



UMEÅ UNIVERSITET

**“ARE YOU WATCHING
CLOSELY?”:
A STUDY OF REAPPRAISAL AND
SELF-EFFICACY**

Oliver Pawlik & Markus Yttling

Master thesis, 30 hp
Psykologprogrammet, 300 hp
Spring term 2026
Supervisor: Kalyani Vishwanatha

With sincere gratitude, we would like to thank all participants who have given their precious time in helping us gather data.

We would also like to express our appreciation and thankfulness to our supervisor, Kalyani Vishwanatha, for providing us with insightful guidance all throughout the process. Without you, this thesis would not have been possible.

Abstract

Emotion regulation is a core process operating throughout life, influencing most domains of functioning, and the emotion regulation strategy of cognitive reappraisal is deemed one of the more functional ones overall. The phenomenon is conventionally viewed as an explicit, conscious, regulatory process. This explicitness is typically cognitively demanding. In everyday functioning, people rely on both explicit and implicit emotion regulation strategies. Therefore, the utilization of the technique implicitly, unconsciously, could have considerable implications on people's everyday functioning. This thesis aimed to examine conditions under which reappraisal can be actualized on an implicit level. Furthermore, the thesis investigated whether there are associations between reappraisal and general self-efficacy.

A within-subjects experimental design was applied, including a convenience sample of 30 participants evenly split among women ($n = 15$) and men ($n = 15$), aged 20–43. Participants were exposed to arousal-eliciting images, and instructed to rate their level of arousal upon viewing each one. If the participant had perceived a triangle antecedent to a second viewing of the image, they were instructed to reappraise the picture. The design consisted of three conditions, with distinct triangle exposure times: clearly visible (120 milliseconds), brief exposure (37/27/17 milliseconds) and completely absent. The time taken to generate a reappraisal was collected before the second viewing of the picture. An awareness-check was also implemented, showing that the brief exposure was not sufficient, regarding its briefness and masking, to activate exclusively implicit processing. A repeated-measures ANOVA revealed equivalent arousal reduction in the reappraisal conditions in contrast to the absent condition. Another repeated-measures ANOVA was conducted regarding time taken to reappraise, revealing no differences between the clearly visible and the brief exposure, but both significantly differing from the absent condition, indicating the briefer exposure time added no cognitive load to the reappraisal process. Correlation analyses indicated no associations between reappraisal effectiveness and self-efficacy. Propositions for methodological improvements on prospective research are presented.

Keywords: implicit emotion regulation, cognitive reappraisal, self-efficacy, visual masking, within-subject experimental design.

Sammanfattning

Emotionsreglering är en kärnprocess som är närvarande genom hela livet, som påverkar de flesta områdena i tillvaron, och emotionsregleringsstrategin som kallas kognitiv omvärdering är en av de mest funktionella överlag. Fenomenet betraktas konventionellt som en explicit, medveten regleringsprocess. Denna medvetenhet är vanligtvis kognitivt krävande. I vardagen förlitar sig människor på såväl explicita som implicita emotionsregleringsstrategier. Om denna strategi skulle kunna användas implicit och omedvetet, skulle det kunna ha betydande inverkan på människors tillvaro i stort. Den här examensuppsatsen ämnade undersöka vilka förutsättningar som skulle kunna krävas för att kognitiv omvärdering ska tillämpas omedvetet. Därutöver undersöktes huruvida det finns samvariation mellan kognitiv omvärdering och upplevd självförmåga. En experimentell inomgruppsdesign tillämpades, med ett bekvämlighetsurval bestående av deltagare med en jämn könsfördelning mellan kvinnor ($n = 15$) och män ($n = 15$) i åldrarna 20–43. I samband med att deltagarna visades känslöväckande bilder instruerades dem att skatta sin nivå av känslöaktivering. Om deltagaren uppfattade en triangel inför den andra visningen av samma känslöväckande bild, uppmanades de att omvärdera bilden. Experimentdesignen utgjordes av tre betingelser med olika långa exponeringstider för triangeln: Klart synlig (120 millisekunder), kortvarig exponering (37/27/17 millisekunder) och fullständigt frånvarande. Tiden det tog att generera en omvärdering mättes före den andra visningen av varje känslöväckande bild. En medvetenhetskontroll implementerades också, som visade att den kortvariga exponeringen inte var tillräcklig, gällande dess kortvarighet och maskering, för att aktivera en till fullo implicit process. En ANOVA för upprepade mätningar visade att båda omvärderingsbetingelserna medförde signifikanta minskningar i känslönivå i kontrast till frånvarobetingelsen. Omvärderingsbetingelserna var jämbördiga i dess påverkan på känslönivå. En ANOVA för upprepade mätningar avseende tidsåtgång att generera en omvärdering visade att inga skillnader kunde påvisas mellan den klart synliga och den kortvariga exponeringen, men båda skiljde sig signifikant från frånvarobetingelsen, vilket indikerar att kortvarig exponering inte tillförde någon kognitiv belastning till omvärderingsprocessen. Korrelationsanalyser uppvisade inga associationer mellan effektivitet av omvärdering och upplevd självförmåga. Förslag för metodologiska förbättringar för framtida forskning presenteras.

Nyckelord: Implicit emotionsreglering, kognitiv omvärdering, upplevd självförmåga, visuell maskering, experimentell inomgruppsdesign.

“Men are not disturbed by things, but by the views they take of them,” claimed the Stoic philosopher Epictetus during the second century AD, articulating a principle that remains relevant to modern psychological theories of emotion (Epictetus, 1995, Sec. 5). This insight is adjacent to, and anticipates, what contemporary psychology would define as the emotion regulation strategy known as cognitive reappraisal, in which “an individual effortfully attempts to describe and characterize an emotional stimulus in terms that change their initial emotional response” (Braunstein et al., 2017, p. 1547).

Alternatively to viewing emotions as emerging solely as a response to external events, cognitive reappraisal emphasizes the regulatory role of subjective interpretation, situating it as an important modulator of emotional experience (Gross, 2015). Accordingly, emotions are perceived as dynamic and malleable processes, susceptible to change and regulation (Gross, 2015; Panksepp, 2005).

Emotion regulation (ER) is defined as “the extrinsic and intrinsic process responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features” (Thompson, 1991, p. 271). ER is a capability that develops over the course of the lifespan, with its foundations laid in infancy and its refinement continuing through adolescence into a uniquely individualized system of emotional understanding and control. This development is driven by a reciprocal interplay between the demands of the social surroundings and the progressive internalization of regulatory control (Thompson, 1991). In alignment with this process, individuals differ in their propensity for, and proficiency at, regulating their emotions (Morawetz & Basten, 2024).

ER is immensely influential in everyday functioning, shaping both momentary behaviour and psychological well-being over time (English et al., 2012; Gross, 2001). The regulation of emotions at the individual level, and particularly the process by which it is enacted, heavily affects one's social relationships in terms of interpersonal warmth and closeness, as well as favorable sociometric standing (English et al., 2012). More proactive and functional ER is also linked to preserved cognitive performance, reduced physiological strain and better long-term somatic health outcomes (Gross, 2001).

Deficiencies in ER are linked to a wide array of psychopathologies, including depressive, anxiety and stress disorders (Lukas et al., 2018; Sloan et al., 2017). Increasingly recognized as a transdiagnostic factor, ER constitutes a fundamental underlying dimension across psychiatric disorders, functioning as an elemental mechanism essential to the development and perpetuation of numerous psychopathologies. Accordingly, emotional dysregulation has been consistently found to be mitigated through psychological treatment. (Sloan et al., 2017). In addition, there are indications that an increase in functional ER antecedes subsequent symptom reduction in a variety of psychiatric disorders (Eichler et al., 2026; Pruessner et al., 2024; Reinholt et al., 2025).

Empirical, systematic findings suggest that distinct neural regions are differentially involved depending on the specific ER strategy implemented, highlighting variability in the neural architecture underlying regulatory processes. During the practical application of cognitive reappraisal, domain-general cognitive control regions are actively engaged. These regions include the bilateral dorsolateral prefrontal cortex (DLPFC), left ventrolateral prefrontal cortex (VLPFC), posterior dorsomedial prefrontal cortex (DMPFC)/pre-

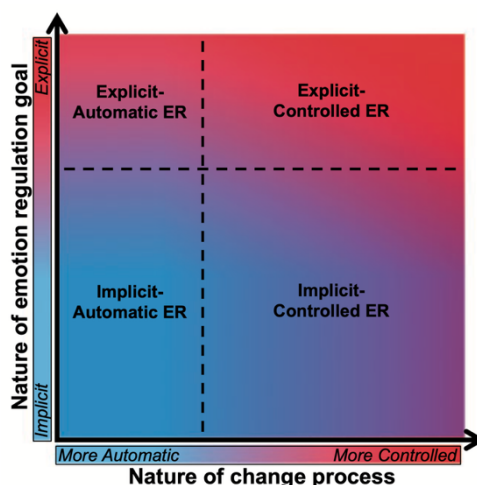
supplementary motor area (pre-SMA), the posterior parietal cortex (PPC), as well as the left posterior temporal cortex (pLTC; Denny et al., 2023).

Conceptual Structure of Emotion Regulation

Within the conceptual framework proposed by Braunstein et al. (2017), a demarcation is drawn between regulatory goals and underlying processes of emotional change. Regulatory goals span a continuum from explicit, in which the individual consciously intends to modify their emotional experience, to implicit, in which the modulation occurs without conscious intent or awareness. Equivalently, the process of emotional change varies from controlled, encompassing resource-intensive, top-down cognitive endeavours, to automatic, which operates with less oversight or effort. When these two dimensions are combined, emotion regulation strategies fall into four functional categories: (a) explicit-controlled, (b) explicit-automatic, (c) implicit-controlled, and (d) implicit-automatic. Notably, this overarching framework moves beyond static classifications of strategies, emphasizing that a given regulatory strategy may occupy different positions within the model depending on how it is instantiated. Strategies are therefore not fixed to a single category, suggesting a possible shift along both dimensions as a function of learning, repetition and contextual demands.

Figure 1

Braunstein's Multilevel Framework for Explicit and Implicit Emotion Regulation



While explicit regulatory strategies can be effective in reshaping emotional responses, their cognitively demanding nature prevents them from being relied upon exclusively in congruence with long-term well-being. Implicit regulatory practices, in contrast, are more efficient and effortless, since they require less cognitive resources. The complementarity of both aforementioned strategies is considered necessary to maintain psychological wellness over time (Gyurak et al., 2011)

Although the functionality of a given strategy is contextual, cognitive reappraisal is generally deemed one of the more adaptive strategies overall, excluding circumstances in which the affective intensity is very high (Gross, 2015). Reappraisal is conventionally regarded

as an explicit regulatory strategy (Gyurak et al., 2011). Specifically, it is conceptualized as aligning with explicit-controlled approaches, since it entails purposeful intent and effortful cognitive processing, though this alignment should not be considered as absolute (Braunstein et al., 2017).

Some research indicates that reappraisal may be actualized at an implicit level, functioning outside of conscious awareness (Williams et al., 2009; Yuan et al., 2015). It has been empirically shown that when individuals are implicitly primed to reappraise while encountering an anxiety-provoking task, there is a decrease in physiological arousal comparable to that of individuals being explicitly instructed to actively reappraise. Moreover, when inferring that reappraisal is the regulatory process operating, the effect of implicitly primed reappraisal is especially evident among those who characteristically employ reappraisal less frequently (Williams et al., 2009). Further empiricism provides nuance to the immediate consequences of reappraisal, whether it is implicitly primed or explicitly evoked. Individuals unconsciously primed to reappraise during frustration-eliciting tasks exhibit reduced physiological reactivity, mirroring those who are explicitly instructed to reappraise. Yet, whereas physiological heart rate reactivity converges across these conditions, the experiential dimension diverges; individuals explicitly instructed to reappraise generally experience decreased frustration, while those unconsciously primed tend to experience persistent frustration (Yuan et al., 2015).

Although implicit reappraisal has evidently been somewhat investigated, the phenomenon remains relatively unresearched. Given the high functionality of reappraisal, its proclivity to be resource-intensive, the necessity and practicability of implicit forms of ER, and the possibility of reappraisal being utilized both more implicitly and efficiently, further research of the strategy is warranted.

Self-efficacy

In his seminal contribution, Bandura (1977) proposed a theory to identify an underlying mechanism that greatly influences one's proclivity to engage in behavioural change. The mechanism was termed self-efficacy (SE) and is defined as the belief in one's own ability to engage in a certain behaviour, as opposed to the mere conviction that the behaviour will lead to a certain outcome. This belief varies in magnitude, in the extent to which it generalizes across contexts, and its resilience towards disconfirming experiences. SE is most effectively fortified through mastery experiences of obstacles overcome, whereas learning through vicarious experience, verbal persuasion and the interpretation of emotional and physiological cues are helpful but not equivalently effective. It has been suggested that the construct is a better predictor for behavioural change than both treatment labels and treatment expectations. Furthermore, SE has been proposed to influence an individual's selection of environment and activities, leading one to avoid situations perceived as exceeding one's coping abilities, and to pursue those perceived as manageable.

This theoretical framework builds on Bandura's social-cognitive theory, which further proposes that perceived SE plays an important role in the regulation of emotions. The belief in one's ability to regulate anger, irritation, despondency, anxiety and worry as well as expressing positive emotions such as enjoyment, enthusiasm and positive affect towards others, has been

linked to psychosocial functioning. These findings suggest that efficacy in this area plays an important role in the successful management of emotional responses (Bandura et al., 2003).

SE has also been shown to be instrumental in work contexts, boosting effort, perseverance, and facilitating proactive action, contributing to overall workplace performance, since individuals with high SE present greater persistence and motivation to achieve their goals (Stajkovic & Luthans, 1998). The same pattern is observed in educational contexts, wherein a high SE correlates with high academic achievement and positive test-related emotions (Pekrun et al., 2004). SE also influences health outcomes through a perceived sense of control, as stress is linked to physiological processes that affect immune functioning and susceptibility to illness. Psychiatric conditions such as depression have also been shown to be influenced by SE, since it contributes to resilience by maintaining feelings of self-worth and promoting engagement in fulfilling activities (Bandura, 1997).

Bandura reasoned that, when examining for the affective functioning, three aspects of SE should be included: coping action, affect and thought. This highlights the function of SE across behavioural, affective and cognitive processes. Coping action pertains to the strategies used to adapt the environment, which is activating the anxiety, to alter its emotional potential. It is also associated with the ability to withhold action to change a situation, assured of one's perceived capability to in fact change the situation, contributing to a sense of control. Affect control relates to how physiological arousal is interpreted. While influenced by the social influence of a situation, the cognitive aspect also influences the affectivity. The thought-related aspect of SE therefore plays a central part in emotional well-being. It is theorized to take three forms: suppression of perturbing thoughts, cognitive diversion to positive trains of thought and cognitive reconstrual of intimidating situations (Bandura, 1997).

Within dual-process frameworks, SE is conceptualized as a part of the explicit, reflective system, operating as a conscious belief that facilitates self-regulation and goal-directed behaviour (St Quinton & Brunton, 2017). As SE operates alongside implicit processes, it accounts for only part of behavioural outcomes, as unconscious processes at times dominate behaviour (Sheeran et al., 2012). SE can therefore be understood as grounded in propositional validation rather than associative evaluation (Gawronski & Bodenhausen, 2006).

SE has been shown to be associated with the use of cognitive reappraisal, while the relationship may vary depending on the SE domain (Doménech et al., 2024; Goldin et al., 2012; Kim, 2024; Ramos-Cejudo et al., 2024). Creative SE is positively associated with more frequent use of cognitive reappraisal and lower levels of emotional exhaustion (Kim, 2024). Furthermore, increases in SE for cognitive reappraisal have also been shown to mediate the effect of cognitive-behavioural therapy on social anxiety (Goldin et al., 2012). Cognitive reappraisal among adolescents has also been shown to be associated with higher levels of emotional SE, with extraversion and emotional stability acting as mediators (Doménech et al., 2024).

Regarding general SE, it has been found to both facilitate and be facilitated by emotion regulation processes, indicating a bidirectional relationship (Ramos-Cejudo et al., 2024). Additionally, general SE has been found to be associated with the habitual use of reappraisal among adolescents (Lande et al., 2023). However, in contrast to domain-specific conceptualizations of SE, relatively little research has directly investigated the association between general SE and effectiveness of cognitive reappraisal.

As existing research on the links between reappraisal and SE have mostly focused on domain-specific SE, further investigation of the relationship between general SE and reappraisal is warranted. Additionally, since SE is conventionally situated within the sphere of conscious, reflective influences on behaviour, it remains unclear whether SE has the range and depth to be associated with an implicit manifestation of reappraisal.

Objective

The overall aim of this thesis is to investigate the characteristics of implicit reappraisal and its relation to SE.

The first objective of this thesis is to examine whether reappraisal can be utilized on an exclusively implicit level when prompted by a briefly displayed and masked visual cue.

The second objective is to explore whether correlations can be found between reappraisal effectiveness and general SE.

Method

Participants

Recruitment was made through a convenience sample, as it was deemed appropriate due to the time constraints of the study. At least 30 participants were required to provide enough statistical power to carry out sound parametric analyses. Participants were informed beforehand that individuals clinically diagnosed with any psychiatric disorder were advised against participating in the study. Fluency in Swedish and being at least 18 years of age were prerequisites. Informed consent was collected in conjunction with participation.

A total of 33 participants completed the test procedure. Three participants were excluded from the analyses due to erroneous factors, resulting in 30 participants included in the analyses. The sample consisted of 50% women ($n = 15$) and 50% men ($n = 15$), aged 20–43 years. All participants were enrolled in post-secondary education programs lasting three years or more.

Instruments and Materials

Self-efficacy

SE was measured using the Swedish 10-item General SE Scale (S-GSE; Schwarzer et al., 1997; Löve et al., 2012), which has shown high reliability as well as sound structural and construct validity across 25 countries (Scholz et al., 2002). The Swedish version of the questionnaire has been validated, demonstrating high internal consistency (Cronbach's $\alpha = .91$), supporting its use to measure general SE within a Swedish setting (Löve et al., 2012).

PsychoPy

Data were collected using PsychoPy, a free and open-source software that provides stimulus presentation and response collection for psychology experiments. For the purposes of this study, the software offers versatile functionality through randomized image presentation, robust timing mechanisms, data gathering from external hardware and monitor calibration

tools. All the collected data have been stored in structured files, easily accessible for analysis (Peirce, 2007).

OASIS

The images chosen for the study were drawn from the Open Affective Standardized Image Set (OASIS), a vast image bank containing 900 different images intended to evoke a range of affective responses. The dataset provides normative ratings for the images across two dimensions: valence (degree of negative or positive affective response) and arousal (intensity of affective response). Both dimensions were measured using a 7-point Likert scale, and show excellent interrater reliability based on resampling split-half correlations ($R_{val} = .98$, $R_{aro} = .93$; Kurdi et al., 2017). Two independent researchers selected 15 images based on an arousal score of at least 4 points. The selection accounted for suitability for the test objective and cultural context. When in disagreement, two other independent researchers were consulted to reach a final selection.

Emotion Arousal Rating

The participants were instructed to rate the level of emotional arousal they experienced in response to each image. This was conducted using a 5-point Likert scale, ranging from 1 (“no emotion”) to 5 (“very intense emotion”).

Testing Procedure

All participants filled out a consent form and the S-GSE before the test procedure. Each participant was assigned an individualized code to link the consent form, S-GSE results and the data from the test procedure. Apart from this, only age, sex and level of education were collected.

The test administrator was present during the entire procedure, available to answer any questions whilst ensuring the software was running without errors. Prior to the test initiation, a number of verbal instructions were given. Participants were told the overview of the study and what was expected of the participant. The study was framed as evaluating a theoretical hypothesis rather than the abilities or performance of participants. Reappraisal was introduced as an emotion regulation strategy, including general examples of how it can be utilized to reduce the intensity of an emotion, regardless of whether it is positive or negative. Participants were also instructed to, at a subsequent rating of an image, rate the same emotion experienced upon the first viewing, regardless of whether a new dominant emotion arose as a result of reappraisal. Participants were informed that they were allowed to ask questions during the training phase and were expected to complete the testing phase without interruptions.

The training phase was intended to prepare the participants for the format and reappraisal task of the testing phase. During the training phase, a repeated procedure was presented using different images. First, an image was presented for 10 seconds. Participants were asked to rate the emotional arousal experienced. After providing the rating, participants were instructed to reappraise the image in a way that reduced the arousal level. The image was subsequently presented again, after which the emotional arousal was rated anew. They were then asked to verbally state which reappraisal they had applied. If participants applied a strategy other than reappraisal, they were informed of the difference and instructed to adhere strictly to the reappraisal strategy. This procedure was repeated using 5 different images.

The testing phase was then initiated, intended to include the element of an implicit activation of reappraisal. First, a calibration procedure aimed at establishing each participant's threshold for detecting the brief exposure of a triangle was conducted via the following sequence: A fixation cross was displayed for 2 seconds, followed by a triangle and finally an abstract image in rapid succession. The triangle was intended to be backwards masked by the abstract image, using the same procedure as Siegel et al. (2022), where an image of a spider at a certain time threshold had successfully been masked by the subsequent image. The participant was asked to declare whether they had noticed a triangle by typing “Y” (yes) or “N” (no). This sequence was repeated three times with the triangle being displayed at three different time durations: 37, 27, and 17 milliseconds. The middle threshold (27 milliseconds) was based on that used in Siegel et al. (2022), and was theorized to be a short enough time frame to avoid conscious awareness in this condition. This sequence was intended to determine the shortest interval at which the participant was able to detect the triangle, using the duration below the detected one (or, if all were detected, the lowest possible duration) for subsequent brief exposures.

The experimental trials then proceeded as a chronological set of stimulus presentations and ratings. First, an image was presented for 10 seconds. The participants then verbally labeled the emotions evoked by the image, followed by rating the emotional arousal experienced from the image. Next, participants were informed that they would be exposed to three images in rapid succession: a plus sign (fixation cross), a triangle and an abstract image. The duration of the triangle displayed varied across three conditions: the clearly visible condition, the brief exposure condition and the absent condition. The clearly visible condition displayed the triangle for 120 milliseconds, intended to be clearly visible and explicitly perceived. In the brief exposure condition, the triangle was displayed for a duration based on the previously established threshold interval. In the absent condition, no triangle was displayed. Following this sequence, the participants were instructed to reappraise the image when it was presented again, if they had noticed the triangle.

The previously viewed image was presented anew, followed by a second emotion labeling and a second arousal rating. Participants were also asked whether they had noticed the triangle or not (Y/N response). Finally, participants were asked to verbally state whether reappraisal had been utilized, and if so, what reappraisal had been applied.

This was repeated 15 times, in which 5 of the cycles included a clearly visible exposure of a triangle, 5 included an intended implicit exposure, and 5 included no triangle at all, constituting the control condition. Each arousal image was linked to one of the three specific triangle exposure conditions, with trial order randomized.

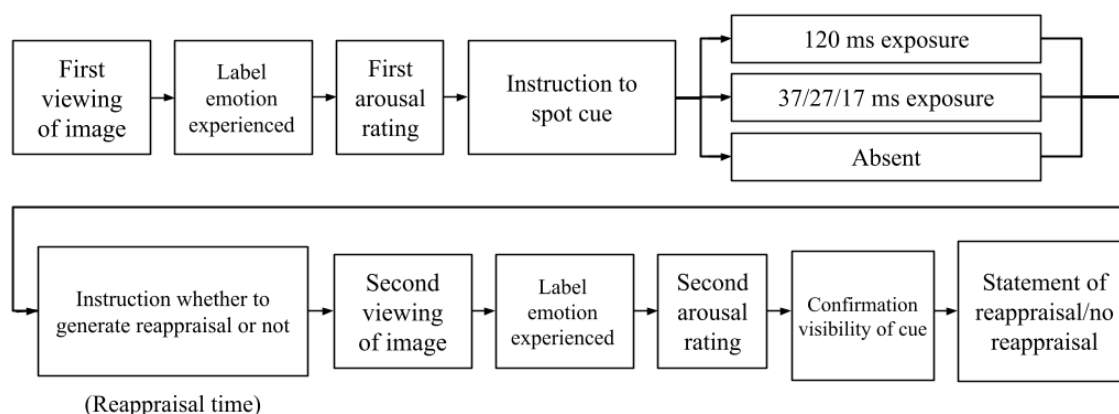
Methodological Foundation

This procedure was hypothesized to provide indications as to whether reappraisal could be initiated without explicit awareness. In accordance with the principles of associative learning, a triangle was intended to function as a target stimulus to a reappraisal response (Bouton, 2007). Through prompts to reappraise if a triangle had been noticed, the triangle was postulated to become associated with reappraisal, prompting the mind to reappraise the image each time the triangle had been presented. In the brief exposure condition the cue was intended

to be presented below the threshold of conscious awareness, prompting the mind to reappraise implicitly. In the clearly visible condition, the association would be verified through confirmation that the triangle had been perceived as well as the description of the specific reappraisal applied. In the brief exposure condition, implicitness would be verified through confirmation that the triangle was undetected. The absent condition would serve as control. In comparing the absent condition with the brief exposure condition, concordance regarding cue detection but discrepancy in arousal reduction, would indicate whether reappraisal had occurred implicitly. If participants however reported noticing the triangle, any reduction in emotional arousal would not be attributed to implicit reappraisal.

Figure 2

Flow chart of testing phase



Reappraisal Time

Reappraisal time was operationalized as the time participants spent between the exposure of either the clearly visible exposure, the brief exposure or the absent exposure condition, and the second viewing of the image. This in turn would indicate the differences in amount of cognitive resources exerted to generate reappraisal. The task being measured, unbeknownst to the participants, therefore occurred during the instruction to reappraise if they had detected a triangle and to proceed without reappraising if no triangle was detected. Differences in reappraisal time across the clearly visible condition, the brief exposure condition and the absent condition were expected to reveal patterns of mental load differing between conditions.

Statistical Analyses

The data collected from the questionnaire as well as the experiment procedure were exported to JAMOVI (version 2.6.26) in order to conduct statistical analyses. Three

participants were excluded prior to analysis due to errors that compromised data collection. One participant was excluded due to an error in the verbal instructions, which resulted in invalid data. Two other participants misinterpreted the written instructions regarding whether to reappraise, resulting in reappraisal of all images, including the absent condition.

The data were analyzed with regard to its normal distribution. This was done using boxplots, histogram, QQ-plots, and converting values of skewness and kurtosis. The latter two values were required to uphold an absolute z -value of below 1.96 and above -1.96 to fulfill the requirement of normal distribution (Ghasemi & Zahediasl, 2012). Shapiro-Wilk tests were also conducted, in which p -values above .05 indicated the data in question were normally distributed.

Upon these analyses one severe outlier was found with reference to arousal ratings. One data point of distortion was backtracked and double-checked through voice-recording, showing that the participant had reappraised despite not being supposed to, and subsequently clicking randomly in order to carry on to the next image. Excluding this data point alone, another normality distribution analysis revealed more normally distributed data. Yet, the distribution in the absent condition remained borderline with respect to its normal distribution ($p = .05$).

Parametric tests were generally used for analysis, while in cases in which the groups were borderline or not at all sufficiently normally distributed, equivalent non-parametric tests were conducted to cross-check the results. In all such cases, the results stemming from the parametric and non-parametric tests aligned.

In order to analyse the mean differences in arousal reduction between the three separate conditions, and since each participant underwent all of the separate conditions, a repeated-measures ANOVA was utilized. The effect size for the repeated-measures ANOVA was calculated as η^2_p (Richardson, 2011), with $\approx .04$ indicating a recommended minimum practical effect (RMPE), $\approx .25$ a moderate effect, and $>.64$ a strong effect (Ferguson, 2009). To clarify which conditions differed significantly, post hoc Bonferroni corrections were conducted, since it is deemed more conservative and diminishes the risk of type I errors (Dunn, 1961; Armstrong, 2014). As one of the conditions was borderline with regard to its normal distribution, non-parametric tests of equivalence, the Friedman test and the Durbin-Conover test, were conducted to ensure whether the outcomes aligned. The effect size reported in relation to the Friedman test was Kendall's W , which was calculated manually as it is not provided by JAMOVI. The following intervals were utilized for interpretation: small effect ($W \geq 0.1$), medium effect ($W \geq 0.3$), and large effect ($W \geq 0.5$; Peres, 2026).

In relation to reappraisal time, the data were not normally distributed. Hence, non-parametric tests were applied in analysis, indicating equivalent results given through parametric tests. Again, the effect size, Kendall's W , was calculated manually. A post hoc Durbin-Conover test was then applied to identify the particular differences between the separate conditions.

For the purpose of investigating whether there are associations between the effectiveness of reappraisal and SE, a Pearson correlation test was applied. In order to examine the relationship between reappraisal time and SE, a non-parametric, Spearman correlation test was employed, due to non-normal distribution of data.

Ethical Considerations

Since the experimental procedure included images intended to arouse emotions, they had been pre-selected based on the arousal levels they had elicited in a normative test population (Kurdi et al., 2017). Therefore, exposure to the images in the training and testing phase could be experienced as disturbing for some participants. For this reason, individuals below the age of 18 and/or with current psychiatric diagnosis were advised against participating in the study. The consent form informed the participant that they could withdraw from participation at any time without providing a reason. Their data would then not be included in the study. All data were anonymized and stored in a hard drive in order to ensure confidentiality and to prevent data being linked to any particular individual.

Results

Arousal Reduction

A repeated-measures ANOVA was conducted, with reappraisal cue exposure time (clearly visible, brief exposure, and absent) as an independent variable, and subjectively rated arousal as the dependent variable. Mauchly's test indicated that the assumption of sphericity was met ($p = .15$). The effect on subjectively rated arousal was significant and moderate, $F(2, 58) = 28.9, p < .001, \eta^2_p = .50$.

Post hoc comparisons (Bonferroni) exhibited that subjectively rated arousal reduction was significantly lower ($p_{\text{bonferroni}} < .001$) in the absent condition ($M = -0.22, SD = 0.25$) in contrast to when the stimulus cue for reappraisal was clearly visible ($M = -0.87, SD = 0.54$), as well as when the stimulus cue for reappraisal was displayed briefly ($M = -0.82, SD = 0.50$). No significant difference was found between the clearly visible condition and the brief exposure condition ($p_{\text{bonferroni}} > .05$).

Since the assumption of normality was borderline, the non-parametric equivalent of a repeated-measures ANOVA, the Friedman test, was also conducted, indicating similar significant differences between conditions, $\chi^2(2) = 20, p < .001$, with a medium effect size, $W = .33$. The subsequent, post hoc, Durbin-Conover test also showed significantly higher ($p < .001$) subjectively rated arousal in the absent condition ($Mdn = -0.18, IQR = 0.30$), in comparison to the clearly visible condition ($Mdn = -0.78, IQR = 0.69$) and the rapid display condition ($Mdn = -0.79, IQR = 0.67$). As before, no significant differences were found contrasting the latter two conditions ($p > .05$).

Reappraisal Time

A non-parametric Friedman test was also conducted, with reappraisal cue exposure time (clearly visible, brief exposure, and absent) as an independent variable, and time taken to generate a reappraisal as the dependent variable. The difference in time taken to generate a reappraisal was significant, $\chi^2(2) = 7.8, p = .02$, with a small effect size, $W = .13$. Post hoc comparisons (Durbin-Conover) revealed that the time taken to generate a reappraisal was significantly longer ($p = .046$) in the clearly visible condition ($Mdn = 6.51, IQR = 4.98$) in contrast to the absent condition ($Mdn = 5.46, IQR = 3.12$). Similarly, the time taken to

reappraise was significantly longer ($p = .006$) in the brief exposure condition ($Mdn = 7.64$, $IQR = 5.30$) in comparison to the absent condition. No significant difference was revealed between the clearly visible condition and the brief exposure condition ($p > .05$).

Self-efficacy and its correlations

Pearson correlation analyses were conducted to examine the relationship between SE and the reappraisal conditions. None of the correlations were statistically significant ($ps > .05$), indicating no reliable associations between the separate variables. Furthermore, non-parametric tests also showed no statistically significant associations ($ps > .05$).

Discussion

This study set out with the overall aim of investigating the characteristics of implicit reappraisal and its relation to SE. Specifically, the first objective was to examine whether reappraisal can be utilized on an exclusively implicit level when prompted by a briefly displayed and masked visual cue. The results showed, by the utilization of an awareness check, no indication of reappraisal occurring solely implicitly. These findings do not establish that reappraisal cannot be operated entirely implicitly, but that the method employed was not adequately rigorous to unveil such a phenomenon.

That said, the results underscore the already well-established effectiveness of explicit reappraisal as an emotion-regulation strategy (Gross, 2015), demonstrating moderate effect of reducing subjective arousal in a context such as this. Additionally, the results indicated that reappraisal proved equally effective despite differing time intervals of the cues. Furthermore, although the cue for engaging in reappraisal was less conspicuous, the time taken to reappraise did not increase significantly. Therefore, when nearing implicit processing, the mental load shows no consequential propensity of increasing.

The second objective of this thesis was to explore whether correlations could be found between reappraisal effectiveness and SE. No such associations were found. A multitude of factors may have contributed to this outcome. Firstly, in accordance with our results, correlations between one's SE and reappraisal may in fact not exist. Secondly, in line with Bandura's (1977) emphasis on the domain-specific nature of SE, general SE may be all too global a construct to influence the effectiveness of such a narrow phenomenon as reappraisal. Instead, more domain-specific SE, such as emotional SE, or, even more specifically, reappraisal SE, may be more closely related to reappraisal effectiveness.

Another curious aspect manifested in this study, as a consequence of the awareness-check included, is that in contrast to the study conducted by Siegel et al. (2022), in which an exposure time of 27 milliseconds was sufficient in preventing images of spiders from reaching conscious awareness, neither 37, 27 nor 17 milliseconds were generally adequate to prevent an elemental geometric shape, in the form of a triangle, from being consciously recognized. This may reflect how basic geometric shapes reach consciousness faster than more intricate, naturalistic phenomena. Furthermore, this observation highlights the necessity of carefully calibrated exposure times when conducting implicit, visual priming. Finding the precise time interval to engage exclusively implicit processing might however prove to be difficult. Although a shorter exposure time may exclude explicit processing, there is no way to ensure

that the cue is indeed still being processed. A short enough time frame may instead evade even implicit processing, as it might escape one's subcognitive apparatus. Finding the right balance to ensure that the exposure time is close enough to conscious detection while still evading it, will be the crucial component of similar research moving forward. Awareness-checks are therefore methodologically critical in studies of implicit processes, as they ensure that the process in question is in fact operating implicitly and not explicitly.

Taken together, within the overall time frame of this thesis, the selected exposure time intervals and masking attempts were insufficient to produce adequate data in relation to the intended implicit activation of reappraisal.

Limitations

There are several limitations to this study. The study relied on convenience sampling, which introduces the risk of selection bias. The sample consisted predominantly of psychology students ($n = 25$), which can reduce the generalizability of the results, as students of psychology might already be conceptually familiar with the subject of ER, implicit priming and SE. While the sample was relatively evenly split among women ($n = 15$) and men ($n = 15$), the sample was still rather homogenous overall with regard to age, level of education, and shared cultural context. Adjacent to this, three participants were excluded from the statistical analyses conducted due to miscommunication and misinterpretation during the test procedure, which in turn may have influenced the final results. While the sample size likely would have been of admissible size in itself ($N = 30$), the overwhelming majority detected the brief exposure of the reappraisal cue, preventing any reliable statistical analyses on strictly implicit processing. On that notion, the reappraisal cue was not displayed at an adequately short time interval to ensure exclusively implicit processing, as confirmed by the awareness fail-safe implemented in this study.

Various observations during the test sessions hinted at internal processes that diverged from those intended. Some participants stated that they unintentionally started reappraising upon the first viewing of an image. This could point to the malleable nature of appraisal, as instructions to reappraise could cue the mind to reshape the habitual perception of stimulus. Given this possibility, data may have been adversely influenced in ways that are misaligned with the intended procedure. That said, the discrepancy between the absent condition and the other conditions indicates that it is not habitual to the degree that it supersedes the conscious intention not to reappraise.

Yet another limitation is that the triangle, intended to condition a reappraisal response, might not have been given an adequate amount of repetitions to be associated with reappraisal. While the triangle was meant to be associated with reappraisal alone, the strategy may instead have been linked with the viewing of images, or the testing situation at large, once the participant started applying reappraisal habitually. Another possibility is that it became associated with emotion regulation at large, with strategies such as suppression and attentional shifting having been employed instead. This may be inferred by some participants finding it difficult to recall what reappraisal they had used when asked to state it, potentially leading them to rely on post hoc explanations. However, there is reason to speculate that it was in fact reappraisal being activated, in the shape of distancing. As stated by Denny et al. (2023),

reappraisal may take the form of reinterpretation as well as distancing. Finding it difficult to recall the reappraisal may suggest that mentally distancing oneself was the employed aspect of reappraisal. The overall point being, there is no way of ensuring reappraisal was the sole strategy engaged, nor that it was exclusively elicited by the triangle.

Some participants also found difficulty in experiencing any emotions in response to certain images and instead based their account on the kinds of emotions commonly attributed to the displayed theme. Their arousal levels, and reduction of them, could therefore be regarded as fabricated for the sake of completing the experiment.

In order to avoid arousal levels being mixed between emotions, participants were asked to rate the same emotion on both exposures. This was found to be cumbersome by some participants, as they found it difficult to bear in mind which emotion was the most dominant before reappraisal, if it had been replaced by another emotion at second exposure. The cognitive effort to withhold this information may have skewed the data.

Another aspect to consider is that reappraisal was not the only emotion regulation strategy set in practice. During the procedure, affect labelling was also employed, an emotion regulation strategy typically influencing affectivity (Braunstein et al., 2017). Yet, while this regulatory strategy was applied, it was applied in conjunction with all viewings of images, implying that the affect labelling should not be the reason for differing arousal ratings between the first and second viewing.

Prospective Research

In future research it is strongly advised to amplify the methodological rigour further, regarding elicitation of implicit processing.

The association between the reappraisal cue and reappraisal response is key in an experimental procedure such as this. This relationship should be established prior to the main test procedure, ensuring that the cue is exclusively associated with a reappraisal response.

A briefer exposure time in relation to an implicit exposure condition would be of service, as 17 milliseconds did not suffice in general, and was in fact too long, to ensure an exclusive implicit processing.

Prospectively, the masking component will also be a crucial element to ensure implicit processing. In this study, the target stimulus of a triangle and the abstract image mask may have differed too greatly in colour and shape, producing a contrast that made the rapid transition between them more easily perceivable. In line with Siegel et al. (2022), using images that share similarities in shape and colour might prove to be more efficient in reducing the conspicuousness of the target stimulus. Research on masking also highlights the factor of attention as influencing whether a target reaches conscious awareness. By increasing the set size of items around the target stimulus, the strength of target masking may increase through delayed or distributed attention and would potentially allow the target to be replaced by a mask before reaching conscious awareness (Enns & Di Lollo, 2000). This could also address the risk of target exposure intervals becoming too brief to allow implicit processing to occur.

Distinguishing implicit processes from one another, and ensuring which one is truly operating at a given moment, is a methodologically complex endeavour and this study has not

solved for it. In further research, and with adequate resources at one's disposal, involving fMRI would be appropriate in order to soundly discern implicit strategies apart.

Conclusion

This thesis was unsuccessful in eliciting exclusively implicit reappraisal but provides further evidence that reappraisal is an effective emotion regulation strategy. Based on the applied methodology, this study cannot confirm that reappraisal can operate within the implicit dimension of emotion regulation. Although further research is needed to explore an implicit utilization of the strategy, no additional cognitive load was found as the procedure sought to approximate implicit processing. Furthermore, reappraisal appeared to function independently of general SE, indicating that it remains an adaptive strategy regardless of SE.

We hope that the present study may be understood not through its limitations, but through its contribution to future research. To quote *Flowers for Algernon* by Daniel Keyes:

No one can know in advance if a project is going to result in something useful. Results are often negative. We learn what something is not - and that is as important as a positive discovery to the man who is going to pick up from there. (Keyes, 1966/2002, p. 169–170)

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Appendix
Stimulus Images for Testing Phase



Cockroach 1



Dead bodies 1



Roller coaster 2



Animal carcass 6



Explosion 6



Rock climbing 3



Miserable pose 3



Fireworks 2



Rafting 5



Tornado 4



Scare face 1



Sad face 9



Dog 6



Tumor 1



War 1

Note. The labels beneath each image correspond to the original image names and numbers used in the OASIS image bank.