The Relationship Between Trait Emotion Regulation and Dream Affect

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Psychology

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Abstract

Studies show that affective experiences during wakefulness are associated with affect experienced in dreams. It has been suggested that individual differences in emotion regulation may underlie this relationship. This master's thesis investigated the relationship between two trait emotion regulation strategies, cognitive reappraisal and expressive suppression, and positive and negative dream affect. The hypotheses predicted that individuals with greater use of adaptive emotion regulation strategies (i.e., greater trait cognitive reappraisal) would have less negative and more positive affect in their dreams, whereas individuals with greater use of less adaptive emotion regulation strategies (i.e., greater trait expressive suppression) would have more negative and less positive affect in their dreams.

Participants (N = 95, women n = 79, men n = 16) with ages ranging from 18–55 years (M = 24.53, SD = 6.45) filled out a scale measuring trait emotion regulation. Thereafter, they kept a 5–7-day home dream diary in which, every morning upon awakening, they reported their dreams and rated the dream affect using dimensional and discrete affect rating scales. In addition to these self-ratings, judges rated the narrative dream reports using the same scales (external ratings). The data was analyzed using multiple regression analysis.

Results showed that trait cognitive reappraisal was negatively associated with self-ratings of negative dream affect (using a dimensional rating scale). However, when controlling for sleep quality, this relationship was no longer significant. Thus, sleep quality explained negative dream affect more than cognitive reappraisal. No significant relationships were found between expressive suppression and positive or negative dream affect. These findings suggest that adaptive emotion regulation is associated with dream affect and provides support for the continuity hypotheses of dreaming. More research is needed to investigate the link between emotion regulation and dream affect to better understand whether dream affect simply reflects or is actively involved in waking emotion regulation.

Keywords: affect, emotion regulation, dreaming, dream affect, self-ratings, external ratings

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Tiivistelmä

Erilaisia tunteita koetaan niin valveilla kuin unessakin, ja tutkimusten mukaan nämä ovat yhteydessä toisiinsa. On ehdotettu, että yksilöiden välisillä tunteiden säätelyn eroilla olisi vaikutusta unennäön aikana koettuihin tunteisiin. Tässä pro gradu -tutkielmassa tarkasteltiin tunteiden säätelykeinojen, kognitiivisen uudelleenarvioinnin ja tunneilmaisujen tukahduttamisen, yhteyttä positiivisiin ja negatiivisiin tunnetiloihin unennäköön liittyen. Hypoteesien mukaan adaptiivisemman tunteiden säätelykeinon käyttö (kognitiivinen uudelleenarviointi) lisäisi positiivisia ja vähentäisi negatiivia tunnetiloja unennäköön liittyen, kun taas vähemmän adaptiivisen tunteiden säätelykeinon käyttö (tunneilmaisujen tukahduttaminen) vähentäisi positiivisia ja lisäisi negatiivisia tunnetiloja unennäköön liittyen.

Koehenkilöt (N = 95, naiset n = 79, miehet n = 16), joiden ikä vaihteli 18–55 vuoden välillä (M = 24.53, SD = 6.45), täyttivät tunteiden säätelykeinoja mittaavan kyselyn. Sen jälkeen, koehenkilöt pitivät 5–7 päivän ajan kotona unipäiväkirjaa, jonka he täyttivät joka aamu heti herätessään. Joka aamu koehenkilöt arvioivat unen laatua, unen yleistä positiivista ja negatiivista sävyä sekä unen eri tunteita erittelevän arviointiasteikon avulla. Unipäiväkirjojen itsearvioinnin lisäksi unipäiväkirjoille toteutettiin ulkoinen arviointi ulkopuolisten arvioijien toimesta. Data analysoitiin usean muuttujan regressioanalyysin avulla.

Tulosten mukaan kognitiivinen uudelleenarviointi oli negatiivisesti yhteydessä negatiivisen unen sävyyn itsearvioituna, mutta ei ulkoisesti arvioituna. Kun unen laatu kontrolloitiin, kognitiivisen uudelleenarvioinnin ja negatiivisen unen sävyn välinen suhde ei ollut enää merkitsevä. Täten unen laatu näytti selittävän enemmän yhteyttä negatiiviseen tunnesävyyn kuin kognitiivinen uudelleenarviointi. Tutkimus ei löytänyt merkitsevää yhteyttä tunneilmaisujen tukahduttamisen ja unen aikaisten positiivisten tai negatiivisten tunteiden välillä. Nämä havainnot viittaavat siihen, että adaptiivinen tunteiden säätely on yhteydessä unennäköön liittyviin tunteisiin ja tukee hypoteesia jatkuvuudesta valveen ja unennäön välillä. Lisää tutkimusta tarvitaan tunteiden säätelyn ja unennäköön liittyvien tunteiden välisestä yhteydestä, jotta voidaan selvittää, ovatko nämä tunteet aktiivisesti mukana tunteiden säätelyssä vai eivät.

Avainsanat: tunteet, tunnetilat, tunteiden säätely, uni, unennäkö, unennäköön liittyvät tunteet, itsearvio, ulkoinen arvio

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1 Introduction

Many of us have experienced vivid dreams that are characterized by intense emotions, such as love, hate, terror, and awe. In fact, research shows that dreams contain numerous emotions and moods that vary in arousal and valence (Sikka, 2020). Why we have such dream experiences remains an open question. It has been suggested that emotions in dreams may actively help regulate emotions in wakefulness (e.g., Cartwright et al., 2006; Hartmann, 1996; Levin & Nielsen, 2009). However, existing research indicates that, instead of dreams actively regulating emotions, there seems to be a continuity between waking and dreaming experiences (Mallett et al., 2022; Sikka et al., 2022). This continuity means that those who experience more negative emotions in waking life also experience more negative emotions in dreams, and those who experience more positive emotions in waking life experience more positive emotions in dreams. It has been suggested that individual differences in emotion regulation may underlie this continuity (see Sikka et al., 2018, 2019, 2022, 2023). However, empirical studies directly testing this proposal are lacking. Therefore, this master's thesis examines the relationship between emotions and moods experienced in dreams (referred to as dream affect; Sikka, 2020) and individual differences in waking emotion regulation.

1.1 Dream Affect

1.1.1 Sleep and Dreaming

The importance of sleep for human well-being and the links between sleep and waking emotions have been well recognized (Hirshkowitz et al., 2015; Kahn et al., 2013; Walker & van der Helm, 2009). Humans spend a large portion of their lives sleeping, averaging 7-8 hours each night (Banks & Dinges, 2007). Sleep is defined as a reversible state in which an individual largely disconnects from their surroundings and ceases to respond to external stimuli (Carskadon & Dement, 2011). Sleep can be divided into rapid eye movement (REM) and non-rapid eye movement (NREM) sleep (Solms, 2000). REM and NREM sleep occur in approximately 90-minute cycles across the course of the night, with NREM stages dominating in the early part of the night (Scammell et al., 2017). The number and duration of REM sleep increases towards the morning (Carskadon & Dement, 2011; Scammell et al., 2017). REM sleep is

characterized by high-frequency activation similar to wakefulness, dominated by low-amplitude alpha (8-12 Hz), and theta (4-7 Hz) and saw-tooth waves, rapid eye movements, and muscle atonia (Pace-Schott & Hobson, 2002; Scammell et al., 2017; Valli & Hoss, 2019). NREM sleep can be divided into three stages, from the lighter stages to the deeper stages (N1, N2, N3) (Scammell et al., 2017). Sleep onset is characterized by light sleep (stage N1). A person can typically be awakened and remain in this stage for only a few minutes. In contrast, a stronger stimulus is required to arouse an individual from N2 sleep, and this stage typically lasts 10 to 25 minutes (Carskadon & Dement, 2011). N2 sleep is characterized by sleep spindles (short bursts of 12-15 Hz activity), K-complexes, and theta waves. Deeper NREM sleep (N3), also known as slow-wave sleep, is characterized by high-amplitude, low-frequency delta activity (0.5-2 Hz) (Kryger et al., 2016; Pace-Schott & Hobson, 2002; Valli & Hoss, 2019). During this stage, the individual becomes even more difficult to awaken with external stimuli. This stage typically lasts for 20 to 40 minutes during the initial cycle (Carskadon & Dement, 2011; Fuller et al., 2006).

Dreaming is typically associated with REM sleep but can also occur in NREM sleep (Solms, 2000). REM sleep dreams are generally emotionally intense and vivid, which is also reflected in the activation of the limbic brain areas during REM sleep (McNamara et al., 2010; Perogamvros & Schwartz, 2012; Scammell et al., 2017). However, partly different brain mechanisms are responsible for dreaming and REM sleep: whereas REM sleep depends on the activation of the brainstem (modulated by the hypothalamus and forebrain networks), dreaming has been shown to be associated with the activation of posterior cortical association areas as well as with medial forebrain regions (Siclari et al., 2017; Solms, 2000). Thus, REM sleep and dreaming can be dissociated (Solms, 2000). This is further supported by findings showing that people also dream during NREM sleep, although these dreams are qualitatively different from and less frequent than REM sleep dreams (Hobson et al., 2000; McNamara et al., 2010; Siclari et al., 2018; Solms, 2000). Nevertheless, the differences between REM and NREM dreams disappear towards the morning/late-night sleep (Wamsley et al., 2007).

1.1.2 Definitions and Phenomenology of Dreaming and Dream Affect

There is no commonly agreed definition of the term **dreaming** (Sikka 2020). According to the broader definition, dreaming refers to all “subjective conscious experiences”

during sleep (Revonsuo, 2000, p. 878). According to the narrower definition, dreaming is considered as a more complex sensory-perceptual dynamic simulation of the waking world (Revonsuo, 2010; Sikka, 2019). According to this narrower view, the simpler unimodal thoughts, or images we have during sleep are considered sleep mentation (Revonsuo, 2010). Windt (2010) supports this narrower view by defining dreams as immersive spatiotemporal hallucinations. Dreaming can be defined as a form of spontaneous thought occurring during sleep that is hyperassociative and almost free from cognitive constraints, that is, less constrained by cognitive control mechanisms than waking thought (Christoff et al., 2016). In this respect, dreaming is not as distinct from waking experiences as typically thought but is continuous with waking spontaneous thought, such as waking daydreaming or mind-wandering. In fact, some consider dreaming as "intensified mind-wandering" (Domhoff & Fox, 2015; Windt, 2021, p. 1). In this master's thesis, the broader definition of dreaming is utilized along with the perspective that dreaming, as a form of spontaneous thought, is continuous with waking thoughts and experiences.

The phenomenology of dreams varies a lot. However, several characteristics can be pointed out to distinguish dreams from and relate them to waking experiences (Nir & Tononi, 2010). Dreams have "vivid sensorimotor imagery" (Hobson et al., 2000, p. 795). Although dreams are mostly visual and auditory in nature, it is possible to feel somatosensory experiences as well as to smell or taste different things, or to speak and move in our dreams (Carskadon & Dement, 2011; Revonsuo, 2006). Dreams can include improbable and bizarre features (Hobson et al., 2000; Revonsuo & Salmivalli, 1995), but they are not as bizarre as typically thought (Valli & Revonsuo, 2009b).

Generally, dreams are experienced by the dream-self, which can be different from our waking self (Revonsuo, 2010). The ability for mental time travel, meaning the ability to remember the past and plan for the future, is generally not fully possible during dreaming (Revonsuo, 2006). Meta-cognitive awareness is often lacking in dreaming (Fox et al., 2013). After waking up, dreams are generally forgotten quite fast (Hobson et al., 2000).

In general, dreams are considered to be affectively intense experiences (Sikka, 2020). In this master's thesis, the term **dream affect** is used to refer to "affective experiences that

occur during dreaming" (Sikka, 2020, p. 28), including all kinds of affective states, that is, emotions and moods, experienced in dreams (Nielsen et al., 2003; Schredl et al., 2004). Affective experiences continue to occur throughout the sleep-wake cycle (Sikka, & Gross 2023). Although dreams seem to be more negative (or less positive) than waking experiences (Sikka et al., 2021), the affective nature of dreams can vary a lot. Similarly, dream content has been proposed to include more negative than positive affect (Revonsuo, 2010). For example, one study has found more fear-related affect and less positive affect in dream reports as compared to waking reports (Nielsen et al., 1991). However, other studies have found a more balanced ratio of positive and negative affects (Fosse et al., 2001) or the dominance of positive affect (Sikka et al., 2017, 2018) in dreams. As discussed below, the frequency and valence of dream affect are highly dependent on the methodology used to collect and analyze dream data, for example, whether the content of narrative dream reports has been analyzed or participants have themselves rated their dream affect (Sikka, 2019, 2020).

1.1.3 Theories of the Function of Dreaming and Dream Affect

Why we dream has fascinated people since ancient times. Over the course of history, various dream theories have been put forward, from the earlier psychoanalytical dream theories (e.g., Freud's "Interpretation of Dreams", 1900), to more recent dream theories (Nir & Tononi, 2010). Broadly, the latter range from theories that consider dreams to be non-functional to those that consider them to serve some function (Sikka, 2020).

Non-functional dream theories argue that dreams perform no specific functions. For example, according to the random activation theories (e.g., Hobson et al., 2000), dreams emerge from random brain activation during sleep. The activation-input source-neuromodulation model, also known as the AIM model (Activation, Information, Mode), has been developed based on the previous activation-synthesis model, according to which dreams emerge as the cortex tries to make sense of the random activation produced by the brainstem (Hobson et al., 2000).

Memory consolidation theories of dreaming suggest that dreams are involved in the processing of memories, especially affective memories, and that this process is reflected in (affective) dream experiences (e.g., Stickgold et al., 2001; Wamsley & Stickgold, 2019). Affective experiences during wakefulness guide the process of memory

consolidation during sleep by acting as indicators of the salience of these experiences (Malinowski & Horton, 2015).

Continuity hypotheses argue that there is a continuity between our waking and dream experiences (Domhoff, 1996; Domhoff, 2017; Schredl & Hofmann, 2003). One version of the continuity hypothesis emphasizes the role of personal concerns in dreams (Domhoff, 1996, 2017; Tuominen et al., 2019). In contrast, another version of the continuity hypothesis argues that dreams reflect waking experiences and events more broadly, rather than personal concerns as such. This hypothesis suggests that waking experiences with high affective intensity are more likely incorporated into and reflected in dreams (Schredl, 2006; Schredl & Hofmann, 2003). Similarly, dream affect is assumed to impact subsequent waking affect (Schredl & Hofmann, 2003; Schredl & Reinhard, 2010). Thus, the continuity hypotheses suggest a positive association between waking affect and dream affect. That is, if individuals experience negative affect during wakefulness, they will also experience negative affect during dreaming (Schredl, 2006; Schredl & Hofmann, 2003). Since individuals differ in terms of the waking experiences they have as well as in their traits (e.g., related to affective processing), the hypotheses predict that individual differences underlie differences in (affective) dream content (Schredl & Hofmann, 2003).

In addition to the non-functional dream theories, there are several functional dream theories that consider dreaming to perform specific functions. Emotion regulation theories of dreaming suggest that dream affect help people to regulate their affect during wakefulness (Cartwright et al., 2006; Hartmann, 1996; Kramer, 1991; Levin & Nielsen, 2009, 2007). These theories are similar to continuity hypotheses in that they consider dream affect to be linked to previous and subsequent waking affect. However, these theories assume that dream affect is negatively associated with the subsequent waking affect. One version of the emotion regulation theories advocates that dreaming helps to down-regulate negative affect, similarly to fear extinction (Levin & Nielsen, 2009, 2007). Thus, experiencing negative affect in dreams leads to reduced negative affect in subsequent wakefulness. Dysfunctions in this process are argued to lead to bad dreams and nightmares (Levin & Nielsen, 2009, 2007; Nielsen & Lara-Carrasco, 2007). In fact, Hartmann (1996) has compared dreams to psychotherapy.

Another class of functional dream theories, the evolutionary dream theories, emphasizes the biological function of dreams. Revonsuo's (2000) Threat Simulation Theory (TST) suggests that dreams simulate threatening events, helping to rehearse coping with dangerous situations in wakefulness. The threat simulation system has evolved to increase an individual's "survival and reproductive success" in the environment of evolutionary adaptiveness (Valli & Revonsuo, 2009a, p. 17), where also emotions play an important role. The theory assumes that dreams are biased toward negative content (Valli et al., 2008).

Another evolutionary dream theory was put forward to explain dreams with a more positive content. According to the Social Simulation Theory (SST) by Revonsuo and colleagues (2015), dreams would rather be simulations of the social environment. Thus, this theory is not exactly focused on dream affect but rather suggests that the main function of dreams is to rehearse social skills. These skills are crucial for social species to form bonds and interact with others during wakefulness (Revonsuo et al., 2015).

1.1.4 Measurement of Dream Affect

There are many different methods for collecting dream data and measuring dream experiences, such as home dream diaries, sleep laboratory studies, and questionnaires. Studies show that differences in the data collection environment influence the results (Sikka, 2019). The collection of home dream diaries, in which participants write down their dreams from the previous night as soon as they wake up, is one of the most typical ways to measure dream experiences (Sikka, 2020). This method has good ecological validity, but it can be difficult to track the precise timing of dream experiences. Performing sleep laboratory awakenings is a method that enables stricter control over the data collection process. Specifically, sleep is monitored by researchers using polysomnography and participants can be woken up during a particular sleep stage. The disadvantages are that it takes more time to collect the data and involves more resources. In addition, the laboratory environment lacks ecological validity and is not a usual place for participants to sleep (Sikka, 2019). Compared to home dream diaries, dreams collected in the sleep laboratory have been shown to be less emotional. It has been suggested that this may be due to differences in what time of night and sleep stage dreams are collected from (Sikka et al., 2018b). Using dream questionnaires to ask general questions about one's dream experiences is a faster and cheaper method. The

problem with questionnaires, however, is that they may fail to accurately represent the experienced or remembered dream because they are often far removed from the specific dream experiences. Taken together, each method has its pros and cons that need to be taken into consideration when measuring dream experiences (Sikka, 2019).

Results regarding dream affect also depend on whether self-ratings or external ratings of dream affect are used (Röver & Schredl, 2017; Schredl & Doll, 1998; Sikka, 2020; Sikka et al., 2014, 2017, 2018b, 2021). Self-ratings of dream affect refer to participants' own ratings of their dream experiences, which they perform after awakening by filling out a specific affect rating scale. External ratings of dream affect refer to the analysis of the narrative content of dream reports by external judges or automated computer software. External judges follow the same strict coding instructions and discuss their ratings to reach an agreement. By using two judges, inter-rater reliability can be calculated (Sikka, 2019).

Studies using self- and external ratings of affect to analyze the same dream episodes have shown that the two methods can lead to different results. With self-ratings, as compared to external ratings, dreams seem to have more positive emotions and emotions in general (Sikka et al., 2014, 2017). This difference does not apply only to the measurement of dream experiences but to affect measured across the sleep-wake cycle (Sikka et al., 2021). With external ratings, dream content is often found to be (relatively) more negative (Schredl & Doll, 1998; Sikka et al., 2014, 2017, 2021). In general, self-, and external ratings converge better in identifying and classifying negative than positive affect in dreams (Sikka et al., 2017; Sikka, 2020). The reason for these differences is not clear. The problem with external ratings is that the language used by participants may not fully represent the experienced dream. The verbal description of the dream may only be a sample of the most salient affect experienced in the dream because participants may remember and emphasize these more (Sikka et al., 2018b, 2023a). Also, people seem to use more explicit affective language when referring to negative experiences but are more implicit when describing positive experiences (Sikka et al., 2017). Moreover, individuals often differ in their language skills, which means that differences in results may be due to the way people express their affect rather than how they actually experienced it (Kahan, 2012; Sikka et al., 2017). On the other hand, the problem with self-reports of dream experiences is that

participants' self-ratings are often based on their memories of the experiences and, presumably, on additional cognitive processes (i.e., reflecting and evaluating their affective states) that they may not necessarily express and which may thus be difficult to verify (e.g., by external judges) (Sikka et al., 2017; Sikka, 2020). These discrepancies between the two measurements suggest that they may measure partially different phenomena, even though they correlate with each other (Röver & Schredl, 2017; Sikka et al., 2021). Given these discrepancies, it is currently recommended to use both external and self-ratings for a more thorough understanding of affective experiences in dreams (Sikka et al., 2019, 2021). Both self- and external ratings can focus on the measurement of discrete (specific affects) or dimensional (overall emotionality) dream affect.

1.2 Emotion Regulation

1.2.1 Definitions of Emotion, Mood, and Affect

Emotion and mood are considered valenced states signaling important information in the external or internal environment (Gross, 1998). The term **emotion** differs from mood in that it is stronger, shorter in duration, and generally has a more specific cause. Compared to emotions, **mood** is generally thought of as less intense, longer lasting, ambiguous, and not always having an immediate cause (Beedie et al., 2005). It is proposed that emotions are multi-componential, including a physiological response, behavior/expression, and subjective feeling (Sander et al., 2018). According to Scherer (2005), the term **feeling** refers to the "subjective emotional experience component of emotion" (Scherer, 2005, p. 699). **Affect** is a broader term that includes an individual's preferences, attitudes, emotions, moods, affective dispositions, and interpersonal attitudes (Scherer, 2005, pp. 703-705). The term **state affect** refers to the individual's subjective experience of affective states, such as mood and emotion, whereas the term **trait affect** refers to individual differences in the experience of these affective states (Sikka, 2020). In this master's thesis, the term affect is used to refer to state affect, and the term trait affect is used to refer to individual differences in affect.

According to **the modal model of emotion** (Gross, 1998), an emotional response arises from important internal or external situation signals that attract an individual's attention. After this, the meaning of these situations/signals is interpreted (or appraised) in terms

of one's goals and the latter causes an emotional response that is reflected in physiological reactions, expression/behaviour, and subjective feelings (e.g., giving a stressful presentation may cause an increase in heart rate, a desire to leave the room, and a feeling of anxiety) (Gross, 2015, 2014). While the model concentrates on emotions specifically, it is probable that moods also comprise these different components (Sikka, 2020).

Whether affect can be characterized as discrete or dimensional has been the subject of debate among theorists (Ekmann, 2016; Gross, 2014). Discrete models of affect attempt to categorize affective states into universal categories that are common across all individuals and across mammals. While discrete models of affect the debate over the number of discrete affect categories (for example fear, anger, joy), dimensional models of affect debate over the number of affective dimensions (Barret et al., 2009; Sikka, 2020). These dimensions typically include valence (pleasant vs. unpleasant) and activation or arousal (low vs. high) (Barrett et al., 2007; Smith & Ellsworth, 1985; Watson et al., 1999). These models determine the methodology for measuring affect by using either dimensional scales (unipolar or bipolar) or discrete affect scales, that list different affect categories (Sikka, 2020). In this master's thesis, both discrete and dimensional models of affect are used because there is no consensus regarding which model or measurement is better.

1.2.2 Definition and Strategies of Emotion Regulation

Emotion regulation refers to "the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (Gross et al., 1998, p. 275). Emotion regulation can be deliberate or automatic (Mauss et al., 2007). Deliberate refers to explicit and automatic refers to implicit emotion regulation strategies (Braunstein et al., 2017). The focus here is on deliberate emotion regulation strategies. The term **affect regulation** is broader and includes emotion regulation, mood regulation, and coping (Gross, 2015). Although affect regulation could be more precise here as it covers the regulation of both emotions and moods, this master's thesis uses the widely accepted term "emotion regulation" as commonly found in the literature. Emotion regulation should be distinguished from two other closely related terms: coping and emotional reactivity. Coping refers to regulating responses to stressful situations even though it also shares some similarities with

emotion regulation (Compas et al., 2017). Emotional reactivity refers to differences among individuals in the duration, intensity, and sensitivity of their affective response. It can influence individuals' capacity to regulate their affective states (Nock et al., 2008).

Individuals use different strategies to regulate their affective states (Kalisch, 2009). According to **the process model of emotion regulation** (Gross 2015), there are antecedent-focused and response-focused emotion regulation strategies. These are divided based on the time of onset of the affective response (Gross, 2001; Gross & John, 2003). Different strategies address different states in the emotion generation process. Here, the focus is on reviewing two of the most widely studied emotion regulation strategies, cognitive reappraisal and expressive suppression. **Cognitive reappraisal** is one of these antecedent-focused emotion regulation strategies because it alters the emotional response before it is generated completely (Gross, 2001; Gross et al., 1998). This strategy targets the evaluation (or appraisal) stage and involves changing the meaning of a situation in which the emotional response occurs by reinterpreting it (e.g., thinking during a stressful test, "I studied well, and it is always possible to retake the test"). **Expressive suppression**, another emotion regulation strategy, alters the response after physiological and behavioral changes have occurred (Gross & John, 2003; McRae & Gross, 2020). It is targeted at the response stage of emotion generation and refers to inhibiting or suppressing the ongoing emotional expression (e.g., keeping a neutral face during a stressful presentation) (Gross, 2001; Gross & John, 2003; Ochsner & Gross, 2013). Both strategies involve inner speech (Salas et al, 2018). Emotion regulation occurs cyclically, from the identification of when to regulate the affective response to the selection of specific strategies to use, to implementation (when a person uses the selected strategy), and to monitoring (when a person monitors his or her success in regulating the affective state), back to the identification where the cycle starts again (McRae & Gross, 2020).

Different emotion regulation strategies are differently associated with well-being. Some of these strategies are generally thought of as adaptive, whereas others are less adaptive (Aldao et al., 2010). Cognitive reappraisal is generally considered an adaptive strategy. It has been shown to be positively associated with well-being, such as positive affect, life satisfaction, and psychological well-being, and negatively associated with

symptoms of depression (Gross & John, 2003, p. 360). On the other hand, expressive suppression is generally considered a less adaptive strategy because it has been shown to be associated with ill-being and mental health symptoms (Gross & John, 2003). Studies show that expressive suppression is related to increased sympathetic reactivity (John & Gross, 2004) and more negative emotions (Gross & John, 2003). A meta-analytic review by Aldao and colleagues (2010) supports the view that suppression, among other similar maladaptive strategies such as rumination or avoidance, has a stronger impact on mental health than adaptive strategies, such as reappraisal. These maladaptive strategies are associated with symptoms of psychopathology (Aldao et al., 2010). However, the adaptiveness of strategies depends on how flexibly individuals use emotion regulation strategies in different contexts. Adaptiveness depends on the level of control an individual has in stressful situations (Rogier et al., 2019; Sheppes, 2020; Troy et al., 2013). This means that cognitive reappraisal might not always be adaptive and expressive suppression might not always be maladaptive (Rogier et al., 2019; Troy et al., 2013).

1.2.3 Measurement of Emotion Regulation

It is important to distinguish the habitual use of emotion regulation strategies in everyday life (trait emotion regulation) from the ability to use particular emotion regulation strategies in different situations (state emotion regulation) (Blanke et al., 2020; McRae & Gross, 2020). Thus, whereas **trait emotion regulation** refers to differences in emotion regulation between individuals, **state emotion regulation** refers to differences in emotion regulation within an individual. Environmental and individual factors, such as personality traits or cultural factors, impact when, how, and which emotion regulation strategy people use (Gresham & Gullone, 2012; McRae & Gross, 2020; Vantieghem et al., 2016). Situational factors, such as the intensity of the current affective state, influence which of these strategies is more likely to be used. When the intensity of affect is lower, people are more likely to use reappraisal. When the intensity of affect is higher, people tend to use distraction, which refers to shifting one's focus to an unrelated stimulus (Sheppes et al., 2011).

Trait emotion regulation can be measured with various questionnaires, the most well-known being the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). The ERQ measures the use of two emotion regulation strategies: cognitive reappraisal and

expressive suppression (Gross & John, 2003). State emotion regulation, however, is typically measured in a laboratory setting in which individuals are typically asked to regulate their responses to various stimuli (e.g., affective pictures) by using specific emotion regulation strategies (McRae & Gross, 2020; Sheppes et al., 2011). For example, participants may be asked to down-regulate their negative affect by thinking that the situation depicted in the picture is not true, but part of a movie (e.g., "It's just a movie") (Sikka et al., 2022). This master's thesis focuses on trait emotion regulation and uses the ERQ (Gross & John, 2003) to measure it.

1.3 The Relationship Between Emotion Regulation and Dream Affect

1.3.1 Relationship Between Waking Affect Dream Affect

Studies show that the pre-sleep waking affect is associated with dream affect. For example, Schredl (2006) demonstrated that the more intense emotions experienced while awake, the more likely they are to be reflected in dreams. Conte and colleagues (2020) found that whereas positive affect decreased from wakefulness to dreams, negative affect increased. Similar findings regarding the positivity bias were reported by Sikka and collagues (2021). In addition to the relationship between the pre-sleep waking affect and subsequent dream affect, there have been studies investigating the relationship between dream affect and post-sleep waking affect. For instance, it has been shown that positive and negative dream affect, as measured by self- and external ratings, are positively correlated with participants' mood the next day, supporting the continuity of dream affect and waking affect (Mallett et al., 2022; Sikka et al., 2022). A study by Barbeau and colleagues (2022) found that pre-sleep affect can serve as an indicator of the affect experienced in dreams and upon awakening.

Similarly, individuals' well-being has been found to be associated with the content and the affective tone of dreams, demonstrating the continuity between waking and dream experiences (Pesant & Zadra, 2006). For example, peace of mind (inner peace and harmony) has been found to be associated with more positive dream affect (Sikka et al., 2018a). Individuals' ill-being and dream content have been studied. For example, there are associations between depressive symptoms and negative dream affect, more specifically nightmares (Blagrove et al., 2004). Symptoms of anxiety are associated with more negative dream affect (Sikka et al., 2018a).

To conclude, many studies indicate a link between waking affect and dream affect, providing evidence for affective continuity between wakefulness and dreams. It has been suggested that some individual differences may account for this relationship. Specifically, individual differences in the habitual use of emotion regulation strategies (or trait emotion regulation), have been suggested to underlie both waking affect and dream affect (Sikka et al., 2018b, 2019, 2022, 2023a).

1.3.2 Relationship Between Individual Differences and Dream Affect

Evidence regarding the relationship between personality traits and dream content is scarce (for a review see Blagrove & Pace-Schott, 2010). It has been shown that different personality traits are related to emotion regulation strategies the individual utilizes in the management of day-to-day affective events. For example, extraversion and openness seem to be associated with the use of cognitive reappraisal, while neuroticism is associated with the use of expressive suppression (Gresham & Gullone, 2012). Further, these traits are related to dream affect. For example, neuroticism have been shown to be associated with negative dream emotions during nightmares (Blagrove et al., 2004; Gan et al., 2022; Zadra & Donderi, 2000). Trait anxiety is also linked with the affective tone of dream experience in which higher levels of trait anxiety are associated with higher levels of negative dream affect (Samson-Daoust et al., 2019). Trait anxiety is also associated with the frequency of nightmares (Zadra & Donderi, 2000). When trait anxiety is controlled, higher levels of trait mindfulness are related to lower levels of dream anxiety (Simor et al., 2011). In a recent study, Sikka and colleagues (2023a) showed that between-individual differences, but not within-individual differences, in participants' daily worry about the COVID-19 pandemic are associated with negatively valenced dream affect.

1.3.3 Relationship Between Emotion Regulation and Dream Affect

Very few studies have investigated the relationship between dream affect and emotion regulation (Sikka et al., 2022), but there are some studies that have examined the relationship between dream affect and emotional reactivity. Lara-Carrasco and colleagues (2009) set out to study the role of dreams in emotional adaptation, defined as a decrease in emotional reactivity to negative pictures on re-exposure to them. In line

with the emotion regulation theories of dreaming, the researchers predicted that those with better emotional adaptation (or emotion regulation) would have more negative affect in their dreams. Thus, these results are more in line with the continuity hypotheses (Lara-Carrasco et al., 2009). Sterpenich and colleagues (2020) used functional magnetic resonance imaging (fMRI) to measure brain activity in response to affective stimuli to investigate how this emotional reactivity is associated with dream affect. The authors also expected to see reduced reactivity in those participants who experienced more negative affect, especially fear, in their dreams. The findings have revealed that those participants who experienced more fear in their dreams (during a week before the fMRI session) had lower reactivity to fear-related stimuli in wakefulness. These results suggest that dreaming may be involved in emotion regulation (Sterpenich et al., 2020, p. 843).

Sikka and colleagues (2022) were the first to directly examine how dream affect is related to the ability to regulate affect the next day. In the study, participants reported their dreams and rated their dream affect, as well as their current mood, upon morning awakening. Right after this, emotional reactivity and emotion regulation ability were measured by asking participants to view negative or neutral images and to down-regulate the affect they experienced while viewing them. The researchers found an association between dream affect and mood after waking up, in that those who experienced more positive dream affect also reported more positive mood upon awakening, whereas those who experienced more negative dream affect reported more negative mood upon awakening. However, dream affect was not associated with emotional reactivity or emotional regulation. Thus, these findings do not support the emotion regulation theories of dreaming but rather the continuity hypotheses of dreaming (Sikka et al., 2022).

Wong and Yu (2022) were the first and to the author's knowledge the only ones, to investigate how dream content is associated with trait emotion regulation. The authors carried out a questionnaire study investigating the relationship between trait emotion regulation, as measured with the ERQ (Gross & John, 2003) and the Perth Emotion Regulation Competency Inventory (Preece et al., 2018), and dream content using the Dream Intensity Scale (DIS) (Yu, 2008). Positive Affect and Negative Affect Schedule (PANAS) (Watson et al., 1988) was used for state affect and The Brief Form of

Affective Neuroscience Personality Scale (BANPS) (Barret et al., 2013) was used for trait affect. Cognitive reappraisal and negative emotion regulation seem to have an indirect association on dream content and intensity by affecting negative state and trait emotions. Cognitive reappraisal is associated negatively with dream vividness (one subscale in dream intensity). In contrast, expressive suppression seems to directly influence dreams through positive trait emotion. However, no relationship between expressive suppression and dream content was found. There was a correlation between difficulties in regulating negative as well as positive emotions and dream content. However, this study did not focus on dream affect, but rather on other aspects of dream content. Also, the authors used a questionnaire to study dream experiences (rather than dream diaries), which is problematic (see section 1.1.4).

1.4 Aim and Hypotheses of the Present Study

As reviewed above, existing studies indicate a link between waking affect and dream affect. It has been suggested that some individual differences, specifically trait emotion regulation, may account for this relationship (Sikka et al., 2018, 2019, 2022, 2023). However, studies directly testing the relationship between trait emotion regulation and dream affect are lacking, with only one study having investigated the relationship between emotion regulation and dream content (but not dream affect specifically) (Wong & Yu, 2022).

Therefore, the aim of the study carried out in the framework of the present master's thesis was to investigate the relationship between trait emotion regulation and dream affect. Specifically, the goal was to examine whether and how dream affect is associated with the use of more adaptive (i.e., trait cognitive reappraisal) and less adaptive (i.e., trait expressive suppression) emotion regulation strategies. The focus was on these two emotion regulation strategies because cognitive reappraisal and expressive suppression are the most well-studied strategies in affective science and, to date, only these strategies have been studied in the context of dream affect (Wong & Yu, 2022). To address the aim, participants' home dream diaries were collected and analyzed by measuring the overall affective tone of the dream and discrete affective states in dreams. To account for possible differences in results obtained with different affect rating methods, dream affect was rated by participants themselves (i.e., self-ratings) as well as by external judges (i.e., external ratings).

The hypotheses of this study were motivated by previous findings supporting continuity theories of dreaming (see section 1.1.3) and were as follows: (1) individuals with greater use of adaptive emotion regulation strategies (i.e., greater trait cognitive reappraisal) will have less negative and more positive affect in their dreams, and (2) individuals with greater use of less adaptive emotion regulation strategies (i.e., greater trait expressive suppression) will have more negative and less positive affect in their dreams.

2 Methods

2.1 Participants and Procedure

The data of this study were collected as part of two different studies (conducted in 2020–2021; Lin et al., under review; Sikka et al., 2022). Participants included 95 Finnish adults (45 participants from Lin et al., under review, and 50 participants from Sikka et al., 2022), with ages ranging from 18–55 years (M = 24.53, SD = 6.45) and with a majority of women (women: n = 79, 83.2%; men: n = 16, 16.8%). Participants included in the study had to meet the following criteria: right-handedness, absence of sleep disorders or psychiatric disorders, and no usage of antidepressants or other drugs that affect the central nervous system.

Participants were recruited through various advertisements. These advertisements were posted on social media and sent to the email lists of various universities, including the University of Turku and other Finnish universities. Participants were offered compensation for participating: psychology students (from the University of Turku) had the possibility to obtain study credits, while other participants had the possibility to participate in a gift card lottery. Data were collected according to the Declaration of Helsinki, and the studies were approved by the Ethics Committee for Human Sciences at the University of Turku.

Informed consent was obtained from participants before they made a decision to be part of the study. At first, participants filled in an online well-being questionnaire (via Webropol) that contained the scale measuring trait emotion regulation as well as demographic questions (e.g., age, gender). Subsequently, participants reported their dreams in an online home dream diary (via Webropol) for seven days (Lin et al., under review) or five days (Sikka et al., 2022). Participants were asked to fill in the dream diary every morning right after waking up.

Altogether (across the two studies), 666 dream reports were collected. Out of these, three reports were duplicates and were thus removed. Additionally, six of the reports included several dreams in the same report. These reports had to be removed because dream affect ratings were provided only once (so it was unclear to which dream or

dreams the affect ratings applied). Due to statistical requirements, five dream reports from one participant had to be excluded from this analysis, since it was the only participant who reported their gender as “other”. As a result, 652 dream reports from 95 participants were included in the final analyses.

Since the data used in this master's thesis had already been collected, it was not possible to calculate an a priori sample size needed for the analyses. However, post-hoc power calculations using G*Power 3.1.9.7 (Faul et al., 2007, 2009) indicated adequate power for correlation analyses (power = .85; N = 95, two-tailed, correlation ρ H_1 = 0.3, α = .05) and multiple regression analyses (power = .79; N = 95, two-tailed, effect size f^2 = 0.15, α = .05, number of predictors = 6).

2.2 Measures

2.2.1 Emotion Regulation Questionnaire

Participants filled in the Finnish version of the Emotion Regulation Questionnaire (for the original scale in English, see Gross & John, 2003; for the Finnish version, see Nummenmaa & Nummenmaa, 2008; Vuorela & Nummenmaa, 2004). This questionnaire measures the habitual use of two emotion regulation strategies: trait cognitive reappraisal and trait expressive suppression. Participants were asked to rate 10 items on a scale from 1 (strongly disagree) to 7 (strongly agree). Cognitive reappraisal was measured with six items (e.g., “When I want to feel less negative emotion, I change the way I’m thinking about the situation”), and expressive suppression with four items (e.g., “When I am feeling negative emotions, I make sure not to express them”). Items of the two subscales were averaged for both subscales and the total score of each subscale could range from 1–7, with higher scores indicating greater use of the particular emotion regulation strategy. This internal consistency of cognitive reappraisal (Cronbach’s α = 0.63) and expressive suppression (Cronbach’s α = 0.79) subscales were acceptable. Similar results were found in a study using the Finnish version of the ERQ (cognitive reappraisal: Cronbach’s α = 0.74, and expressive suppression: Cronbach’s α = 0.81; Westerlund & Santtila, 2018).

2.2.2 Dream Diary

Dream diary instructions were based on previous studies (Sikka et al., 2014, 2017, 2018b, 2021). Participants had to fill in their bedtime and awakening time. Participants were asked to evaluate the quality of their sleep on a scale from 1 ("very good") to 4 ("very bad"). After that, participants were asked whether they (1) remembered (at least some of) the contents of their dream, (2) thought they had had a dream but did not recall its contents, or (3) did not have any dreams. If participants remembered (at least some of) the contents of their dream, the dream had to be written down as detailed as it was recalled. Participants were asked to report their dreams as truthfully and accurately as possible without censoring their text or interpreting it afterward. They were instructed to report everything they remembered about the dream ("what happened, where, with whom, what was felt and thought"). If participants experienced multiple dreams during the night, they were directed to complete separate diary entries for each individual dream. If participants forgot to submit a dream diary on a particular day, they were sent a reminder.

2.2.3 Self-Ratings of Dream Affect

In the online dream diary, after providing a narrative dream report, participants were asked to rate the affect they experienced in their dream. Firstly, participants rated the overall affective tone of the dream using two unidimensional scales: positive dream affect and negative dream affect. Both were on a scale from 1 ("not at all") to 5 ("very much"). These self-ratings are referred to as self-rated dimensional positive affect and self-rated dimensional negative affect, respectively.

Secondly, participants rated discrete affective states in their dreams using the Finnish version of the modified Differential Emotions Scale (mDES; see Appendix 1) (Fredrickson, 2013; Sikka et al., 2014). The mDES scale has been shown to have good reliability and validity (Conte et al., 2020; Sikka et al., 2018b). This scale includes 20 discrete affect items, ten negative and ten positive, each consisting of three adjectives (e.g., "sad, downhearted, or unhappy", "joyful, glad, or happy"). Participants were asked to rate the extent to which they experienced each of the 20 discrete affect items on scale from 1 ("not at all") to 5 ("very much"). The ten negative affect items were aggregated to form the negative discrete affect subscale and the ten positive affect items

were aggregated to form the positive discrete affect subscale, the scores of which could range from 1 to 5. Additionally, the “Other” category was included to provide participants the opportunity to rate affects not presented as part of the 20 items. The internal consistency for negative discrete affect (Cronbach’s $\alpha = 0.85$) and for positive discrete affect (Cronbach’s $\alpha = 0.90$).

2.2.4 External Ratings of Dream Affect

The collected dream reports were anonymized, and blind judges rated the same reports in a different order. One judge (the author of this master’s thesis) rated all the dream reports ($n = 652$), and two judges (N.S., V.L.) rated half of the reports each ($n = 322$, $n = 330$). Judges utilized the same dimensional and discrete affect scales as the participants. First, the judges rated independently the overall tone of the dream reports for both negative and positive affect from 0 ("not at all") to 4 ("very much"). The ratings of the judges were aggregated to form the external ratings of negative dimensional affect and the external ratings of positive dimensional affect.

After this, the judges used the modified Differential Emotional Scale (mDES) to classify each identified affect into categories 1-21 (see Appendix 1) (Fredrickson, 2013; Sikka et al., 2014). To this end, the judges worked independently and first identified each affective state expressed in the dream report. Then, the judges categorized each affective state into the 20 mDES categories (plus “Other”). Subsequently, the judges discussed each identified and categorized affective state among each other and tried to reach an agreement about whether the affective state was indeed expressed and, if so, which mDES category it belonged to. If an agreement was not reached, this particular affective state was excluded from the analysis. Ten negative discrete affect items were aggregated to form the external ratings of negative discrete affect and ten positive discrete affect items were aggregated to form the external ratings of negative discrete affect. The internal consistency of the external ratings of negative discrete affect (Cronbach’s $\alpha = 0.91$) and external ratings of negative discrete affect (Cronbach’s $\alpha = 0.91$) subscales was good.

External judges used the following inclusion criteria: the affect expressed had to be experienced by the dream self, and either explicitly expressed or clearly interpreted from the description of the behaviour of the dream self. The exclusion criteria were:

situations in which the same affect was mentioned repeatedly but clearly related to the same situation, an affect that was expressed through behaviour but was vague and could not be inferred from the context, and the affective word was a general compliment.

The judges identified more negative (n = 436) than positive (n = 213) discrete dream affect. The most common affect categories were fear (n = 120), anger (n = 91), and stress (n = 88). When the judges were not able to categorize a discrete affect into any of the 20 affect categories, they classified it into the "Other" category. In total, 278 instances of affect were classified into this category: negative affect (n = 113), positive affect (n = 30), and other mixed affect states that could not be clearly classified as positive or negative (n = 135). The most common affective states in this "Other" category were wonder (n = 51), anxiety (n = 37), and confusion (n = 22).

Altogether, 1230 affective states were identified from the 652 dream reports. The judges agreed on 901 affective states and disagreed on 329 affective states. The interrater agreement rate was 73.3 %. After the discussion about the identified affective states, the judges agreed on 927 affective states. The ones that the judges disagreed on were not included in the analyses. The interrater reliability of affect classification was assessed using Cohen's κ (Landis & Koch, 1977). The judges displayed substantial agreement with the classifications (κ = .69).

2.3 Statistical Analyses

The data were analyzed using IBM SPSS Statistics (Version 27). There were two independent variables (cognitive reappraisal, expressive suppression), eight dependent variables (self-rated dimensional negative affect, self-rated dimensional positive affect, self-rated discrete negative affect, self-rated discrete positive affect, externally rated dimensional negative affect, externally rated dimensional positive affect, externally rated discrete negative affect, externally rated discrete positive affect), and five control variables (age, sleep quality, word count, gender, study). During preprocessing, aggregated scores of all dream affect variables and sleep quality were calculated for each participant. Word count was determined by counting the words in the dream report, after removing any waking comments that were not directly part of the dream.

Because some of the variables were skewed to the right (the external ratings of discrete positive and negative affect, and dimensional positive affect), associations between variables were analyzed using Spearman's correlations. A multiple linear regression was performed to examine the relationship between one dependent variable and independent variables in addition to the control variables (Marill, 2004). To perform a multiple regression analysis, first, the assumptions were checked. The independence of observations was achieved by aggregating variables per participant. Independence of residuals was checked using the Durbin-Watson statistic. The linearity assumption was checked using scatterplots between independent and dependent variables. Multicollinearity between independent variables did not pose any issues since the correlation between cognitive reappraisal and expressive suppression was not significant (see Table 2).

3 Results

3.1 Descriptive Statistics

Descriptive statistics of dream affect scores and trait emotion regulation scores are presented in Table 1. Mean trait cognitive reappraisal and expressive suppression scores correspond well with a previous study of a Finnish population (Westerlund & Santtila, 2018).

Table 1

Descriptive Statistics of Study Variables (*N* = 95)

	M	*SD*	*Minimum*	*Maximum*
Trait cognitive reappraisal	4.88	0.77	3.00	7.00
Trait expressive suppression	3.23	1.21	1.00	6.00
SR Dimensional Positive Affect	2.85	0.64	1.20	4.40
SR Dimensional Negative Affect	2.87	0.68	1.00	5.00
ER Dimensional Positive affect	0.74	0.65	0.00	3.08
ER Dimensional Negative affect	1.31	0.76	0.00	3.00
SR Discrete Positive Affect	1.95	0.56	1.00	4.10
SR Discrete Negative Affect	1.78	0.52	1.02	3.80
ER Discrete Positive Affect	0.39	0.45	0.00	2.50
ER Discrete Negative Affect	0.74	0.80	0.00	3.67
Age	24.53	6.45	18.00	55.00
Sleep quality	1.94	0.38	1.00	3.00
Word Count	137.98	85.52	21.00	437.33

Note. SR = Self-ratings, ER = External ratings

3.2 Correlations Between Variables

Correlations between all study variables can be seen in Table 2. There was a weak negative correlation between trait cognitive reappraisal and self-rated negative dimensional dream affect, r_s (95) = -.232, p = .024. This was the only significant correlation found between independent and dependent variables. None of the variables correlated significantly with expressive suppression.

In addition, there were positive correlations between externally rated and self-rated dimensional and discrete positive affects. There were positive correlations between externally rated and self-rated dimensional negative affects and discrete negative affects. From the control variables, sleep quality was correlated with trait cognitive reappraisal, as well as with self-rated dimensional negative affect and externally rated discrete positive affect.

Table 2

Spearman's Correlations Between Study Variables ($N = 95$)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Trait cognitive reappraisal	1														
2. Trait expressive suppression	-.03	1													
3. SR Dimensional Positive Affect	.12	-.10	1												
4. SR Dimensional Negative Affect	**-.23***	.18	**-.40****	1											
5. ER Dimensional Positive affect	-.09	-.14	**.44*****	-.07	1										
6. ER Dimensional Negative affect	-.08	.08	**-.36****	**.59*****	**.24***	1									
7. SR Discrete Positive Affect	.17	-.02	**.72****	**-.28****	**.31****	**-.23***	1								
8. SR Discrete Negative Affect	-.12	.20	**-.32****	**.76****	-.11	**.55****	.06	1							
9. ER Discrete Positive Affect	-.13	-.15	**.34****	-.04	**.88****	**.33****	**.24***	-.06	1						
10. ER Discrete Negative Affect	-.01	.06	**-.20***	**.41****	**.28****	**.80****	-.08	**.39*****	**.39****	1					
11. Age	-.15	-.06	.06	-.05	.10	.02	-.06	-.03	.08	-.03	1				
12. Sleep quality	**-.27****	.19	-.12	**.20***	-.19	.02	-.11	.11	**-.26***	-.13	.06	1			
13. Word count	-.05	.01	-.03	**.20***	**.47****	**.57****	.05	.13	**.53****	**.66****	.07	-.18	1		

Note. SR = Self-ratings, ER = External ratings

* = Correlation is significant at the 0.05 level (2-tailed), ** = Correlation is significant at the 0.01 level (2-tailed), *** = Correlation is significant at the 0.001 level (2-tailed)

3.3 Multiple Regression Analysis

A multiple regression analysis was performed to further investigate the relationship between trait cognitive reappraisal and self-rated negative dimensional affect, while controlling for the control variables (age, sleep quality, word count, gender, study). A hierarchical regression, in which the control variables were added to the model in the first step, followed by the cognitive reappraisal score in the second step, was conducted.

The control variables explained 10.3% of the variance in self-rated dimensional negative affect. When adding the cognitive reappraisal scores into the model, 11.2% of the variance in the self-rated dimensional negative affect was accounted for. When controlling for the control variables, trait cognitive reappraisal was not a significant predictor. Instead, word count and sleep quality remained the only significant predictors of self-rated negative dimensional dream affect.

The adequacy of the multiple regression was viewed with Fisher's F-relation test. The model seemed to fit better than an empty model (F (6,88) = 2.98, p = .011, Adjusted R^2 = .11). No problem of multicollinearity (estimated with VIF and tolerance values) was detected in the regression model. The hierarchical multiple regression model can be seen in Table 3.

To further examine whether sleep quality explained the non-significant relationship between trait cognitive reappraisal and self-rated dimensional negative affect, another hierarchical multiple regression model was performed. In step one, all the control variables (except sleep quality) were added to the model (F (4,90) = 1.58, p = .188, Adjusted R^2 = .02). In step two, cognitive reappraisal was added to the model (F (5,89) = 2.33, p = .049, Adjusted R^2 = .07). Cognitive reappraisal was a significant predictor in the model (β = -.23, p = .027). In step three, sleep quality was added to the model (F (6,88) = 2.98, p = .011, Adjusted R^2 = .11) after which the relationship between trait cognitive reappraisal and self-rated dimensional negative dream affect was not significant (β = -.15, p = .165).

Table 3

Hierarchical Multiple Regression Models Predicting Self-Rated Dimensional Negative Affect From Trait Cognitive Reappraisal ($N = 95$)

	R2	Adjusted *R2*	*SEE*	*B*	SE	β	*t*	*p*	*Partial*	*Part*	*Tolerance*	*VIF*
Step 1	.15	.10	.65									
Age				-0.04	0.01	-.13	-1.29	.219	-.13	-.12	.86	1.17
Gender				0.15	0.20	.08	0.78	.438	.08	.08	.82	1.23
Word Count				0.002	0.001	.29	2.50	**.014***	.26	.25	.72	1.39
Sleep Quality				0.55	0.18	.30	2.98	**.004****	.30	.29	.92	1.08
Study				-0.11	0.15	-.08	-0.74	.461	-.08	-.07	.75	1.34
Step 2	.17	.11	.64									
Age				-0.02	0.01	-.14	-1.34	.185	-.14	-.13	.85	1.17
Gender				0.16	0.20	.09	0.82	.416	.09	.08	.82	1.23
Word Count				0.002	0.001	.26	2.25	**.027***	.23	.22	.70	1.43
Sleep Quality				0.46	0.19	.25	2.36	**.020***	.24	.23	.82	1.22
Study				-0.10	0.15	-.07	-0.65	.515	-.07	-.06	.74	1.35
Cognitive reappraisal				-0.13	0.09	-.15	-1.40	.165	-.15	-.14	.88	1.14

Note. * = Correlation is significant at the 0.05 level (2-tailed), ** = Correlation is significant at the 0.01 level (2-tailed)

4 Discussion

The aim of this master's thesis was to examine the relationship between trait emotion regulation and dream affect. To this end, positive and negative dream affect were measured with self- and external ratings, and trait cognitive reappraisal and trait expressive suppression were measured with the ERQ. Results provided partial support for the hypotheses. As hypothesized, individuals who reported using more cognitive reappraisal in waking life experienced less negative affect in dreams. However, this relationship was only observed for self-rated dimensional dream affect, not for self-rated discrete dream affect, nor for externally rated dream affect. Furthermore, when sleep quality was controlled for, trait cognitive reappraisal no longer remained a significant predictor of negative dream affect. Cognitive reappraisal was not related to positive dream affect. The hypothesis that the use of expressive suppression would be associated with more negative and less positive dream affect was not supported.

4.1 Emotion Regulation Strategies and Dream Affect

The use of adaptive emotion regulation strategies seems to have a similar relationship with dream affect as with waking affect. Studies have also demonstrated negative correlations between cognitive reappraisal and negative affect in wakefulness (Balzarotti, 2021; Jiang, 2021). When awake, cognitive reappraisal has been shown to be related to higher levels of positive emotions and lower levels of depressive symptoms (Gross & John, 2003).

In this study, trait expressive suppression was not associated with negative dream affect. Also, previous studies indicate more consistent findings between cognitive reappraisal and negative affect in wakefulness than between expressive suppression and waking negative affect (Balzarotti, 2021; Cabello et al., 2013). One reason why cognitive reappraisal is more consistently related to negative affect could be that expressive suppression is a response-focused strategy in which the emotional response is already generated, while cognitive reappraisal is an antecedent-focused strategy in which the individual modifies the interpretation of the situation and attempts to downregulate the negative affect before it is generated. Thus, cognitive reappraisal may be more strongly related to negative affect because it targets the affective state earlier in the emotion generation process (Gross, 2001; Gross & John, 2003).

The finding regarding the relationship between lower levels of negative dream affect (self-rated) and the use of cognitive reappraisal is in line with other similar studies. Recently, it has been shown that the amount of waking stress about the COVID-19 pandemic is related to negative dream content (Kennedy et al., 2022). In addition, waking levels of anxiety have been shown to be associated with nightmares (Secrist et al., 2019). Previous studies have also explored other trait differences and negative dream affect. Better skills in trait mindfulness (also considered important for emotion regulation) are associated with less dream anxiety (Simor et al., 2011). Previous studies have explored emotion regulation and negative dream affect. In the study of Lin and colleagues (under review) poorer affect regulation results in rising levels of negative affect. The found result is also in line with a previous review by Andrews and Hanna (2020) in which they point out a connection between negative cognitive appraisal and nightmares in dreams (Andrews & Hanna, 2020).

In this study, no significant relationships were found between cognitive reappraisal or expressive suppression and positive dimensional or discrete dream affect. In previous studies, individual differences in peace of mind have been found to be associated with positive dream affect as well as with the use of the more adaptive emotion regulation strategy, cognitive reappraisal (Sikka et al., 2018a; Sikka et al., 2023b). Reappraisal has been previously associated with increased levels of positive waking affect, whereas suppression with decreased levels of positive waking affect (Balzarotti, 2021; Gross & John, 2003; Jiang, 2021). It has been suggested that negative and positive affect may be reflected differently in dreams since negative affect requires more regulation during wakefulness than positive affect (Conte, 2020). The intensity of waking affect is related to what experiences are incorporated and processed in dreams. Another possible explanation for the difference between negative and positive dream affect could be that negative waking experiences are more intense than positive ones (Schredl, 2018).

It may also be that negative and positive affect have different genetic components. Negative affect, but not positive affect, has been shown to be significantly heritable. Thus, positive affect may be more dependent on environmental factors than negative affect (Zheng et al., 2016). This may explain differences with respect to trait cognitive

reappraisal. On the other hand, it has been shown that expressive suppression is more heritable compared to cognitive reappraisal (McRae et al., 2017).

In this study, better sleep quality was associated with greater use of trait cognitive reappraisal. When controlling for sleep quality, the relationship between cognitive reappraisal and negative dream affect was not significant. This means that sleep quality explains negative dream affect to a greater degree than cognitive reappraisal. Previous studies have linked sleep quality to dream affect, with poorer sleep associated with more negative affect and vice versa (Sikka et al., 2023a). Better sleep quality is also associated with more externally rated positive affect and more self-rated dimensional negative affect (Sikka, 2020). Additionally, poorer sleep quality has been shown to be linked with decreased positive affect after waking up (Sikka et al., 2022).

4.2 Implications in Light of Different Dream Theories

This study did not directly test different dream theories but can still provide some evidence in favor of the continuity hypotheses (e.g., Domhoff, 2017; Schredl, 2006; Schredl & Hofmann, 2003). The continuity hypotheses suggest that individual differences are associated with dream content in that individuals who tend to feel more negative affect during the day should also experience more negative dreams (Schredl & Hofmann, 2003). Later version of the continuity hypothesis (Schredl, 2006) suggests that the emotional intensity of waking experiences influences which waking experiences are incorporated into dreams. The results of this study show that differences in affect-related traits underlie affect experienced in dreams. It may be that emotion regulation is involved in the intensity of affective experiences in wakefulness, and this may determine which affective experiences are reflected in dreams (Schredl, 2006).

The results are not in line with emotion regulation theories, which suggest that higher levels of negative affect in dreams indicate more adaptive emotion regulation skills (e.g., Cartwright et al., 2006; Hartmann, 1996; Levin & Nielsen, 2009). For example, Sterpenich and colleagues (2020) showed that experiencing fear in dreams is associated with more adaptive responses to fear-related stimuli while awake (Sterpenich et al., 2020).

The results of this study also fit well with the predictions from the Threat Simulation Theory of Dreaming (TST). This theory predicts a relationship between the amount of threat individuals experience during the day and the negative content of their dreams (Revonsuo, 2000; Sikka et al., 2023a). In this way, the theory also suggests a continuity of negative experiences throughout the sleep-wake cycle (Revonsuo, 2000).

4.3 Differences in Results Obtained with Self-Ratings and External Ratings

The relationship between cognitive reappraisal and negative affect only applied to self-ratings but not to external ratings. There are many possible reasons that may explain these differences. It has been suggested that self-ratings and external ratings may measure partly different phenomena, as they yield partly distinct results (Röver & Schredl, 2017; Sikka et al., 2021). Whereas self-ratings rely on participants' own evaluations of the experiences they had in their dreams, external ratings rely on how participants describe their dream experiences in words (Sikka et al., 2014).

Previous studies have shown that with self-ratings dreams appear to be more positive than with external ratings, especially in women (Sikka et al., 2014, 2017, 2021). Similarly, in this study, external ratings resulted in more negative than positive dream affect, whereas with self-ratings dreams had a more balanced affective tone. It has also been shown that the convergent validity of measuring negative dream affect is higher than that of positive affect (Sikka et al., 2017, 2020). Given the discrepancies in self-ratings and external ratings, it is not surprising that the significant results only applied to self-ratings of negative affect considering that dream affect and trait emotion regulation were both measured with a self-rating scale. Interestingly, however, despite different results regarding the relationship with trait cognitive reappraisal, self-and external ratings were still positively and significantly correlated. This association was found both with positive discrete and dimensional scales as well as negative discrete and dimensional scales. This indicates that the two methods do converge, at least to some extent.

There are several considerations regarding self-ratings. This study was based on participants' retrospective self-reports of the affect they experienced in their dreams. Self-ratings of affective experiences may be more valid when the affective state is experienced recently compared to a longer period of time ago (Robinson & Clore,

2002). The way participants memorize the affect they experienced in a different state of consciousness may also affect the results (Sikka, 2020). Affective experiences, especially in relation to more complex affective states, are typically appraised in relation to past or future events afterward. Since meta-cognition is typically not possible in dreams, dream affect is interpreted only after waking up (Gross, 2015, 2014; Revonsuo, 2006). Also, the negative content of dreams may be easier to recall after waking up (Fox et al., 2013). The latter may explain why significant results applied to negative, but not positive, dream affect.

As to external ratings, the verbal dream report is the only access an external judge has to the participant's dream experience. The problem in measuring subjective experiences based on these reports is that an external rater might not be able to capture the participant's affective experiences due to differences in report length and in the use of affective language. In this study, participants had different reporting styles for the affective states experienced in their dreams. While some participants used more specific words and multiple words to describe an affective experience, others reported described their affects using less specific words, such as "felt good". Even though participants utilized affective language differently, it is difficult to conclude whether the experience itself was different. Therefore, the results may be influenced by how people recognize different affective states and can verbalize them in the report. Additionally, the judges had difficulties in categorizing some of the affective states expressed in the dream reports into the 20 positive and negative affect categories, partly due to the ambiguity in the affect words used (e.g., "mixed feelings"). Also, it was difficult to rate some affective words because of the ambiguity as to whether they referred to positive or negative affective states, or they seemed to refer to both positive and negative valence. As a result, a number of expressed affect words were categorized into the "Other" category.

It is reasonable that word count is associated with external ratings of narrative dream reports (Sikka et al., 2014). In this study, dream reports differed greatly in length. While some participants were very detailed in describing their dream experiences, others produced only a few sentences. The reason why the report length varied so greatly might be due to some participants' having low motivation for participation, difficulties in expressing emotions in words, difficulties in dream recall, or other misunderstandings

regarding the given instructions about how to report dreams. Differences between self- and external ratings may decrease with longer dream reports (Röver & Schredl, 2017), which reflects the need for either selecting participants more carefully or training them in how to write dream reports.

4.4 Differences in Results Obtained with Dimensional and Discrete Affect Rating Scales

Significant findings in this study only applied to the dimensional affect scale but not to discrete affect scales. On the dimensional affect rating scales, affective states were measured on a scale from 0 (“not at all”) to 4 (“very much”). The dimensional scales allow for measuring affect intensity, in contrast to discrete scales (Schredl, 2018). The strength of these types of scales is the ease of rating one's affective state. For both participants and external judges, analyzing the tone of the dream may be simpler than analyzing discrete affect. However, Likert scales can be susceptible to response bias related to different styles of answering the questionnaires, potentially impacting the reliability and validity of the results (Kusmaryono et al., 2022, p. 633).

The discrete affective states were measured using the mDES scale (Fredrickson, 2013), which is a modification of Izard's (1977) Differential Emotions Scale (DES) (Galanakis et al., 2016). Theoretically, it is based on the broaden-and-build theory of positive emotions, and the categories of emotions are built based on the theory’s assumptions (Fredrickson, 2013). This theoretical framework for positive emotions should be considered when analyzing the results. For example, some items on the scale may be challenging to categorize as purely positive or negative emotions, as they may include both positive and negative emotions (Galanakis et al., 2016).

The mDES has demonstrated good internal and construct validity as well as reliability in the measurement of dream affect in different languages (e.g., Conte et al., 2020; Galanakis et al., 2016). However, further research on the psychometric properties of the Finnish version of the mDES scale used in this study is still necessary. As to affect ratings using this scale, participants must identify their experienced affective states and rate these by providing a single-item rating (Chin et al., 2023). Also, showing participants a list of items can induce a response bias, because participants may simply

tick off some affective states simply because they are presented to them (Domhoff, 2005; Sikka 2017).

4.5 Strengths and Limitations of the Study and Future Directions

One of the strengths of this study was that it controlled for variables that can influence the results regarding dream affect. Specifically, when designing dream studies, it is crucial to take into account sleep quality and word count (Conte et al., 2021; Röver & Schredl, 2017). The results showed that word count and sleep quality are indeed significantly associated with dream affect. A second strength of this study was that it utilized both self- and external ratings, which is highly recommended for dream studies (Sikka et al., 2021). A third strength is that the study was conducted in the home environment, which is more ecologically valid (Sikka, 2019). A fourth strength that the sample size was adequate for a dream study addressing individual differences.

However, several limitations should be taken into account. First, the findings of this study may have been influenced by sample characteristics, like age, culture, and gender. Participants included mostly young healthy women from universities. As such, they represent WEIRD (Western, Educated, Industrialized, Rich, and Democratic) countries (Henrich et al., 2010). Age, culture and gender affect which emotion regulation strategies an individual utilizes (Kwon et al., 2013; Zimmermann & Iwanski, 2014). Studies have shown that the use of emotion regulation strategies as well as dream content, dream recall, and emotional reactivity differ between genders (Rogier et al., 2019; Troy et al., 2013). However, the valence of dream affect does not necessarily differ between genders (Schredl & Doll, 1998). A study by Westerlund and Santtila (2018) examined the Finnish adaptation of the ERQ, concluding that women and younger participants are more likely to use cognitive reappraisal strategies (Westerlund & Santtila, 2018). In younger participants, the genetic influence of negative affect has been shown to be higher (Neiss & Almeida, 2004). In addition, participation in the study demanded motivation and dedication, as it required a considerable amount of time and effort to fill in the daily dream diaries. Participants may have differed in their motivation and dedication, potentially influencing the length and content of dream reports (Sikka et al., 2023). Future studies should include a wider range of participants (different genders, ages, and cultures) to understand the generalizability of these results.

Second, the study was conducted in the home environment, which is less controlled than a laboratory setting (Sikka, 2020). For example, it is not known at which stage of sleep or at what time during sleep the dream was experienced (Malinowski & Horton, 2021). It has been previously argued that home dreams likely represent late-night dreams. These dreams contain more affect than dreams deriving from early-night sleep (Agargun & Cartwright, 2003; Verdone, 1965). Additionally, home dream reports appear to be more negative than laboratory dream reports, which likely result from dreams deriving from different times of night (Sikka et al., 2018b). Dreams experienced during the first hours of sleep have also been shown to be more continuous with daytime events, while those experienced later in sleep are often characterized by more intense affective experiences (Malinowski & Horton, 2021). In addition, the ratings and reports of home dreams may be influenced by memory biases. Specifically, participants tend to remember their most affectively salient and recent dream experiences (Goodenough et al., 1974; Sikka, 2020). In the future, it would be interesting to replicate this study in a laboratory setting.

Third, it is important to note that this study was correlational in nature. Therefore, it is not possible to draw conclusions regarding the causal relationship between trait emotion regulation and dream affect. In future studies, it would be valuable to investigate whether emotion regulation interventions or training can modulate dream affect over time. Since affect and dream have been shown to have bidirectional connections, it would be interesting to study how dream affect is associated with traits using a longitudinal study design (Altena et al., 2016; Andrews & Hanna, 2020; Kahn et al., 2013). Longitudinal studies that would examine not only individual differences but also within-person relationships between emotion regulation and dream affect would also enable to test the emotion regulation theories of dreaming more directly.

Fourth, the findings regarding dream affect and its relationship to other variables, such as trait emotion regulation, may have been influenced by the order effect. This is because the participants first reported the dream report and then rated the affective experiences in their dreams (Sikka et al., 2017).

Fifth, given the differences in rating methods, it would be interesting to utilize modern AI-based natural language processing to analyze dream reports. It would be intriguing

to compare these results with external ratings and see whether they yield similar or different results.

Sixth, in this study only two emotion regulation strategies were investigated. Future studies could also use other measures of emotion regulation, such as the Cognitive Emotion Regulation Questionnaire (CERQ) (Jermann et al., 2006) or the Perth Emotion Regulation Competency Inventory (PERCI) (Preece et al., 2018) that allow to measure a wider range of strategies as well as difficulties in regulating positive and negative emotions. In addition to investigating trait emotion regulation, daily measures in the use of emotion regulation strategies should be employed (for this experience sampling methodology can be used) (Gross et al., 2021). Also, more studies investigating emotion regulation ability (using different kinds of tasks) and how this is associated with dream affect are needed.

4.6 Conclusion

This study investigated the relationship between dream affect and individual differences in emotion regulation (i.e., trait emotion regulation). Results showed that trait cognitive reappraisal was negatively associated with self-rated negative dimensional dream affect. However, this relationship was not significant when controlling for sleep quality. Trait expressive suppression was not associated with dream affect. These findings show that adaptive emotion regulation is associated with dream affect and provide support for the continuity hypotheses of dreaming. However, more research is needed to further investigate the link between emotion regulation and dream affect to better understand whether dream affect simply reflects or is actively involved in waking emotion regulation.

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Appendices

Appendix 1

The modified Differential Emotional Scale (mDES)

Code	Items in English	Items in Finnish	Scale
1.	Amused, fun-loving, or giggly	huvittuneisuutta, hauskuutta tai tunnetta, että nauruni on herkässä	PA1
2.	Angry, irritated, or annoyed	kiukkua, ärtymystä tai harmistuneisuutta	NA1
3.	Ashamed, humiliated or disgraced	häpeää, nöyryytystä tai että kunniaani oli loukattu	NA2
4.	Awe, wonder, or amazement	pelonsekaista kunnioitusta, ihmetystä tai hämmästystä	PA2
5.	Contemptuous, scornful or disdainful	halveksuntaa, väheksyntää tai ylenkatsetta jotakin kohtaan	NA3
6.	Disgust, distaste, or revulsion	vastenmielisyyttä, inhoa tai mauttomuutta	NA4
7.	Embarrassed, self-conscious, or blushing	olevani nolo, tietoinen itsestäni tai punastuvani	NA5
8.	Grateful, appreciative, or thankful	kiitollisuutta tai arvostusta	PA3
9.	Guilty, repentant, or blameworthy	syyllisyyttä, katumusta tai olevani syntipukki	NA6
10.	Hate, distrust, or suspicion	vihaa, epäluottamusta tai epäilystä	NA7
11.	Hopeful, optimistic, or encouraged	toiveikkuutta, optimismia tai olevani rohkaistunut	PA4
12.	Inspired, uplifted, or elevated	inspiroitunut, innoittunut tai ylevöitynyt	PA5
13.	Interested, alert, or curious	kiinnostuneisuutta, valppautta tai uteliaisuutta	PA6
14.	Joyful, glad, or happy	iloisuutta, onnellisuutta tai hyväntuulisuutta	PA7
15.	Love, closeness, or trust	rakkautta, läheisyyttä tai luottamusta	PA8
16.	Proud, confident, or self-assured	ylpeyttä, itseluottamusta tai itsevarmuutta	PA9
17.	Sad, downhearted, or unhappy	surullisuutta, alakuloisuutta tai onnettomuutta	NA8
18.	Scared, fearful, or afraid	pelkoa, pelokkuutta tai kauhua	NA9
19.	Serene, content, or peaceful	tyytyväisyyttä, rauhallisuutta tai tyyneyttä	PA10
20.	Stressed, nervous, or overwhelmed	stressiä, hermostuneisuutta tai ylitsepääsemättömyyttä	NA10
21.	Other (what?) (e.g., surprised; confused)	muu (mikä?) (e.g., yllättynyt, hämmentynyt)	

Note. PA = Positive affect, NA = Negative affect