condition. Score higher than 0 indicate increase in rumination, lower than 0 a decrease in rumination. The bars represent 95% confidence intervals.

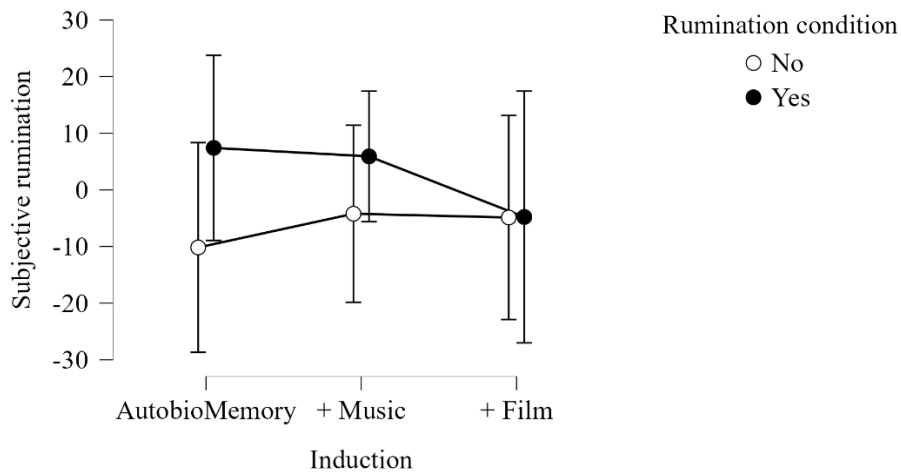


Figure 2. Explorative change of subjective rumination. Participants rated their feelings on a scale from 0 – LOW (I don't ruminate at all) to 100 – HIGH (extreme rumination). „+“ indicates a stimulus added before autobiographical memory remembrance in a condition. Scores below 0 indicate a decrease in rumination and above 0 indicate an increase in rumination. The bars represent 95% confidence intervals.

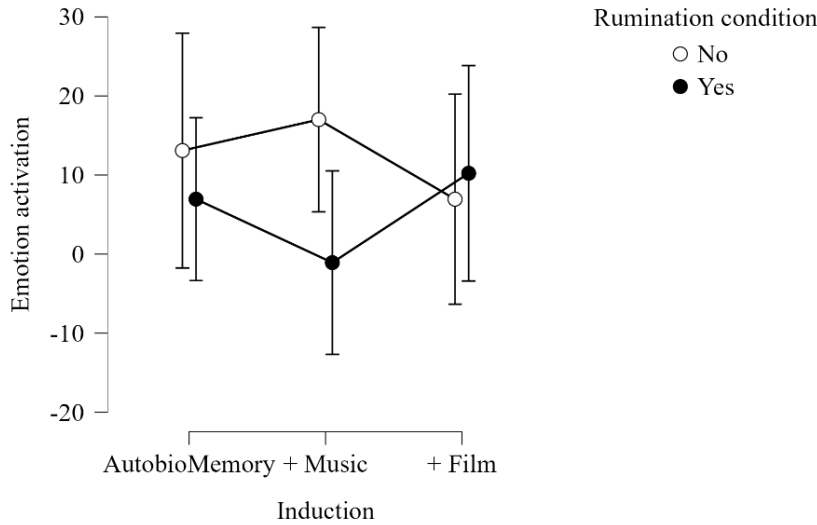


Figure 3. Explorative change of emotion activation. Participants rated their feelings on a scale from 0 – LOW (I feel that I am currently ... sleepy, tired, relaxed, calm) to 100 – HIGH (I feel that I am currently ... excited, activated, surprised, stimulated). „+“ indicates a stimulus added before autobiographical memory remembrance in a condition. Scores below 0 indicate a decrease in activation and above 0 indicate an increase in activation. The bars represent 95% confidence intervals.

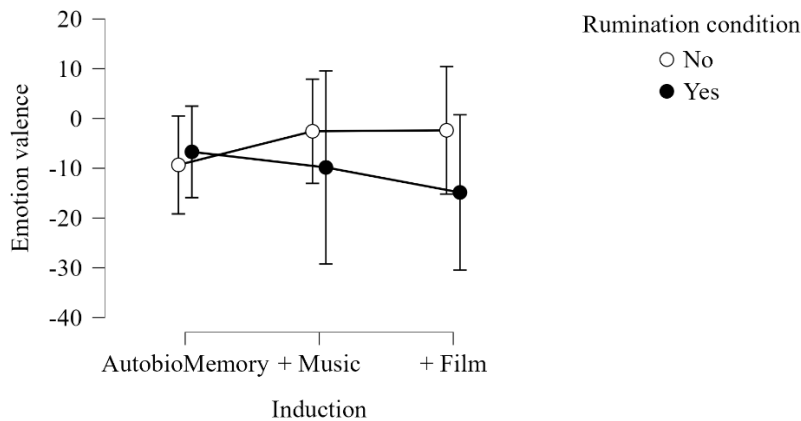


Figure 4. Explorative change of emotion valence. Participants rated their feelings on a scale from 0 – NEGATIVE (I feel that I am currently ... unhappy, miserable, depressed, anxious) to 100 – POSITIVE (I feel that I am currently ... happy, content, hopeful, satisfied). „+“ indicates a stimulus added before autobiographical memory remembrance in a condition. Scores below 0 indicate a decrease in valence and above 0 indicate an increase in valence. The bars represent 95% confidence intervals.

Qualitative analysis of factors facilitating rumination induction

Interviews with participants who showed an increase in rumination after being exposed to rumination condition revealed three main themes.

First, respondents seemed to refer to a presence of a personally relevant memory, when reflecting on the experimental material and that it played a role in how they felt during the experiment. For example participant from group 3 (Negative film + Negative autobiographical recall + RMT) mentioned: “*[those thoughts] had been in the back of my mind for a few days*” and “*since I already had that memory at the time, I had thought about it even before I started taking the test, and I've been thinking about it for several days now, so it wasn't hard for me [to remember it]*”. This indicated that the sad memory was accessible and relevant, therefore easier to engage with during the experiment. It was also pointed out from member of the 5th group (Negative music + Negative autobiographical recall + RMT) that the memories being personal played a role in experiencing negative emotions: “*Since it was linked to personal memories, it had a profound effect on me.*” This also indicated that personal memories being more accessible at the time of the experiment helped participants to engage with them.

Secondly, pre-existing low mood prior to the experiment appeared to play a role in the induction process. During the interview, participant for whom the rumination induction condition reflected increase in rumination reported low mood prior to starting the experiment: “*because I was, well... feeling kind of sad anyway*”. Low mood might have increased sensitivity to the material, which might have made participant more vulnerable to negative stimuli and rumination induction.

Interviews also reflected possible individual differences in emotional engagement with the material. One participant in group 1 (Negative autobiographical recall + RMT) mentioned that, in their opinion, since they are a more emotional person in general, they interacted more deeply with the experimental material: “*I'm kind of a more emotional person, and I can kind of relive those emotions again.*” This indicated that it was easier for the participant on individual level to engage with the negative memory and evoke the emotional state as if reliving those memories here and now. The interviewed person from the 5th group (Negative music + Negative autobiographical recall + RMT) also showed an individual preference towards the experimental material, as they said that music had a significant impact on them usually in everyday life: “*Music affects me even in my daily life and sets the mood,*” and “*Audio had the biggest impact*

on me.” This might have suggested that the participant connected more deeply with the material because of individual differences and therefore might have had more influence on their emotional state.

Qualitative analysis of the factors inhibiting rumination induction

Interviews with participants who showed no increase or even a decrease in rumination after being exposed to rumination induction condition also revealed three main themes.

Firstly, for some participants it was difficult to identify a relevant negative autobiographical memory. For example, the participant from group 3 (Negative film + Negative autobiographical recall + RMT) pointed out that recalling memories was not an easy task for them, since they didn't do that in everyday life: *“I couldn't really... think of much from the recent past... any kind of, well, sad events [...] It's a little difficult. I'm not used to doing something like this, like bringing up some event like that again”*. Participant from 5th group (Negative music + Negative autobiographical recall + RMT) pointed out that they couldn't recall a negative memory because, in their opinion people rather remember positive things: *“people tend to remember positive things,”* and recalling the situation after it happened didn't evoke such negative emotions: *“Sometimes I think, okay, yeah, it was sad, but when you think about it later, you think, okay, actually it's not that important”*. This showed that some people had difficulties in identifying personal relevant negative memories as it was not something they were used to doing. Implying that repetitive engagement with negative memories was an essential condition for rumination induction and must not have been assumed across all participants. If the internal condition for such engagement is absent, rumination induction seemed to fail. Similar results were reported in neutral condition, where there was no goal of inducing any negative affect.

Precisely, participant from 2nd (Neutral autobiographical recall + Distraction questions) mentioned that the absence of a relevant memory in their condition played a role. That is, it was not the neutral memory itself that had no effect, but rather the absence of a neutral memory: *“It was very difficult [to choose a neutral memory to focus on] for me because I have never been in a situation in my life where I feel nothing, and that is why I did not answer”*. Participant from the 6th group (Neutral music + Neutral autobiographical recall + Distraction questions) also indicated, that such a memory, where no emotions are felt was difficult to find: *“It [finding the memory to focus on] was hard because, well... finding things that are kind of neutral and don't evoke any emotions, [...] I found it hard to remember them”*. This showed that it could be hard

for people to indicate a memory in which there are no feelings involved. Therefore, engagement with memories might have been shaped by emotional accessibility and if it was absent, participants were not able to perform the task.

In addition to memory accessibility, there were participants that reported the lack of intensity of experimental material. For example, participant from group 5 (Negative music + Negative autobiographical recall + RMT) recalled the sad audio in the interview as “*just music*” and that they didn’t feel or remember much about it. They pointed out that the music they had to listen to didn’t feel sad to them: “*It wasn’t any kind of sad music.*” Similarly, regarding the sad film watched in group 3 (Negative film + Negative autobiographical recall + RMT), the participant said, that they were constantly thinking about the purpose of the video, but the video itself didn’t particularly affect their state of mind: “*I didn’t feel like this video had affected me much anyway [...] I was kind of constantly thinking, like, what is the purpose of this video, what is the purpose of this experiment, or how am I supposed to feel now while we’re watching this video.*” Similarly, in the neutral condition the lack of intensity in the test material was also reported. For instance, participant in the 6th group (Neutral music + Neutral autobiographical recall + Distraction questions) reflected in the interview: “*... I think it was some kind of classical music or something like that, which didn’t really evoke any emotions at all.*” Interestingly, the same participant mentioned listening to similar music prior to the experiment and speculated that they did not feel any change because of that: “*I had been listening to classical music before I started this survey, and it just kind of blended in with what I had been doing before, so that’s probably why I didn’t really notice it, you know.*”

This implied that experimental material in rumination condition might have failed to evoke a response in participants, as it was perceived to lack emotional intensity similarly to no rumination condition. Alternatively, if the purpose of engaging with the material felt too artificial or blended with prior experiences, it might have inhibited the induction in rumination condition. This suggested that participants were able to detach from the material in the rumination induction setting, which therefore prevented induction.

A third inhibiting factor seemed to be active engagement in cognitive reappraisal as a coping mechanism. Some participants regarded the experimental material as an opportunity to delve into the negative memory more analytically and rather than experiencing an induction of a ruminative effect, participants reported solving their problems. For example, in group 1

(Negative autobiographical recall + RMT) the participant mentioned, *“thanks to this study, I realized that I hadn’t quite understood... I basically used this study to process those emotions”* and *“this analysis still had a positive effect on me because [...] I was able to make sense of the situation for myself.”* Participant also added that since the problem they recalled was recent, they particularly liked the self-analysis part. Participant from the 3rd group (Negative film + Negative autobiographical recall + RMT) also pointed out that after the analysis, the situation became more positive: *“it sort of turned positive toward the end of the task. [...] Because, well, when you see the questions coming, then I kind of thought the situation through more and then I kind of rationalized it for myself”*. They explained that the analysis was enjoyable because it helped them understand the problem better: *“but I liked analysing this problem and it kind of made me think that not everything is so bad, and it helped me rationalize it too.”* Similarly, participant from the 5th group (Negative music + Negative autobiographical recall + RMT), described that thinking through the situation usually helps them view the problem from a practical perspective, which in turn makes the situation easier to handle: *“when you think it through, then [...] you might just set those emotions aside [...] and realize that it was a long time ago [...] and that, in reality, right now it’s not really a catastrophe anymore”*. This active engagement in viewing analysis as a problem-solving mechanism implied that some people engaged in reframing the negative situation, which in turn inhibited the induction process. Participants naturally resolved to learned coping strategies, which therefore led to no sustained negative affect.

Qualitative analysis of the discrepancy between self-reported experience and BSRI scores

Even though the BSRI scale indicated an increase in rumination following the rumination induction, the interview revealed that sometimes a participant did not recall any change: *“[...] I had to answer the same questions several times, and it seemed to me that my own state hadn’t changed, so why do I have to keep re-evaluating it all the time?”*. The same participant also reported small motivation and reflected upon the disadvantage of the used scale: *“One downside [of the experimental design] might be that... um... there was that scale, [...] It might have been a bit random in this case... [...] And then, like, I remember that I tried to recall how I rated it last time... so I wouldn’t have to analyze my feelings all over again... Because I felt like I was being lazy... I didn’t bother to evaluate it again”*. Also, same participant reported that watching the film did not affect them: *“I felt that this video didn’t affect me, because I understood that it was fiction”* and *“I think that watching this video didn’t influence that choice in any way”*, which

indicated that this induction combination might not have worked for this participant, even though the BSRI score indicated a change.

Participants, whose BSRI scores reflected an increase in rumination, similarly reflected in the interview that the analysis helped with their negative feelings and they felt better, which is counterintuitive with increased BSRI scores: “[...] *analysing the situation somehow helped me to not be so caught up in that worry.*” Similarly, in the 1st group (Negative autobiographical recall + RMT) the participant reported: “*It was as if all those negative thoughts came flooding back into my mind... But then I also thought about how I had gotten past that situation, and that actually brought up some positive emotions.*” This might have implied that the BSRI scale did not reflect the actual change and the scores were random. Alternatively, this might have reflected that the participants were unaware of mood changes.

Discussion

The aim of this research was to compare the effects of depressive rumination induction techniques on rumination and state affect and qualitatively explore which factors facilitated or inhibited rumination induction. The rumination induction and additional variables like emotion activation and emotion valence were measured using VAS scales (Lyubomirsky & Nolen-Hoeksema’s 1995). This research consisted of online experiment and follow-up online interviews with participants, whose reported scores on the BSRI (Marchetti et al., 2018) were the most different (the highest and the lowest) from others within their group. This combination of methods allowed for a more detailed approach than conventional rumination induction research and therefore was beneficial for more comprehensive evaluation.

The first explorative question was considering what effects different induction methods had on rumination induction. Current research used a 2x3 design, which consisted of 3 methods: a sad autobiographical memory remembrance followed by RMT, watching a negative video prior to a sad autobiographical memory remembrance followed by RMT, and listening to a negative audio prior to a sad autobiographical memory remembrance followed by RMT (Nolen-Hoeksema & Morrow, 1993). The control conditions had the same combination but had neutral valence and no rumination induction. The key takeaway was that none of the conditions produced a statistically significant differences in rumination, emotion valence and emotion activation. One possible explanation for these results was that the sample was too small and therefore ANOVA was underpowered, which prevented statistical test to detect real effects. Conducting the

manipulation check a significant change was reported for emotion activation in 2nd and 6th groups. It was although possible that the significant t-test was a Type I error given the underpowered design.

There was a borderline statistically significant result ($p = 0.05$) for rumination condition on one-item subjective rumination scale, although the BSRI and subjective rumination scale were often contradicting each other. For example, negative film condition appeared to produce the largest increase in BSRI rumination, yet on the one-item rumination scale it appeared to decrease rumination. Similarly autobiographical memory remembrance in rumination condition decreased rumination based on BSRI scale but increased rumination based on one-item rumination scale. BSRI scale was a validated state rumination measurement, while one-item subjective rumination scale was reported to be easier and less time consuming to complete (Michel-Kröhler et al., 2023). Both measurements used VAS, but BSRI was an 8-item scale that measures how one perceives thinking about one's mood. One-item subjective rumination, on the other hand, measured how much a person evaluates that they ruminate here and now. This implied that either the participants may have interpreted two scales differently or intrinsic motivation to fully engage with the material was too low, as participants might have scored randomly since the online experiment was long lasting. It could have also been that the scales captured different aspects of rumination and did not underline the same construct. Possibly, there was a misunderstanding of the language, as less than half of the participants were Estonian native speakers. This implied the need to reevaluate the experimental design and decrease the cognitive load on the participants. Additionally, attention checks might be added in the future to ensure that items are read carefully.

Nevertheless, these findings deserved a careful consideration, and trends were interpreted using visual directional patterns shown in Figures 1-4. Visually reported BSRI scores showed sad music and sad film conditions paired with sad autobiographical memory remembrance + RMT to figuratively increase rumination compared to no rumination condition, where participants experienced a neutral stimulus. Visually reported subjective rumination scores, on the other hand, showed a sad autobiographical memory followed by RMT and a sad music paired with sad autobiographical memory and RMT to produce more rumination compared to no rumination condition. Figures also showed large variations. These findings were similar to Tamm and colleagues (2025b) research, who indicated that rumination induction resulted in more

rumination compared to control groups, but there was a large variation in responsiveness to induction procedure. Similarly to Tamm and colleagues (2025b), current research results proposed a need for further methodological control of the induction procedures.

The qualitative data collected in this study offered an important step towards providing insights into the individual-level factors that may have helped to determine rumination induction inhibitors and facilitators. This helped to narrow down the ambiguity of factors and proposed a clearer way of studying the rumination induction in the future.

Second exploratory question regarded what features of stimuli were reported to influence rumination induction. Interviews revealed that there were three main rumination induction facilitating factors and three main rumination induction inhibiting factors. It appeared that if participants were able to recall a personally relevant memory (meaning it was fresh and accessible) this acted as a rumination induction facilitator. This is comparable with previous results from a meta-analysis (Fernández-Pérez et al., 2025), which stated that negative autobiographical induction was associated with increase in negative affect. This could be due to activation of the brain regions that were similar to ones activated during the experience of the event (Kober et al., 2008).

What also seemed to play an important role in rumination induction was the pre-existing low mood prior to the start of the experiment. Meaning that not the mood induction itself facilitated a low mood, but if the person was already struggling and going through something, they might have been more sensitive to experimental material and therefore more sensitive to rumination induction. This might be consistent with the findings that depression increased negative attention bias, implying that melancholic participants were more prone to negative rumination bias (Wang et al., 2025). This may have suggested that if vulnerability to rumination induction depends on pre-existing low mood, then single-session experimental induction may be fundamentally not sufficient for participants who are not already in a low mood state. Future research may address this with either multi-session or longitudinal mood induction protocols or deliberately recruit participants who report being in a low mood.

Self-reported general emotional sensitivity appeared to also play a role in rumination induction, as it was reported to make participants more vulnerable to experimental stimuli and therefore rumination induction might have been more successful. Therefore, individual differences might have been an important factor for successful induction. This was similar to the

findings that neuroticism, as a marker of emotional reactivity, played an important role in negative mood induction, as people high in neuroticism processed experimental mood induction stimuli more firmly (Larsen & Ketelaar, 1989). Therefore, indicating that individual differences in sensitivity might have been an important indicator in whether rumination induction would be successful.

Some factors seemed to inhibit rumination induction. For instance, difficulty recalling emotionally charged memories was reported in interviews with people for whom induction did not work. That means that participants did not find any relevant and recent sad memory to focus on. This might have been explained with pleasantness bias, as healthy individuals might generally remember more positive instances in their life (Rasmussen & Berntsen, 2009). Previous findings also showed that positive memories were more voluntarily recalled than negative ones (Rasmussen & Berntsen, 2009), which indicated that it might have been harder for participants in this study to recall sad memories. When it comes to remembering a neutral memory, it was also reported as a harder task, as participants indicated not having a moment in life, when they do not particularly feel anything. As Faul and LaBar (2023) said: “life is not a neutral experience”, therefore it was consistent with the ideas that came up in the interviews, that memories in general were usually eliciting positive or negative emotions. This proposed a need to reevaluate the induction regarding memories in future studies. For example, recruiting participants who report lower moods in general or who are used to recalling negative memories and therefore naturally engage in rumination.

Another factor inhibiting rumination induction was reappraisal as a coping technique. Those participants who used RMT as a problem analysis method reported to understand the problem deeply and get over it through becoming more aware of different perspectives of it and therefore reappraise the problem for themselves. Positive reappraisal is an adaptive coping strategy, which, if followed after deliberate thinking, can help people cope with negative situations (Krys & Reininger, 2023). This implied that prior to rumination induction it might be needed to know what kind of coping strategies individuals usually use. Therefore, it could be that on individual level the rumination induction technique might just not work for everyone.

Lastly, perceived low intensity of stimuli was also reported as a rumination induction inhibitor. This was also reflected in descriptive graphs, as emotion activation tended to change very little for rumination conditions, with the lowest on average being 0, indicating no change in

activation. From the interviews it was reported that participants for whom rumination induction did not increase rumination, regarded the experienced stimuli as low in intensity. This is consistent with ideas of Lench, Flores and colleagues (2011) that for film to be an effective mood induction, participants must willingly engage with the fictional reality. Otherwise, the effects of film on emotions were usually unclear (Lench et al., 2011). Therefore, if the intensity was low, participants might have been disinterested in the material. Similarly, it is arguable whether music elicits the same emotions across all participants and therefore participants might use different strategies to engage with the material (Lench et al., 2011). In this case, it could have been a high variability in what some people perceive as sufficient and therefore the same music might not have worked the same way for everyone.

This study has several limitations. The study was underpowered, as the sample was small and experimental groups were unequal. Before the start of the online experiment, researchers were aware of this limitation and since the current research was a pilot experiment it was planned to have a small sample. The main limitation for qualitative interviews was that the study was unable to include everyone the researchers would have liked to interview, as only 8 out of 12 contacted participants were reached. None of the participants from group 4 answered, therefore it was impossible to gather data regarding the effects of neutral film. This implied that the results should be interpreted with very careful consideration as some aspects might have remained unclear. Future implications might focus on gathering a bigger sample and include more interviews to gather valuable data.

The study being conducted online severely reduced experimental control. Even though in the beginning of the study the instructions were given, the experimenters could not have controlled whether the participants were truly focused and undisturbed. Conducting an online study certainly had its advantages as more than 300 people started the experiment within one week, which would have given the advantage of gathering more data in a shorter time, although only 86 people completed the online experiment. Future implication might consider conducting a real-life experiment to increase control, ensuring that participants are focused during the experiment.

All in all, while there were no statistically significant differences between the rumination induction groups, the key value of this pilot-study lies in the qualitative analysis of the post-experiment experiences. These results showed that some important factors to facilitate

rumination induction experiences in the study participants were presence of a personally relevant sad memory, pre-existing low mood prior to the experiment, and individual differences, such as self-reported general emotional sensitivity. Factors that possibly inhibited rumination induction in participants were absence of relevant or accessible memory, positive reappraisal during the task, and perceived low intensity of stimuli. Moreover, the results showed that there could have been a discrepancy between the scales. This research opens a discussion into validity of depressive rumination induction methods currently used in literature. Gathering information from participants directly gave important insights into which factors play a role in successful rumination induction. Since this study is one of the first to investigate this paradigm, it is important to further develop the method by using larger samples and improving the experimental design.

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Appendix

Appendix 1. BSRI forward and back translation into Estonian language

Original:

1. Right now, I am reflecting about my mood.
2. Right now, I wonder why I react the way I do
3. Right now, I wonder why I always feel the way I do
4. Right now, I am thinking: “why do I have problems other people don’t have?”
5. Right now, I am rehashing in my mind recent things I’ve said or done
6. Right now, I am thinking: “why can’t I handle things better?”
7. Right now, it is hard for me to shut off negative thoughts about myself
8. Right now, I wonder why I can’t respond in a better way

Expert A:

Hetkel mõtisklen enda tuju üle.

Hetkel mõtlen sellele, et miks ma reageerin sellisel viisil.

Hetkel mõtlen sellele, et miks ma tunnen end alati seda moodi.

Hetkel mõtlen: "miks on mul selliseid probleeme, mida teistel pole?"

Hetkel korrutan enda peas hiljuti öeldud ja tehtud asju.

Hetkel mõtlen: "miks ei suuda ma asjadega paremini hakkama saada?"

Hetkel on mul raske enda kohta käivaid negatiivseid mõtteid välja lülitada.

Hetkel mõtlen, et miks ei suuda ma paremini reageerida.

Expert B:

Praegu ma reflekteerin minu tujule

Praegu ma mõtlen miks ma reageerin just sellisel viisil

Praegu ma mõtlen miks ma alati tunnen ennast nii

Praegu ma mõtlen “miks mul esinevad probleemid, mida teistel ei ole”

Praegu ma kordan enda peas asju mida ma ütlesin või tegin

Praegu ma mõtlen “miks ma ei saa hakkama paremini”

Praegu mul on raske lülitada negatiivseid mõtteid enda kohta välja

Praegu ma mõtlen miks ma ei saa vastata paremal viisil

Expert C:

Praegusel hetkel ma mõtlen oma tuju peale

Praegusel hetkel mõtlen miks ma reageerin nii, nagu ma reageerin

Praegusel hetkel mõtlen miks ma end alati nii tunnen

Praegusel hetkel mõtlen miks mul on probleemid, mida teistel pole

Praegusel hetkel kordan uuesti enda peas hiljutisi ütlemissi või tegusid

Praegusel hetkel mõtlen miks ma ei suuda asjadega paremini toime tulla

Praegusel hetkel mul on raske vaigistada negatiivseid mõtteid minu enda kohta

Praegusel hetkel mõtlen miks ma ei oska reageerida paremal moel

Consensus 1:

Praegusel hetkel ma mõtisklen enda tuju üle.

Praegusel hetkel mõtlen, miks ma reageerin just sellisel viisil.

Praegusel hetkel mõtlen, miks ma end alati niimoodi tunnen.

Praegusel hetkel mõtlen miks mul on probleemid, mida teistel pole

Praegusel hetkel korrutan enda peas hiljuti öeldud või tehtud asju

Praegusel hetkel mõtlen miks ma ei suuda asjadega paremini hakkama saada.

Praegusel hetkel on mul raske enesekohaseid negatiivseid mõtteid välja lülitada

Praegusel hetkel mõtlen miks ma ei suuda reageerida paremal moel

A consensus was reached following the discussion, and the draft was sent for translation. This is a qualitative adaptation. We reviewed the translation with experts in the field.

Independent back translation 1:

I am thinking about my emotional state right now.

Right now, I am thinking about why I react the way I do.

Right now, I am thinking about why I always feel the way I do.

Right now, I am thinking about why I have problems that others don't.

Right now, I am mentally reliving the things I've said or done recently.

Right now, I am thinking about why I am not able to deal with things better.

It is difficult to turn off negative thoughts about myself right now.

Right now, I am thinking about why I am not able to react in a better way.

Alternative 1:

Praegusel hetkel ma mõtisklen enda meeleolu üle

Praegusel hetkel mõtisklen, miks ma reageerin just sellisel viisil.

Praegusel hetkel mõtisklen, miks ma end alati niimodi tunnen

Praegusel hetkel mõtlen miks mul on probleemid, mida teistel pole

Praegusel hetkel korrutan enda peas hiljuti öeldud või tehtud asju

Praegusel hetkel mõtlen, miks ma ei suuda asjadega paremini hakkama saada.

Praegusel hetkel on mul raske enesekohaseid negatiivseid mõtteid välja lülitada

Praegusel hetkel mõtlisklen miks ma ei suuda reageerida paremal moel

Estonian language expert feedback:

Praegusel hetkel ma mõtisklen oma meeleolu üle.

Praegusel hetkel mõtisklen, miks ma reageerin just sellisel viisil.

Praegusel hetkel mõtisklen, miks ma end alati just niimoodi tunnen.

Praegusel hetkel mõtlen, miks mul on probleemid, mida teistel pole.

Praegusel hetkel korrutan enda peas hiljuti öeldud või tehtud asju.

Praegusel hetkel mõtlen, miks ma ei suuda asjadega paremini hakkama saada.

Praegusel hetkel on mul raske endast halvasti mõtlemist lõpetada.

Praegusel hetkel mõtisklen, miks ma ei suuda reageerida paremal moel.

Consensus 2:

Praegusel hetkel ma mõtisklen oma meeleolu üle.

Praegusel hetkel mõtisklen, miks ma reageerin just sellisel viisil.

Praegusel hetkel mõtisklen, miks ma end alati just niimoodi tunnen.

Praegusel hetkel mõtlen, miks mul on probleemid, mida teistel pole.

Praegusel hetkel korrutan enda peas hiljuti öeldud või tehtud asju.

Praegusel hetkel mõtlen, miks ma ei suuda asjadega paremini hakkama saada.

Praegusel hetkel on mul raske endast halvasti mõtlemist lõpetada.

Praegusel hetkel mõtisklen, miks ma ei suuda reageerida paremal moel.

Independent back translation 2:

I am pondering over my emotional state right now.

Right now, I am pondering over why I react the way I do.

Right now, I am pondering over why I always feel the way I do.

At this moment, I am thinking about why I have problems that others don't.

At this moment, I am mentally repeating the things I've said or done recently.

At this moment, I am thinking about why I can't deal with things better.

It is difficult to stop thinking negatively about myself right now.

At this moment, I am pondering about why I can't react in a better way.

Consensus 3:

Praegusel hetkel ma mõtisklen oma meeleolu üle.

Praegusel hetkel mõtisklen, miks ma reageerin just sellisel viisil.

Praegusel hetkel mõtisklen, miks ma end alati just niimoodi tunnen.

Praegusel hetkel mõtlen, miks mul on probleemid, mida teistel inimestel pole.

Praegusel hetkel korruptan enda peas hiljuti öeldud või tehtud asju.

Praegusel hetkel mõtlen, miks ma ei suuda asjadega paremini hakkama saada.

Praegusel hetkel on mul raske endast halvasti mõtlemist lõpetada.

Praegusel hetkel mõtisklen, miks ma ei suuda reageerida paremal moel.

Appendix 2. Semi-structured interview questions in Estonian language

Tere tulemast järelintervjuule. Täna eesmärgiks on mõista paremini, kuidas pilootkatse materjal teid mõjutas või ei mõjutanud. Järgnevalt esitan teile mõned küsimused katse kohta. Kas teile sobib, et meie intervjuu salvestatakse? Samuti ütlen, et pärast andmeanalüüsi see salvestust kustutatakse, teie vastuseid ei levitata kuskil. (vastus)

Teema 0. Üldine kogemus. Mida arvate, kuidas teil katses osalemine läks? Palun kirjeldage, kuidas teile uuringus osalemine meeldis? Mis ei meeldinud ja mis meeldis? Miks?

Teema 1. Teie osalesite emotsioone uurivas katses, palun kirjeldage lühidalt mida te pidite tegema? Mis jäi teile katsest kõige eredamalt meelde?

Mhm, manisite audio/video. Räägiks korra natukene rohkem sellest (kui audio/video materila puudus, siis Teema 4).

Teema 2. Audio/Video mäletamine. Mida mäletate audiost või videost mida nägite/kuulsite? Millised tunded ja mõtted teil tekkisid selle video vaadates/audio kuulates? Miks? Kas see mõjutas teid kuidagi? Kuidas?

Teema 3. Audio/Video mõju. Kuidas te hindaksite kuivõrd audio/video teid emotsionaalselt tol hetkel mõjutas 1-10ni. Ütleme, et 1 on “ei mõjutanud üldse” ja 10 “et tekkis väga suur mõju”. Kirjeldage, miks? Mis mõjutas teid ja mis ei mõjutanud? Kas mõju oli positiivne, negatiivne või neutraalne? Miks? Mis osa audiost või videost teid enim mõjutas? Palun analüüsige – miks? Kui mõju puudus – palun analüüsige, miks see võis nii olla?

Teema 4. Mälestuse valik.

Okei, aitäh teile selle sisendi eest. Mainisite, et pidite meenutama mälestust. Kuivõrd keeruline või lihtne oli teie jaoks see mälestus välja valida?

Teema 4. Mälestuse mõju.

Kas mälestuse meenutamine mõjutas teid kuidagi (tekitas tundeid)? Milliseid mõtteid ja tundeid see mälestus teie tekitas? Kirjeldage palun kuivõrd teil õnnestus mälestuse hoidmine oma mõtetes katse ajal? Kuidas te hindaksite praegu kuivõrd see element teid emotsionaalselt mõjus 1-10ni. Ütleme, et 1 on “ei mõjutanud üldse” ja 10 “et tekkis väga suur mõju”. Mis täpselt selles elemendis teie arvates teid mõjutas/ miks teie arvates see element ei tekitanud mingit mõju teile?

Teema 5. Suunavate küsimuste (või kontrolltingimuse) protseduur.

Samuti oli teil vaja keskenduda konkreetsetele osadele oma mälestusest. Kuidas see teil õnnestus? Mis tunded ja mõtted tekkisid? Kirjeldage palun kuidas te hoidsite fookust oma mälestusel? Kuivõrd olid suunavad küsimused teile abiks mõtete fokusseerimisel? Kuivõrd mõjutasid need küsimused teie tundeid või mõtteid? Kuidas te hindaksite praegu kuivõrd see element teid emotsionaalselt mõjus 1-10ni. Ütleme, et 1 on “ei mõjutanud üldse” ja 10 “et tekkis väga suur mõju”. Mis täpselt selles elemendis teie arvates teid mõjutas/ miks teie arvates see element ei tekitanud mingit mõju teile?

Teema 6. Väga hea, aitäh selle sisendi eest. Viimaseks küsimuseks, korra täpsustan: kui peaksite valima, mis sellest kõigest, mida te pidite läbi tegema selles katses pani teid kõige rohkem korduvalt mõtlema oma tunnete üle? Miks just see osa?

Teema 7. Vaba teema. Kas tahaksite veel midagi lisada või täpsustada oma uuringus osalemise kogemuse kohta?

Käesolevaga kinnitan, et olen korrekselt viidanud kõigile oma töös kasutatud teiste autorite poolt loodud kirjalikele töödele, lausetele, mõtetele, ideedele või andmetele.

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Katarina Urm