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HOW DOES RITUALIZED BEHAVIOR LOWER ANXIETY? THE ROLE OF COGNITIVE LOAD AND CONSCIOUS PREOCCUPATION IN ANXIETY REDUCTION

Abstract. Although rituals are believed to lower anxiety, the underlying mechanism of anxiety reduction has not been explained well enough. According to Boyer and Liénard (2006), ritualized behavior decreases the anxiety levels because it swamps working memory. This blocks anxious thoughts' access to consciousness. As a result, ritualized behavior lowers anxiety temporarily but maintains it in the long run. In the article, I analyze what processes should be engaged in ritualized behavior to bring the aforementioned outcomes. I propose that ritualized behavior has anxiolytic properties if it preoccupies consciousness without placing too many demands on cognitive control. While conscious preoccupation with ritualized behavior should reduce anxiety, cognitive control load related to efforts to concentrate on ritualized behavior may bring immediate paradoxical effects of self-regulation, i.e., anxiety increases. Moreover, since anxiety disrupts attentional control capabilities, ritualized behavior should not be too cognitively demanding if an anxious person is to perform it.

Keywords: ritual, ritualized behavior, anxiety, cognitive load, conscious preoccupation

Introduction

From the early anthropological and clinical observations to recent experimental findings, there seems to be evidence for the existence of a link between rituals and anxiety. One of the first to describe that link was Malinowski (1948). The investigator noticed that on the Trobriand Islands fishing in dangerous circumstances in open-sea waters was accompanied by magical rituals concerning safety and fishing success. Such rituals were absent among fishermen on predictable and safe lagoon waters. Rituals are also a component of obsessive-compulsive disorder (OCD), a mental condition characterized by high anxiety levels. OCD patients are claimed to feel temporary relief after ritual performance (Salkovskis, 1985). Similarly, recent empirical

research points to the anxiolytic effects of engagement in a ritual (Anastasi & Newberg, 2008; Sosis & Handwerker, 2011). For instance, Brooks and colleagues (2016) demonstrated that even a laboratory-developed artificial ritual helped participants to reduce anxiety and improve task performance.

In the literature, we can find a few suggestions on how rituals reduce anxiety. Brooks et al. (2016) list four possible non-exclusive explanatory mechanisms. Firstly, a ritual may help to provide order and a feeling of control (Lang, Krátký, Shaver, Jerotijević, & Xygalatas, 2015). Secondly, it can act as a buffer against a threat as it refers to contents that enable one to transcend the self. Thirdly, ritual can be a form of placebo which makes a person believe he or she is safe, and the future will be more prosperous. Fourthly, rituals “swamp” working memory and hence block anxious apprehensions’ access to consciousness (Boyer & Liénard, 2006). Although it is possible that all the listed mechanisms have a role in anxiety reduction, in the article I would like to focus on the swamping working memory mechanism.

The idea that rituals swamp working memory was proposed by Boyer and Liénard (2006) in their influential theory of ritualized behavior (RB). Their claim that RB depends greatly on working memory has been recalled by different authors (e.g., Hobson, Schroeder, Risen, Xygalatas, & Inzlicht, 2018; Karl & Fischer, 2018; Krátký, Lang, Shaver, Jerotijević, & Xygalatas, 2016; Lang et al., 2015; Tonna, Marchesi, & Parmigiani, 2019). However, it is necessary to clarify what is meant by working memory being swamped. Working memory can be understood as a system that enables one to temporarily hold information in an active state and manipulate it. It can also be conceived more broadly as short-term storage plus cognitive control functions (i.e., executive functions; Diamond, 2013). Hence, demands placed on working memory may pertain to (different) executive functions or to (different kinds of) short-term memory¹. Cognitive demands pertaining to different processes may have different impact on the anxiety levels. In the article I try to clarify what Boyer and Liénard’s (2006) term swamping working memory means.

I begin by describing Boyer and Liénard’s (2006) theory of RB. Next, I analyze what the theory’s term of swamping working memory should mean to bring results expected by the authors, i.e., the short-term reduction of anxiety and of the frequency of anxious intrusion, followed by their later ironic rebound. To specify the term, I refer – like Boyer and Liénard (2006) do – to Wegner’s theory of ironic processes of mental control (1994). I conclude that swamping working memory with RB requires being consciously preoccupied by RB.

After this theoretical analysis, I review the empirical findings on how working memory load influences anxiety reduction and thought control. In particular, I show the contradictory outcomes of different studies that explore the impact of cognitive load on self-regulation. I try to reconcile those discrepancies by distinguishing between cognitive load related to effortful control and cognitive load related to conscious preoccupation. Working memory load connected to conscious preoccupation with a task (e.g., a ritual) may reduce intrusion frequency and anxiety. Working memory load related to effortful focus on a task that does not attract conscious thoughts may produce paradoxical increases of anxiety and intrusion frequency.

The following step is a consideration how anxiety influences cognitive control capabilities. Anxiety makes working memory tasks especially difficult. An inability to perform a difficult task may be a source of anxiety itself. Hence, I argue that RB that lowers anxiety is not very cognitively demanding.

I finish the article by formulating conclusions about the demands that RB will have to place on the cognitive system if it is expected to temporarily reduce anxiety. I also put forth some suggestions on how the anxiolytic effects of rituals should be studied.

How does ritualized behavior lower anxiety? The swamping working memory hypothesis

Boyer and Liénard (2006) created the RB development theory in which the anxiolytic properties of RB are one of the crucial points. The authors differentiate RB from rituals: RB is a group of behaviors characterized by specific features; rituals consist of RB as well as other behaviors. If rituals reduce anxiety, it is because of the RB they incorporate.

Five features characterize RB: 1) RB is compulsive which means that not performing it feels wrong or unsafe; 2) It relates to a specific range of themes such as contamination and purification; 3) The actions of RB are often non-functional (goal-demotion) and 4) are redundantly repeated (redundancy); Finally, 5) RB as a whole is rigidly repeated – its performance always looks the same.

According to Boyer and Liénard (2006), the development of RB starts with the detection of a threat. This makes a person anxious and aroused, which in turn results in eagerness to do something to protect oneself. However, sometimes performing an action is not enough to eliminate anxiety.

Then the actions are repeated until the feeling of closure eventually appears. Because of that, the actions lose their function – no goal requires such excessive repetitions. When there is no goal to explain the entirety of the behavior, one's attention is drawn by low level action units, like gestures. As a result, information about many small actions is being temporarily held. Moreover, high cognitive control over actions is engaged to ensure that they are performed properly. This swamps working memory. That in turn takes up space or resources for conscious thoughts unrelated to RB, including anxious apprehensions. Effectively, anxiety is temporarily reduced. In the long run, however, avoided thoughts paradoxically return what is claimed to be explained by the Wegner's theory of ironic processes of mental control (1994).

Anxiolytic effects of ritualized behavior in the light of the theory of ironic processes of mental control

Wegner (1994) suggested that there are two processes involved in mental control: the operating and the monitoring process. The operating process simply realizes a goal of mental control. If that goal is to suppress unwanted thoughts, then the operating process searches for mental contents unrelated to the unwanted one. At the same time, the monitoring process checks if the goal is achieved. In the case of thought suppression, it looks for unwanted thoughts among contents that may reach consciousness soon. If avoided contents are found, the operating process resumes its work. The operating process is a non-automatic process: it is effortful and consciously controlled. In contrast, the monitoring process is an automatic process. Hence, it depends on fewer resources than the operating process.

Mental control may succeed when there are enough resources to feed the operating process. If resources are lacking – because, for example, of stress or engagement in a cognitively demanding task – it is probable that paradoxical effects manifest instantly. These are side effects of the monitoring process that makes the mind sensitive to unwanted contents. When this sensitization is not balanced by the operating process, unwanted contents reach consciousness and mental control fails. Paradoxical effects may also occur at a later time, when the person is no longer attempting to control their mind. In that situation, the operating process is volitionally terminated but the unconscious, uncontrolled monitoring process still operates. To sum up, suppression of unwanted thoughts can be achieved if the operating process fills the person's consciousness with distractors. Thought suppression

has paradoxical effects when the operating process stops working or cannot work properly (Wenzlaff & Wegner, 2000).

There is much support for the theory of ironic processes of mental control. A number of studies show the so-called rebound effect of thought suppression: Target thoughts are more frequent after suppression compared to conditions with no earlier suppression attempts (for reviews and meta-analyses see: Abramowitz, Tolin, & Street, 2001; Magee, Harden, & Teachman, 2012; Wang, Hagger, & Chatzisarantis, 2019; Wegner, 2009; Wenzlaff & Wegner, 2000). Moreover, engagement in concurrent cognitively demanding tasks may produce paradoxical effects immediately (for meta-analysis see: Wang et al., 2019). For example, rehearsing a multi-digit number during suppression was shown to produce hyperaccessibility of a suppressed content (Slepian, Oikawa, & Smyth, 2014; Wegner & Erber, 1992). That form of cognitive load also impaired participants' ability to change their mood or to suppress unwanted mood-related thoughts while the participants without a cognitive load completed those mental control tasks quite successfully (Wegner, Erber, & Zanakos, 1993).

Considering what has been said of the theory of ironic processes of mental control, we may now delineate what kind of working memory swamping can reduce anxious thoughts and anxiety temporarily while leading to rebound effects in the long run. That would be an activity that fills consciousness without placing too many demands on the cognitive system. To be more specific, I argue that the activity should occupy consciousness with relative easiness.

Hence, in the light of the theory of ironic processes of mental control, a ritual that lowers anxiety and suppresses anxious thoughts is a ritual that provides activities which capture consciousness without significant effort by the participant. As a result, there is no room for conscious anxious thoughts and mental control success is achieved as long as the person is willing to participate in RB. When RB ends and when there is no intention to distract oneself from anxious thoughts, they may paradoxically return because of the unbalanced monitoring process.

The role of cognitive control load in the regulation of thoughts and emotions

Although Wegner (1994) postulated that cognitive capacity is needed for mental control success and that capacity is limited when a person is under some cognitive load or stress, investigators of anxiolytic effects

of rituals often posit that cognitive load may help in anxiety reduction (e.g., Boyer & Liénard, 2006; Hobson et al., 2018; Karl & Fischer, 2018; Krátký et al., 2016). My claim is that the discrepancy stems from the lack of discrimination between cognitive load of conscious preoccupation with something that distracts from anxious thoughts and cognitive load of trying to concentrate on that distractor. Hypothetically, if cognitive load is related to conscious preoccupation with distractors (e.g., with RB), it reduces anxiety and anxious thought frequency. If cognitive load is a result of difficulties in focusing on distractors (cognitive control load), paradoxical effects of mood and thought control are likely. I try to support those hypotheses in this and the following section.

The notion that cognitive load in general facilitates anxiety reduction is based among others on the work of Van Dillen on mood regulation (e.g., Van Dillen & Koole, 2007). This research shows that the bigger the cognitive load, the more effective the mood regulation. For instance, in studies of Van Dillen and Koole (2007) after viewing negative images, the participants' mood was rated as more positive in conditions of solving mathematical equations after the exposition of the images compared to a lack of such a distracting task. The influence of the task on mood was more pronounced with difficult equations. Another experiment (Van Dillen, Heslenfeld, & Koole, 2009) revealed greater activity reduction in emotional centers of the brain as a result of cognitive load: After viewing a negative image, the response of the amygdala was less pronounced in the conditions of a difficult task compared to an easy task (the task was performed after the exposition of the images). There is much research confirming that cognitive load alleviates emotional reaction or processing task-irrelevant emotional information (e.g., Doallo, Holguín, & Cadaveira, 2006; Dvorak-Bertsch, Curtin, Rubinstein, & Newman, 2007; Erber & Tesser, 1992; Erk, Abler, & Walter, 2006; Erk, Kleczar, & Walter, 2007; King & Schaefer, 2011; Lim, Padmala, & Pessoa, 2008; MacNamara, Ferri, & Hajcak, 2011; Mitchell et al., 2007; Pessoa, Padmala, & Morland, 2005; Van Dillen & Derks, 2012; Van Dillen & Koole, 2009; Vytal, Cornwell, Arkin, & Grillon, 2012).

How can we reconcile these outcomes with the body of research concentrated around the theory of ironic processes of mental control? To find the reasons for the contradictory research results, it may be useful to analyze the differences in research methodology. One quite obvious methodological difference concerns the requirement to change one's own mood or thoughts: This requirement is present in studies concentrated around Wegner's theory, but it is absent in Van Dillen's and related studies.

It may seem surprising that the presence of explicit self-regulation intention could have a prevalent impact on an actual change in thoughts and feelings. It is paradoxical: if there is an intention to change the current mental state, then cognitive load will promote counter-intentional results but if there is no such intention – cognitive load will facilitate the change. The theory of ironic processes of mental control explains these results: when the self-regulation intention is present, then so is the monitoring process which searches for counter-intentional contents. There is no monitoring process when there is no self-regulation intention. Paradoxical effects are side effects of the monitoring process; hence, they are present when the monitoring process is present.

However, this does not explain why the same factor, i.e., cognitive load, has such a divergent impact depending on the presence of the self-regulation intention. If it serves as a distraction from the current mental state when there is no self-regulation intention, why isn't it a distraction when the intention is there? If the role of the operating process is to fill consciousness with distractors, then its work should be supported by a concurrent cognitively demanding task rather than impaired – as performing that task requires consciousness.

Some cognitively demanding tasks impair thought suppression and self-regulation in general probably because they are hard to focus on. An example of such a task is multi-digit number rehearsal – a task proved to impair thought suppression (e.g., Wegner & Erber, 1992). It is difficult, effortful and rather boring. Moreover, it does not concern anything important to the person since the number has no special or personal meaning. Contents that are hard to concentrate on or even to remember have fewer chances to win the contest for access to consciousness. In that situation, attentional deviation to other contents is likely. Attention may be attracted to highly activated contents. Given that the monitoring process increases activation of avoided mental contents, we can expect those contents to reach consciousness.

However, theoretically, the frequency of anxious thoughts might be increased by engagement in a cognitively demanding task also when there is no intention to suppress thoughts. This is because the monitoring process is not the only source of mental content activation. Other highly activated contents are contents related to the person's goals (Eitam & Higgins, 2010; Eitam & Higgins, 2016). Intrusions often pertain to individual goals, especially to a threat of not achieving the goals. For instance, they may concern loss, failure, contamination, personal injustice, hurting someone or being hurt, etc. (Berry & Laskey, 2012; Boyer & Liénard, 2006;

Clark, 2005; Julien, O'Connor, & Aardema, 2009). Such intrusions might be a source of great discomfort because it is important to the person that they do not come true. Given that goal-related thoughts are highly activated and that intrusions concern goals, we can deduce that intrusions are highly activated. If a person suffering from highly activated intrusions engages in a task that is hard to focus on, intrusions may pop into consciousness even if there is no explicit thought suppression intention and no monitoring process. Trying to focus on an activity that is not immersive may end with more frequent intrusions even if there was no intention to avoid them.

The role of conscious preoccupation in the regulation of thoughts and emotions

Research on the impact of engagement in cognitively challenging tasks on mental state change is inconclusive. However, there are tasks that have been quite consistently shown to help in thought suppression (Lin & Wicker, 2007; Luciano & González, 2007; Magee, Dreyer-Oren, Sarfan, Teachman, & Clerkin, 2019; May, Andrade, Batey, Berry, & Kavanagh, 2010; Najmi, Riemann, & Wegner, 2009; Salkovskis & Reynolds, 1994; Wang, Chatzisarantis, & Hagger, 2017, 2018; Wegner, Schneider, Carter, & White, 1987; Wegner, Schneider, Knutson, & McMahon, 1991). I argue that the common feature of those tasks is that they preoccupy consciousness without much effort directed to focus on them.

From the earliest experiments on thought suppression, it has been apparent that focusing on a single distractor is a strategy that can help to deal with intrusions (Wegner et al., 1987). Focusing on a single target during suppression prevents the setting up of numerous reminders of an unwanted thought: If a number of targets are used to draw attention away from an intrusion, a number of associations are built between the intrusion and distractors. These associations are based on negation – distractors are labelled as non-intrusion. Because of such associations, those contents later remind about the suppressed thought. When there is only one distractor, a person is less often reminded of the unwanted content because they are less likely to come across the distractor. Examples of distractors that focusing on has been shown to improve suppression are: the thought of a car (Magee et al., 2019; Wegner et al., 1987), of a weekend with friends (Najmi et al., 2009), a memory of a situation when the participant's need was satisfied (Wang et al., 2017, 2018), visualization of some place (Lin

& Wicker, 2007; Luciano & González, 2007) or visualization of an activity (May et al., 2010).

Those distractors seem to be more amenable to concentrating and elaborating upon than a multi-digit number. The ease of keeping a distractor in consciousness is hypothetically the property that makes a distractor helpful in fighting intrusions. Wang and colleagues (2017) provided empirical support for that notion by finding a negative correlation between distractor immersivity and the frequency and accessibility of intrusions. Moreover, in Wang and colleagues' research (2017, 2018), the only distractors that helped in thought suppression were thoughts related to psychological need satisfaction (e.g., being competent). In contrast, thoughts about achieving extrinsic goals (e.g., being rich) or a neutral thought about a leaf did not support thought suppression. Thinking about each of these distractors seems quite similar in regard to its cognitive demands. If anything, it may require more cognitive resources to focus on a neutral thought than on a thought of need satisfaction. Yet, it was the latter that was shown to help to escape intrusions.

Ju and Lien (2016) directly studied what is better in reducing intrusion frequency: the more or the less cognitively demanding distraction. The investigators asked participants to suppress thoughts about a white bear focusing either on a thought of a car or on their own breath. Focusing on the breath was considered as less demanding as, unlike the other task, it does not require searching for and maintaining a mental content. That view was confirmed by results pertaining to a relationship between both tasks and working memory capacity: While the participants with greater working memory capacity were better at maintaining focus on the thought of a car than the participants with smaller working memory capacity, there was no relationship between working memory capacity and the ability to focus on the breath. Moreover, greater working memory capacity correlated with better thought suppression among the participants focusing on a car but not on their breath. The authors interpreted those outcomes as a sign that focusing on the breath was less dependent on effortful top-down control than focusing on a car. What is of main importance, is that a less cognitively demanding task happened to be more effective in fighting intrusions than a more demanding task.

The conclusion that a not-demanding task may help in self-regulation received some support also in the research on anxiolytic effects of rituals. One correlational and one experimental study showed that relatively simple tasks of reading psalms (Sosis & Handwerker, 2011) or reciting the rosary (Anastasi & Newberg, 2008) lowered the anxiety levels.

Anxiety reduction by conscious preoccupation: ritualized behavior does not have to engage effortful cognitive control

Some forms of cognitive load help in self-regulation while other forms of cognitive load hinder it. I argue that cognitive load stemming from conscious preoccupation is what supports mental control. Cognitive load stemming from effortful concentration on something that is hard to focus on may disrupt mental control.

According to Boyer and Liénard (2006), it is the conscious preoccupation which accompanies RB that gives this behavior anxiolytic properties. The authors connect the consciousness of performed acts with effortful control though. However, the idea of control adds nothing to the explanation of the mechanism of intrusion frequency and anxiety reduction. Theoretically, to suppress thoughts and lower anxiety, it is only necessary to block anxious thoughts' access to consciousness – regardless of whether distracting thoughts became conscious by effortful control or because they attracted attention.

Consciousness, effort, and control may be intuitively considered as something that always coincide. In light of the current data, however, this claim appears wrong. Moors and De Houwer (2006) showed that consciousness, effort, and control can occur separately. For instance, control without consciousness was present in research revealing that participants unconsciously primed with a goal were eager to realize that goal even without the conscious intention (Bargh, Lee-Chai, Barndollar, Gollwitzer, & Trötschel, 2001). On the other hand, people may be conscious of some content, while their minds wonder, without the effortful control of the stream of consciousness (indeed, they might be trying to effortfully redirect their consciousness to work they are supposed to do). Nevertheless, there is no doubt that consciousness and effortful control often come together. For example, a cognitively demanding, novel task, like the task measuring working memory span, depends on effortful conscious control. Without constant awareness of the task's requirements, mistakes are likely.

Some research has shown that greater cognitive demands are related to greater anxiety alleviation (e.g., Van Dillen & Koole, 2007). This may not necessarily mean that cognitive load generally reduces anxiety. Those results can be explained instead by conscious preoccupation: more demanding tasks leave less room for task-unrelated conscious thoughts. This is confirmed by research by Teasdale and collaborators (1995, experiment 3) which revealed fewer task-unrelated thoughts during a new task compared to a practiced task. In other experiments, Teasdale and colleagues (Teasdale et al., 1995,

experiment 4; Teasdale, Proctor, Lloyd, & Baddeley, 1993, experiment 3a) showed that task-unrelated thoughts were more frequent during more automatic and – what is important – less conscious task performance. However, there were no differences in the frequency of task-unrelated thoughts between two tasks that differed in cognitive requirements but not in their capacity to preoccupy consciousness (Teasdale et al, 1993). For instance, an easy task of shadowing digits presented at a fast rate was related to a comparable number of task-unrelated thoughts as the more difficult task of memorizing digits.

In conclusion, I argue that it is conscious preoccupation, not cognitive load in general, that helps deal with intrusions. Conscious preoccupation is required by cognitively demanding tasks and this may lead to confusion regarding those two factors. There are instances when consciousness is drawn by some content without accompanying cognitive control load. In those cases, as well as during performing a cognitively demanding task that attracts conscious thoughts, intrusion frequency may be reduced.²

Anxiety makes performing cognitively demanding tasks more difficult

Someone might say that if cognitively demanding tasks involve consciousness to a greater degree, it is legitimate to claim that – in short – cognitive load in general helps reduce anxiety and intrusion frequency. But that is an oversimplification. Firstly, the aforementioned mental control research pointed out that a form of cognitive load may contribute to paradoxical self-regulation effects. Secondly, anxiety disrupts cognitive control capabilities, so performing a cognitively demanding task while being anxious may lead to poor task outcomes and the maintenance or even increase in anxiety.

Moran's (2016) meta-analysis of correlational studies on anxiety and working memory capacity revealed a negative correlation between those two factors. The investigator also reviewed experimental research on the impact of anxiety on working memory and his conclusion is that in general anxiety impairs working memory tasks performance.

If a task is to reduce anxiety, it should provide distractor contents that win the competition to the access to consciousness with highly activated anxious thoughts. It is unlikely that contents that are hard to memorize or to concentrate upon can win that competition. It seems even less probable when we consider that anxiety disrupts the capability to direct the focus

of attention and impairs working memory capacity (Moran, 2016). Even if a person is usually capable of performing a task, it may be too difficult to focus upon the task and to memorize all the information needed when the same person is anxious. Effectively, an anxious person may have problems with using a cognitively demanding task as a distraction from anxious thoughts.

Moreover, a difficult task may be a source of anxiety itself. This is because mistakes might trigger distress and the unwillingness to continue such a difficult task. That prediction is consistent with the research of Spangler and Friedman (2017) which showed that increases in cognitive demand were accompanied by increases in anxiety level (see also: Simpson, Snyder, Gusnard, & Raichle, 2000). Also, Karl and Fischer (2018) in their work on anxiolytic effects of rituals noticed that a task with high cognitive demands that was supposed to reduce anxiety might have caused it to flare up.

When anxious, people perform worse in cognitive control tasks. Consequently, using especially cognitively demanding tasks may not help with anxiety reduction, since for an anxious person, they might be too difficult. Applying those remarks to the context of anxiolytic effects of RB, I argue that RB that reduces anxiety attracts attention without too many demands pertaining to cognitive control.

Conclusions

I tried to clarify what cognitive processes should be involved in RB if RB is to reduce anxiety. Boyer and Liénard (2006) claim that RB's anxiolytic effects are the result of what they call swamping working memory. I suggest understanding that term as conscious preoccupation. Consistently with the theory of ironic processes of mental control (Wegner, 1994), conscious preoccupation with ritual actions should block the access of anxious thoughts to consciousness and thereby reduce anxiety in the short term. In the long term, the same thoughts and mood may return because of the ironic monitoring process that works after RB is finished. This is a pattern of results that Boyer and Liénard (2006) expect.

It is important to differentiate conscious preoccupation from cognitive load. The latter may take different forms as it may be related to taking resources from different reservoirs. Cognitive load that refers to taking resources needed by conscious thought is inherently connected to conscious preoccupation. At the same time, conscious thought may not coincide with cognitive load related to cognitive control. In other words, not every con-

conscious thought is a thought that is used by cognitive control. While conscious preoccupation should reduce anxiety, engagement of cognitive control is not directly related to anxiety reduction. If a cognitively demanding task attracts the focus of consciousness, anxiety decreases may be expected. However, if a task requires high cognitive control to consciously concentrate on it, anxiety might even be paradoxically increased³. Thus, RB that reduces anxiety attracts conscious thoughts without high demands placed on cognitive control. The latter point is even more important since anxiety reduces cognitive control capabilities. Given that RB is performed in anxious circumstances (as it is claimed to serve anxiety reduction), it cannot be cognitively challenging because an anxious person would not manage to perform it.

If conscious preoccupation is not equal to cognitive load, that distinction should be included in studies exploring anxiety reduction by RB. If conscious preoccupation with RB is the factor that lowers anxiety levels, experiments should manipulate this concrete factor, not some random form of cognitive load. The lack of that discrimination might be the reason for the confusing results of studies on cognitive load's impact on self-regulation.

When conducting experiments on the anxiolytic effects of rituals, it also seems important to consider whether anxiety reduction is something intended by the participant. For instance, in OCD there is a strong desire to dispose of anxious intrusions and there are attempts to suppress those unwanted thoughts – for example by engaging in a ritual. Those attempts do not help the patients, which is exactly what the theory of ironic processes of mental control predicts (Wegner, 1994). Intention to decrease the anxiety levels or to suppress anxious thoughts triggers the monitoring process that searches for anxiety-related contents. This may paradoxically lower the chance of achieving the desired mental state. Thus, when there is such intention, RB might have fewer anxiolytic effects than where there is no self-regulation intention.

The monitoring process is not the only source of mental content activation, however. Anxious thought may be activated because of the thoughts' relatedness to the person's goals. Contents related to individual goals tend to be more highly activated. Supposedly, intrusions are usually goal-related. This is why it is hard to dispose of them. Experiments investigating if rituals can reduce the frequency of naturally highly activated anxious thoughts, should involve anxious contents that are highly activated. The anxiety that is supposed to be lowered in a laboratory by RB should resemble anxiety that accompanies RB in natural circumstances. Anxious thoughts should be relatively difficult to dispose of – otherwise, in

the light of Boyer and Liénard's (2006) theory, there would be no use for the natural development of RB. This suggests that the use of unpleasant images does not seem to be an appropriate experimental mechanism to induce anxiety. Interestingly, most studies showing that cognitive load reduces emotional intensity used images to evoke a particular emotional state (e.g., Doallo et al., 2006; Erk et al., 2007; King & Schaefer, 2011; Lim et al., 2008; Pessoa et al., 2005; Van Dillen & Derks, 2012; Van Dillen et al., 2009; Van Dillen & Koole, 2007; but see also: Dvorak-Bertsch et al., 2007; Vytal et al., 2012). Such stimuli are not very powerful nor do they represent personal concerns. It is relatively easy to stop thinking about, and maybe even forget about, an image by simply engaging in another experimental task. However, in natural circumstances much stronger intrusions are the norm. Thus, I would suggest that research on anxiolytic effects of rituals should use higher activated anxious content (extensive recommendation on how to conduct research exploring the relationship between anxiety and cognition can be found in the work of Shackman et al., 2006). Hopefully, with the development of experimental design of studies on rituals, we will soon be able to better explain how rituals reduce anxiety.

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N O T E S

¹ For example, Baddeley (2012), who created one of the most famous models of working memory, posits that working memory consists of a few components, each having its own characteristics and resource pool.

² Yet it is believed that self-regulation can be established thanks to effortful (Type 2) as well as efficient (Type 1) processes (Gyurak, Gross, & Etkin, 2011).

³ That issue may seem to invite a dual-process theory framework (Pennycook, 2018). Using its terms we could say that anxiety reduction should be expected when RB is conscious because of autonomous (Type 1) processes. Anxiety reduction is unlikely if controlled (Type 2) processes have to be engaged to maintain focus of attention on RB.

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