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The Creative State of Mind

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Chapter 4. The Creative State of Mind: A Proposed Theoretical Integration and Meta-Analysis

The following co-authors contributed to the work reported in this chapter: Nijstad, B.A., Rietzschel, E.F., Winter, K., Baas, M., Sassenberg, K.

Creativity, defined as the generation of ideas or solutions that are both novel and potentially useful (Amabile, 1983b; Runco & Jaeger, 2012), is increasingly studied within psychology, management and organizational behavior (Anderson et al., 2014c; J. Zhou & Hoever, 2014). Within psychology, the emphasis originally was on uncovering why certain individuals are more creative than others (e.g., Feist, 1998; Guilford, 1950; Mumford & Gustafson, 1988; Torrance, 1966), but research has since demonstrated that creativity varies within as well as between persons. For example, transient mood states have been shown to be systematically related to human creativity (Baas et al., 2008), and given that mood states fluctuate over time, so does creativity (e.g., Amabile et al., 2005; Binnewies & Wörnlein, 2011; To et al., 2021). Similarly, creativity has been related to temporarily activated motivational or cognitive states, such as regulatory focus (e.g., Friedman & Förster, 2001) or construal level (e.g., Förster et al., 2004). These transient effects on creativity are important, because they speak to the ability of the mind to adapt to contextual variations. For example, the cognitive tuning hypothesis suggests that mood states signal certain situational requirements and that the cognitive system adapts to this by adopting a more heuristic (e.g., when happy) versus systematic processing style (e.g., when anxious; Schwarz, 1990; Schwarz & Clore, 2007; see also George & Zhou, 2007).

That contextual factors can influence creativity even at short time scales (i.e., seconds or minutes) is most clearly demonstrated in priming research. In this type of research, participants are exposed to a stimulus, or perform a task, after which they engage in a further

task that measures their creativity. It is assumed that the initial exposure to a stimulus or task carries over to the later (creativity) task, because it activates certain knowledge, certain goals, or a certain mindset that has effects that extend over time (Bargh, 2014; Förster et al., 2007; Förster & Liberman, 2007; Fujita & Trope, 2014; Tulving & Pearlstone, 1966). This type of evidence is particularly compelling, because the experimental methodology is designed to demonstrate causality, and because effects often occur without the participant's awareness, which limits potential demand characteristics effects (Bargh, 2014). By now, a substantial body of evidence (that we review in this paper) demonstrates that creativity can indeed be primed, and that these effects can be strong (e.g., Huang et al., 2015; Memmert et al., 2013; Sacramento et al., 2013; Wu et al., 2017).

However, although it is clear that transient psychological states can influence creative functioning, what is less clear is how these effects can be explained. In other words, what remains elusive is exactly *which* psychological state or states mediate these effects of transient contextual factors on creativity. It is not so much the case that authors do not theorize about this, but more that they have suggested many different psychological states that may play a role. For example, effects have been attributed to a multi-identity mindset (Gaither et al., 2020), a desire for symbolic immortality (Sligte et al., 2013), and to a childlike mindset (Zabelina & Robinson, 2010). As a result, this literature lacks an integrated understanding of how and why momentary psychological states affect human creativity.

This paper addresses this issue, and has two broad aims. Our first aim is to develop theory about a (limited) set of psychological states that can plausibly explain fleeting (short-term) contextual effects on creativity. For a psychological state to qualify as a mediator, we propose that two conditions should be satisfied. First, there should be basic psychological theory and evidence that this state can be evoked by contextual factors. Second, there should be basic psychological theory and evidence that this state is reliably related to creativity.

Based on this, in the first part of this paper we propose four broad mechanisms as potential psychological states that mediate effects of contextual factors on creativity: unconstrained thought, abstraction, uniqueness, and open-mindedness.

Our second aim is to (begin to) examine the validity of our approach. To do so, we qualitatively and quantitatively examine the literature on priming and creativity. One major issue in this literature, as we will review, is that it is very heterogeneous, and includes a wide variety of priming stimuli. For example, studies on priming and creativity have used priming procedures that vary as widely as priming entitlement (Zitek & Vincent, 2014), perspective taking (Krause, 2015), one's own mortality (Sligte et al., 2013), and forgiveness (Fehr, 2010). Because of this heterogeneity, our knowledge of how certain (externally induced) psychological states may relate to creativity remains scattered. In the second part of the paper, we therefore categorize priming studies into our four theoretically derived categories, and meta-analytically estimate effect sizes within each category. Subsequently, we more closely analyze the studies that fall into a certain category, and based on this draw further conclusions (e.g., based on moderator analyses) and note potential problems and issues for further research. In this second part, our aim is not – as in most meta-analyses – to establish an overall effect size, which would not be meaningful given the heterogeneity of the primary research studies. Rather, our aim is to review and organize the field, and see whether a limited set of mechanisms may explain a wide variety of effects.

This paper has two distinct parts and proceeds as follows. In the first part, we start with a short introduction into creativity research, and then provide a theoretical analysis of four mechanisms that may explain short-term contextual effects on creativity. In the second part, we start by introducing the priming methodology and the link between priming and creativity. Then, we categorize priming studies according to our four explanatory categories (unconstrained thought, abstraction, uniqueness, and open-mindedness) and generate

hypotheses for each category. We then introduce our methodology, and describe the results of our quantitative (meta-analytical) and qualitative analyses. Finally, in the discussion, we draw conclusions and note areas for future research.

Part 1: Theoretical Review

Creativity

It is generally agreed that creativity involves the generation of ideas that are novel (or original, new, uncommon) and potentially useful (valuable, feasible, appropriate; Amabile, 1983a; Litchfield et al., 2015; Runco & Jaeger, 2012; Sternberg & Lubart, 1999). The systematic study of creativity within psychology started when Guilford (1950) gave his presidential address to the American Psychological Association on this topic (see Runco, 2001; Simonton, 2000). Initially, research focused on the characteristics of creative genius and the role of individual differences in creativity (Guilford, 1967; see also Barron & Harrington, 1981; Feist, 1998; Mumford & Gustafson, 1988). Contextual factors were studied more extensively from the 1970s and 1980s, especially as a consequence of Amabile's (Amabile, 1979, 1983a, 1996; Amabile et al., 1982) research program on the role of the environment in shaping people's motivation and creative performance. Current approaches to creativity typically acknowledge that creativity is a function of both the creator's characteristics (e.g., personality traits, knowledge, or thinking skills) and environmental factors or stimuli (e.g., Amabile, 1983a; Zhou & Hoever, 2014). These environmental factors can be more enduring, such as one's family or work context (e.g., job characteristics and leadership), but can also be more fleeting or transient. In this paper, we focus on the latter.

Creativity is measured in different ways, but given our focus on transient effects, most important for the current paper are tasks and indicators that are used in experimental work. Creativity tasks vary widely but can be classified into different categories (e.g., Baas et al., 2016). For the purposes of our review and meta-analysis, we distinguish between *divergent*

thinking tasks (generating many answers or solutions, such as brainstorming or the unusual uses task; e.g., Silvia et al., 2008), and tasks that (also) have *convergent* aspects (generating a single answer, e.g., Cropley, 2006). Among the latter are creative product tasks (e.g., producing a single poem, story, collage; e.g., Amabile et al., 1982; Amabile & Gitomer, 1984), the Remote Associates Test (RAT; finding a target word that is associated with three stimulus words; M. T. Mednick et al., 1964; S. A. Mednick, 1962), and creative insight tasks (e.g., Duncker, 1945).

Measures of creative performance (i.e., creativity indicators) are derived from these tasks in different ways. Some tasks require the identification of a correct solution (e.g., the RAT and insight tasks), and creativity can be established by counting participants' correct answers. Other tasks require scoring by, usually, independent judges. Divergent thinking tasks are often coded for creativity indicators, such as fluency (number of responses), flexibility (number of different categories of responses), and originality (e.g., statistical infrequency of a response; Guilford, 1967; Reiter-Palmon et al., 2019). Creative products, such as poems, collages, or posters are usually scored for dimensions such as originality and usefulness, or receive a global creativity rating (following the "Consensual Assessment Technique"; Amabile et al., 1982).

An advantage of these different operationalizations is that they can provide information about different aspects of the creative process. For example, it makes a difference whether people achieve novelty by coming up with ideas across a wide range of semantic categories (flexibility) or by more deeply probing a limited set of categories (persistence; e.g., Nijstad et al., 2010). Importantly, these different operationalizations may also relate differently to various transient creativity-relevant states – for example, this has been found for emotions and moods (e.g., Baas et al., 2008). Moreover, in contrast to real-world measures of creativity (such as creative achievements in various domains or creative

performance at work), these measures are well-suited for experimental research on how transient states can influence people's momentary levels of creativity.

As mentioned above, a good example of 'state'-focused creativity research is research regarding the influence of affect (moods and emotions) on creative behavior (see Baas et al., 2008; Davis, 2009 for meta-analytic reviews). In these studies, mood states or emotions are measured or manipulated, and participants are then asked to perform a creativity task (such as idea generation or solving insight problems). This research demonstrates that there is a direct causal link between a state elicited by a contextual factor and subsequent creative performance. In essence, this is also what happens in priming research. However, while these studies may clearly demonstrate causal effects of transient states on creative performance, we lack a coherent framework that can help us interpret these results.

Towards a coherent framework

To understand the effects of priming on creativity, it is essential to specify which mechanisms underlie these effects. Ideally, a framework specifying such mechanisms is grounded in a broad understanding of the creative process, rather than tied to the specifics of any particular (priming) study. Moreover, it should be parsimonious, explaining or describing a wide variety of studies, results, or phenomena with a limited set of mechanisms. Therefore, our goal is to derive and describe a limited number of underlying mechanisms and subsequently categorize priming studies based on these mechanisms. This will not only bring order and parsimony to the variety of priming studies, but will also allow us, in the next section of this paper, to formulate hypotheses per category of studies. For example, we can examine whether certain mechanisms relate more strongly to particular types of priming or to particular measures of creative performance.

We propose four theoretically derived mechanisms that may explain priming effects on creativity: unconstrained thought, abstraction, uniqueness, and open-mindedness. These

Chapter 4

mechanisms were largely derived from the creativity literature and from fundamental psychological theories, although we also built upon the priming studies we encountered in our review. Although mechanisms are not necessarily completely independent or exhaustive, they provide a good starting point for a better understanding of the relation between transient psychological states and creativity. Unconstrained thought and abstraction reflect mostly cognitive processes and states, whereas open-mindedness and uniqueness refer more to social-motivational states (Table 1 provides an overview). In the following paragraphs, for each of these mechanisms we will provide arguments and evidence (1) that contextual variables may affect this mechanism (implying that it can be primed) and (2) that this mechanism is reliably related to creativity.

Table 1*Overview of the four mechanisms*

Category	Definition	Foundational theories and key references
Unconstrained thought	A psychological state of reduced cognitive control, characterized by bottom-up perception and broad awareness.	Associative theory (S. A. Mednick, 1962) States of mind (Herz et al., 2020) Meta-control state model of cognitive control (Zhang et al., 2020) Matched filter for cognitive control (Chrysikou et al., 2014)
Abstraction	A psychological state that accompanies the process of identifying the defining characteristics of a target.	Construal level theory (Trope & Liberman, 2010) Global-local processing (Förster & Dannenberg, 2010) The creative cognition approach (Ward et al., 1995)
Uniqueness	A psychological state in which people aim to differentiate themselves from others and emphasize their unique characteristics and distinctiveness, rather than strive to be similar to others or follow rules and traditions.	Need for uniqueness (Lynn & Snyder, 2002; Snyder & Fromkin, 1977) Optimal distinctiveness theory (Brewer, 1991; Leonardelli et al., 2010) Self-construal and individualism-collectivism (Markus & Kitayama, 1991) Non-conformity and dissent (Nemeth, 1986)
Open-mindedness	A psychological state associated with a general tendency toward exploring and acquiring complex, abstract, unfamiliar, and novel information and experiences.	Big 5 personality model; openness to experience (McCrae, 1987) Regulatory focus theory (E. T. Higgins, 1996b, 1997) Novelty categorization theory (Förster et al., 2010) Lay epistemic theory (Kruglanski, 1990) Dynamic systems model (Van Geert, 1998)

Unconstrained Thought

Definition and background. Unconstrained thought is a psychological state of reduced cognitive control. Cognitive control is a mechanism that helps people achieve what they want, and therefore, when exercised, tends to constrain thought. In general, cognitive control involves an evaluation of how an activity is going in relation to certain goals, criteria,

or constraints, and makes goal-oriented activity more efficient or more effective. If one wants to meet strict criteria, cognitive control will constrain thinking: filter incoming stimuli, prevent distraction, and monitor progress. However, if criteria are weak or absent, cognitive control may be reduced, which will leave the thought process relatively unconstrained and intuitive, in turn enabling access to remote associations and diverse incoming stimuli.

While cognitive control relates to intelligence (Y. Chen et al., 2019) and generally helps in achieving various life goals, high cognitive control is not always better. Chrysikou et al. (2014) suggested that an optimal level of control is one that matches the type of activity and that in novel, less structured situations without a clear pathway to success, unconstrained thought works better. Unconstrained thought leaves space for learning and exploration, which is crucial when a situation is new or when there are multiple pathways to the goal. The meta-control state model (Hommel, 2015) proposes a similar idea: constrained thought (strong top-down guidance) favors one idea over the other, while unconstrained thought (weak top-down guidance) allows multiple ideas to emerge (Zhang et al., 2020). In a similar vein, Amer et al. (2016) pointed out that while constrained thought blocks distraction and supports processing information in working memory, it may come at a cost, as it may suppress relevant information or hinder spotting patterns in the breadth of information.

As can be seen from these different theoretical perspectives, the notion of unconstrained thought is broad. We argue that unconstrained thought is typically activated through two specific, related mechanisms: bottom-up processing and broad attention.

Bottom-up processing. Bottom-up processing is information processing that is less guided or constrained by high-level goals, expectations, or experience; instead, it is more directly driven by sensory input or other specific stimuli or concrete elements (Herz et al., 2020; Rauss & Pourtois, 2013). Several authors have suggested that engaging participants in more bottom-up processing and less goal-directed tasks may elicit a state of unconstrained

thought (Beaty et al., 2016; Chrysikou, 2019; Chrysikou et al., 2014; Corbetta & Shulman, 2002; Herz et al., 2020). For example, participants may be asked to observe stimuli without specified goals or instructions, as opposed to perceiving the stimuli along certain rules or under constraints (as proposed by Chrysikou et al., 2014). Another possibility is to have participants engage in open-ended tasks without a goal, in contrast to a task with a concrete goal (such as Liu et al., 2015; Moreau & Engeset, 2016; cf. output constraints; Acar et al., 2019). Similarly, participants could complete a task in their chosen way, or adhere to certain rules or follow certain steps when performing a task (Fan, 2018; cf. process constraints; Acar et al., 2019). Lastly, bottom-up processing may be activated through generating new content without a predetermined plan, while top-down processing can be activated by reproducing old content (Limb & Braun, 2008; Liu et al., 2012; see also Chrysikou, 2019).

Bottom-up processing activates a state of hypofrontality, which refers to decreased activation of the lower prefrontal cortex, a brain region that has been linked to goal-directed and controlled attention. For example, Limb and Braun (2008) and Liu et al. (2012) found lower prefrontal cortex activation during jazz and rap improvisation, as compared to reproducing known sequences, while Rosen et al. (2020) found that hypofrontality related to higher quality of improvisation. Pinho et al. (2016) showed similar brain activity in less structured piano improvisation, in contrast to more structured improvisation assignment. Additionally, Herz et al. (2020) found that more bottom-up (vs. top-down) processing in the brain relates to multiple dimensions of a broad state of mind: global attention, broad thinking style, and exploratory behavior, all pointing towards unconstrained thought.

Broad attention. Beside bottom-up processing, unconstrained thought may also be stimulated when performing activities that rely on broad (as opposed to narrow or focused) attention. For example, participants may be asked to attend to a broad range of stimuli, as opposed to focusing only on a certain stimulus (e.g., Simons & Chabris, 1999). Alternatively,

participants may engage in open-monitoring meditation (observing all the thoughts and sensations arising in awareness) rather than focused-attention meditation (focusing on a specific object, or a concept, and consistently returning to it after distraction). Focused attention meditation involves high cognitive control: sustaining a goal, preventing distraction, and repeatedly redirecting attention to the goal. In contrast, open-monitoring meditation suspends any ongoing goal pursuits; it involves monitoring one's whole experience without focusing on any object in particular (Lutz et al., 2008).

Both neuroscientific and behavioral evidence shows that broad attention manipulations or interventions may induce a state of unconstrained thought. For example, Marzetti et al. (2014) recorded brain activity of expert Buddhist monks during meditation and found stronger coupling within the default mode network in open monitoring (as compared to focused-attention meditation), which suggests higher involvement of unconstrained processes (see also Tsai & Chou, 2016). Colzato et al. (2016) found that focused attention results in higher performance in a task that requires more constrained thought compared to open-monitoring meditation. Additionally, a meta-analysis (Ganesan et al., 2022) concluded that focused-attention meditation was associated with deactivation in the default mode network and with activation in the control network, which suggests that focused-attention meditation constrains attention. Finally, a meta-analysis by Fox et al. (2016) suggests that focused-attention meditation activates regions related to cognitive control and self-reflection, while it deactivates regions associated with mind wandering. In contrast, open-monitoring meditation was found to activate regions related to the regulation of thought and action (frontoparietal control network) and deactivate a region which is thought to limit the scope of sensory stimuli entering the awareness (right thalamus).

Unconstrained thought and creativity. A state of unconstrained thought elicited by bottom-up processing and/or broad attention may stimulate creative thinking, because

achieving novelty – a core aspect of creative ideas – is less likely when thinking is constrained by precise criteria, specific goals, or a narrow field of attention. Furthermore, it is often impossible to define what kind of information might be useful during creative thinking and where the process will end up, especially in comparison to analytic thinking, where the goal is more clearly defined.

This reasoning is consistent with the classic associative theory of creativity (S. A. Mednick, 1962). According to that theory, creative ideas come from associating *remote* concepts (i.e., concepts that are not commonly associated). These remote associations may emerge when thinking is relatively unconstrained, because otherwise they may be filtered out as seemingly irrelevant distractions. Chrysikou et al. (2014) and Chrysikou (2019) further suggested that the strength of cognitive control should match the level of constraints of a given activity. Thus, unconstrained thought should be better for more open-ended, loosely defined, and unrestricted creative activities (e.g., drawing or divergent thinking; also see Amer et al., 2016). From a neurocognitive perspective, coupling of the default (“resting”) and the control (“executive”) network in the brain should depend on the degree of goal-directedness of a given creative task: the control network may be more involved in verifying whether the task criteria have been met and less involved in spontaneous idea generation (Beaty et al., 2016). Lastly, Zhang et al. (2020) proposed that meta-control states can be biased either towards persistence or flexibility. Bias towards persistence implies strong goal activation, which guides perception and favors information relevant for that goal. In the flexible meta-control state, goals are less active, which allows many ideas to emerge, without evaluating their quality. Open-ended creative activities, such as writing a creative story or solving unusual problems, benefit from such a flexible meta-control state.

Consistent with these ideas, Moreau and Engeset (2016) found that participants who played with LEGO bricks without instruction displayed higher originality on a subsequent

creativity task than participants who built a specified figure with a step-by-step instruction. Memmert (2007) found that an attention-broadening training program in team ball games improved sports creativity relative to attention-narrowing training and a control group. Moreover, multiple studies showed that open-monitoring meditation, compared to focused-attention meditation, resulted in higher fluency, flexibility, originality and remote associations (Baas et al., 2014; Colzato et al., 2012, 2017; also see Lebudá et al., 2016).

Abstraction

Definition and background. Abstraction is the process of identifying the central (rather than incidental or surface-level) characteristics of a target (Burgoon et al., 2013). This includes using broader, more inclusive categories (Rosch et al., 1976), detecting a global meaning or a summary (Schul, 1983), developing a more comprehensive understanding (Vallacher & Wegner, 1987), ascribing a trait rather than a behavior to a person (Semin & Fiedler, 1991), and fading out attributes which may change while focusing on relatively invariant features of a target (Shapira et al., 2012). Abstraction is essential in organizing and storing knowledge into categories (Rosch et al., 1976). In addition, knowledge retrieval processes and the understanding of unknown events or targets are guided by abstract knowledge. Abstraction is, thus, essential for learning, judgment, decision-making, and behavior regulation (Burgoon et al., 2013).

The process of abstraction operates on a specific target. Burgoon et al. (2013) mention three main targets of abstraction: First, abstraction can take place during the *perception of stimuli*, in which people either attend to the stimulus as a whole (e.g., a cat) or details (e.g., single hairs of fur). Second, *objects* can be categorized into more abstract categories defined by the core features of exemplars. Finally, abstraction can also be applied to *actions*. For example, actions can be explained by goals (Vallacher & Wegner, 1987) or traits (Jones & Davis, 1965).

Various studies have shown that abstraction can be induced as a state. For example, people think in more abstract terms when they are in a positive mood (e.g., Gasper & Clore, 2002) and when focusing on expected (compared to unexpected) events, for instance, based on stereotypes (Beukeboom, 2014; Maass, 1999; Wigboldus et al., 2005). Moreover, according to construal level theory (Trope & Liberman, 2010), psychologically distant targets, such as events in the future or hypothetical events, are processed in more abstract terms. Here, abstraction serves as a means to broaden one's perspective and thereby mentally overcome the distance (Trope & Liberman, 2012). Consequently, abstraction has been measured and manipulated in various ways (for an overview, see Burgoon et al., 2013). Here, we describe three ways in which abstraction has been directly manipulated: visual global (vs. local) processing, semantic abstraction, and abstraction of goals. In addition, we will discuss *indirect* manipulations of abstraction based on psychological distance.

Visual global processing. When visually inspecting a stimulus, people can focus on the target as a whole and process it at the global level, or they can turn to the details and process information at the local level. Global perceptual processing focuses on the core characteristics of the target, which corresponds to the abstract representation of the category of objects. In contrast, local perceptual processing means recognizing details that might vary between concrete exemplars of a category (for example, the letter A might look different in various fonts, but all of them are the letter A). Accordingly, Förster and Dannenberg (2010) argued that global visual processing primes an abstract processing style, whereas local processing primes a concrete processing style. In line with this, manipulations have instructed people to process visual stimuli globally (vs. locally) to induce an abstract (vs. concrete) processing style. Examples include focusing on a map as a whole (global processing) or on the map's details (local processing; e.g., Friedman et al., 2003), and naming large versus

small letters (the Navon task; e.g., Groborz & Nećka, 2003; Macrae & Lewis, 2002; Navon, 1977).

Semantic abstraction. At a semantic level, abstraction means a focus on superordinate categories rather than subordinate exemplars. The fact that objects can be represented at different levels of abstraction was observed in a classic study by Rosch (1975). Later on, the fact whether an individual includes an atypical exemplar (e.g., “a camel”) into a superordinate category (e.g., “transportation modes”) has been used to study creativity (Isen & Daubman, 1984). A typical priming manipulation developed from that research tradition asks participants to generate a more abstract category or a more concrete example or a characteristic (e.g., a fruit; Burgoon et al., 2013; Fujita et al., 2006).

Abstraction of goals. Goal hierarchies can be used to make sense of human action (Vallacher & Wegner, 1987). Asking *why* an action is shown asks for a goal and leads to abstraction, whereas asking *how* an action was performed asks for means and concrete descriptions. In line with this notion, abstraction has been manipulated by asking why vs. how an event was executed (e.g., Liberman & Trope, 1998; Wakslak & Trope, 2009). In an alternative version of this manipulation, participants generate which personality traits may explain why someone performs an action (abstract) vs. which objects are used to execute it (concrete; e.g., Liberman et al., 2007).

Psychological distance. Beside these three direct manipulations of abstractions, it is also possible to bring about a state of abstraction more indirectly. According to construal level theory and the rich evidence supporting it, manipulations of spatial, temporal, and social distance, as well as hypotheticality, affect abstraction (for a summary, Trope & Liberman, 2012). To manipulate spatial distance, participants are informed that their task concerns people or events close by vs. far away (e.g., Fujita et al., 2006; Jia et al., 2009). To manipulate temporal distance, participants are asked to imagine doing a task or think about

their lives in the near vs. distant future (Förster et al., 2004). Alternatively, temporal distance has been manipulated by asking participants to think about the same event that either takes place in the near or the distant future (Liberman & Trope, 1998). Social distance has been manipulated by varying the (apparent) similarity between participants and a task-relevant target person (e.g., Liviatan et al., 2008) or by asking people to imagine that a judgment involves a stranger vs. a close other (e.g., Eyal et al., 2008). Construal level theory also posits that hypothetical events are construed more abstractly than events that are likely to happen (Trope & Liberman, 2010; but see Calderon et al., 2006). Hypotheticality is manipulated by describing a task-related event or an event that might happen to the participant in the study as high or low in likelihood (Wakslak et al., 2006).

Abstraction and creativity. Abstraction provides room for variation of details and features that allow for new ideas. Furthermore, combining abstract representations across categories results in the use of broad and inclusive categories, which allows for flexibility, creativity, and innovation (B. A. Nijstad et al., 2010; Palmiero, 2020). It should be easier to switch between (or combine) remote semantic categories (flexibility) when higher-level (more abstract) categories are more accessible. Similarly, the creative cognition approach (S. M. Smith et al., 1995) proposes that idea generation relies on categories and schemata. In the case of low abstraction, ideas are of limited creativity because they incorporate features of known exemplars. When people are instructed to retrieve abstract characteristics (e.g., characteristics that are essential for extraterrestrial animals to survive), this inspires the generation of more original ideas than when instructed to think about a concrete exemplar (Ward et al., 2004). Thinking about spatially, temporally, or socially distant and hypothetical targets lead to abstraction (Trope & Liberman, 2012), and thinking about these targets also contributes to creativity (Förster et al., 2006; Jia et al., 2009; Liberman et al., 2012).

Uniqueness

Definition and background. Uniqueness refers to a social-motivational state in which people aim to differentiate themselves from others and emphasize their unique characteristics and distinctiveness, rather than strive to be similar to others or follow rules and traditions (e.g., Brewer, 1991; Leonardelli et al., 2010; Snyder & Fromkin, 1977). This uniqueness motive is rooted in the literature on individual differences in need for uniqueness (Dollinger, 2003; Snyder & Fromkin, 1977), optimal distinctiveness theory (Brewer, 1991), cultural theories of individualism-collectivism and self-construal (Markus & Kitayama, 1991), and literature on (non-)conformity and dissent (e.g., Nemeth, 1986). The main argument is that originality, as a basic component of creativity, by definition means a departure from what has been done before, and that people with a strong uniqueness motive are less constrained by convention and more likely to contribute original ideas.

Both the literature on need for uniqueness and optimal distinctiveness argue that people have two opposing needs: the need for assimilation and inclusion, and a desire to belong to certain groups or communities (see also Baumeister & Leary, 1995), and a need for uniqueness and distinctiveness. According to optimal distinctiveness theory, when people feel more included in a group, “the need for inclusion is satisfied but the need for differentiation is activated; conversely, as inclusiveness decreases, the differentiation need is reduced but the need for inclusion is activated” (Leonardelli et al., 2010, p. 66). Both needs can be satisfied simultaneously (i.e., optimal distinctiveness), for example through group memberships that provide both a sense of inclusion and a sense of differentiation (e.g., in subcultures, where members have a sense of “shared distinctiveness”).

This idea of opposing needs (inclusion and uniqueness) is also reflected in the cultural dimension individualism – collectivism, and in particular in ideas around self-construal. Markus and Kitayama (1991) distinguished between an independent (prevalent in many

Western and individualistic cultures) and an interdependent self-construal (prevalent in many Eastern and collectivistic cultures). An independent self-construal implies that the self is a separate entity and emphasizes independence and the expression of one's unique attributes. An interdependent self-construal, in contrast, emphasizes the fundamental connectedness between individuals, and that the self is determined by and dependent on others. Independent individuals will be motivated to express the self, be unique, and promote own goals; interdependent individuals will be inclined to fit in, be concerned with appropriateness of behavior, and promote others' goals.

Uniqueness has strong associations with (non)conformity. For example, Snyder and Fromkin (1977) assumed that people with a high need for uniqueness would feel relatively free from social constraints and would be resistant to conformity. Similarly, Markus and Kitayama (1991) assume that people with an independent self-construal rely more on their own goals and their unique internal attributes, whereas those with an interdependent self-construal are more sensitive to norms and traditions. This bears relations with the social influence literature, and in particular the distinction between minority and majority influence, with minorities (vs. majorities) more associated with uniqueness (vs. inclusion) (see e.g., (Moscovici et al., 1969; Moscovici & Lage, 1976).

Based on this, we distinguish two ways in which the overall mechanism of uniqueness has been activated in previous research, which are nonconformity and individualism.

Nonconformity. Conformity refers to compliance with standards, rules, norms, and laws, and to going along with a majority or with others who have a particular opinion or preference. Conformity is necessary and beneficial for the collective: conformity to rules, norms, and laws is essential to create and maintain social order, and conformity to a majority allows social groups to take decisive action. However, conformity constrains action repertoires and may lead to inferior outcomes when the majority is wrong (e.g., groupthink,

Janis, 1972). Nonconformity can create undesirable outcomes when people break laws or do not take others' interests into account, but can also create an impetus for beneficial social change.

Research has shown that being confronted with nonconformists (e.g., dissenters or deviants) can be liberating and may make people's behavior more in line with their own opinions, attitudes, or goals. For example, in the Asch conformity studies, it was observed that conformity to a (wrong) majority was drastically reduced when another person also took a deviant position (Asch, 1955; also see Allen & Levine, 1969). Further, research on minority dissent has shown that being confronted with a disagreeing minority does not necessarily make people change their minds, but can lead to more independent thought processes (e.g., (Martin & Hewstone, 2008; Nemeth & Chiles, 1988). These findings suggest that (observing) nonconformity can activate the motive to express independence and uniqueness.

Individualism. The dimension individualism—collectivism was originally proposed by Hofstede as a dimension on which (national) cultures differ (e.g., Hofstede, 2001), but this distinction can also be meaningfully applied at the individual level (i.e., as individual differences; Singelis, 1994). According to Brewer and Chen (2007), the individualism—collectivism dimension consists of two factors: values, referring to whether people prioritize individual or collective outcomes, and self-construal, referring to the distinction between independent and interdependent self-construal.

At the individual level, these values and self-construals are context-dependent. For example, collective rather than individual rewards can trigger more collectivistic values (see e.g., Bechtoldt et al., 2012; Courtright et al., 2015). Research has also shown that self-construal can be primed. For example, Gardner et al. (1999) asked their participants to circle either personal (*I, me*) or collective (*we, us*) pronouns in a text, and then measured their endorsement of (collectivistic and individualistic) values and their sensitivity to social

obligations. Self-construal priming indeed had the expected effects on these values and on norm conformity (i.e., conformity was lower when participants were primed with an individualistic self-construal). Further, Hornsey et al. (2006) manipulated individualistic versus collectivistic group norms, and found that their (Australian) participants were less tolerant of dissenting members after collectivistic norms were primed. Thus, activating individualistic (versus collectivistic) values and self-construal will generally make people more non-conforming and more likely to express and follow their own (individual) opinions, preferences, and goals.

Uniqueness and creativity. Because creativity involves novelty (originality), it benefits from the expression of unique insights; vice versa, conformity would associate with ideas that are low in originality and do not depart much from what is there already. This relation is supported by empirical findings. For example, a program of research by Nemeth (1986) has found that being confronted with a deviating minority (i.e., non-conformity) stimulates divergent thinking and creativity (e.g., Nemeth & Kwan, 1987). Deviance itself has also been related to creativity (e.g., “creative deviance”; Mainemelis, 2010; and “bootlegging”; Criscuolo et al., 2014), and it has been found that creativity is positively related to unethical behavior (implying non-conformity to rules; e.g., Gino & Ariely, 2012). Conformity, in contrast, has been associated with lower levels of creativity. For example, Madjar et al. (2011) found that conformity was associated with routine job performance rather than creativity. Further, the cultural dimension of cultural tightness (strong conformity) vs. looseness (weaker conformity) is negatively associated with creativity in the United States, both over time (J. C. Jackson et al., 2019) and across different states (Harrington & Gelfand, 2014). Vice versa, articulating creative ideas feels like an act of self-disclosure, in which people express a unique part of themselves (Goncalo & Katz, 2020).

Similarly, the cultural dimension of individualism-collectivism is related to creativity. For example, Shane (1992) found a positive association between the level of individualism in a society and the number of patents per capita (see also Rinne et al., 2013). At the team and individual level, an independent (vs. interdependent) self-construal is associated with higher levels of creativity (e.g., Bechtoldt et al., 2012; Goncalo & Staw, 2006; Shao et al., 2019; Wiekens & Stapel, 2008). Finally, need for uniqueness is positively related to creativity (Dollinger, 2003). In sum, research and theory strongly suggest an association between uniqueness and creativity.

Open-Mindedness

Definition and background. Open-mindedness (or openness) refers to a general tendency toward exploring and acquiring complex, abstract, unfamiliar, and novel information and experiences (DeYoung et al., 2005; McCrae & Greenberg, 2014; Oleynick et al., 2017; Szumowska & Kruglanski, 2020). It is thought to rely on dopaminergic brain functioning that governs the mechanisms that support cognitive exploration (DeYoung, 2013). People who are high in openness have a greater preference for, and interest in, deviant, unusual, and complex information (Brandt et al., 2015; Gocłowska et al., 2017; Litman & Silvia, 2006). They also have a greater tendency to explore a wide variety of information through reasoning, fantasy, perception, and artistic endeavor (Oleynick et al., 2017).

Because openness involves a desire for novel information and experiences, it is strongly related to curiosity, an emotional-motivational state that energizes and directs novelty-seeking behaviors to stimulate one's interest (Litman & Silvia, 2006). It is also strongly related to novelty seeking, the behavioral tendency to explore novel and unfamiliar stimuli and environments (Costa & McCrae, 2014; Gocłowska et al., 2019; Gordon & Luo, 2011). Because openness involves a desire to explore complex, abstract, and varied information, it is also related to epistemic motivation, the desire for knowledge and

information and a thorough understanding of the world (Hardy et al., 2017; Szumowska & Kruglanski, 2020).

Openness and related factors are often assessed as personality traits with scales measuring individual differences in openness characteristics, such as curiosity, imagination, perceptiveness, and thoughtfulness (DeYoung, 2013; Litman & Silvia, 2006; McCrae, 1987; Woo et al., 2014). However, openness can also be viewed as a state that fluctuates over time and that can be momentarily influenced with incidental manipulations (Gocłowska et al., 2019; Sher et al., 2019). Two possible factors that may influence people's openness have been manipulated in research: knowledge expansion and restructuring, and regulatory focus.

Knowledge expansion and restructuring. Early on, developmental researchers have theorized about how new information interacts with existing knowledge structures and proposed two distinct processes: assimilation and accommodation (Piaget, 1969). Assimilation occurs when new information is adjusted to fit existing knowledge structures, and accommodation entails that the existing knowledge structures are modified when faced with new information (for a critical review, see Van Geert, 1998). Thus, new information may *expand* current knowledge by merely adding certain elements to the puzzle, or *restructure* current knowledge by reconfiguring the whole puzzle. These ideas were echoed in Lay Epistemic Theory by the concept of seizing and freezing: premature knowledge formation results in seizing new information and freezing the cognitive structures, preventing from further knowledge development, akin to an extreme case of assimilation (Kruglanski, 2004; Kruglanski et al., 2009, 2010). However, open-minded tendencies can be situationally enhanced by low *need for closure* or *need to avoid closure* (Kruglanski & Webster, 1996; Webster & Kruglanski, 1994). Further, Novelty Categorization Theory argues that non-threatening novelty can be integrated with the existing knowledge structures (Förster et al., 2010). Finally, flexibility mindsets – heightened tendencies to consider alternatives beyond

the existing knowledge – have been found to reduce stereotyping, diminish biases in interpersonal behavior, and prevent from biased decision making, suggesting that knowledge restructuring induces open-mindedness (for a review, see Sassenberg et al., 2021).

Multiple priming tasks have been used to expand or restructure one's knowledge, although the distinction between knowledge expansion and knowledge restructuring is not as clear in the literature as one would hope. It seems that knowledge can be expanded by any learning experience or interaction with mild novelty, such as imagining pleasant (vs. unpleasant) novel events, performing tasks introduced as novel (vs. familiar; Förster et al., 2009, 2010; Gillebaart et al., 2013), or generating atypical (vs. typical) category exemplars (S. Liu, 2016b). Knowledge restructuring entails a switch of perspective, and thus, seems to be primed by encountering entirely new perspectives, such as schema-violating walk in an upside-down cafeteria (Ritter et al., 2012), observing paradoxes (e.g., Miron-Spektor et al., 2011), or experiencing diversity (Gocłowska et al., 2016).

Promotion focus. A factor that directly affects people's willingness to explore is regulatory focus (E. T. Higgins, 1997). Regulatory focus theory distinguishes between two self-regulatory orientations. In a prevention focus, people are concerned with safety, security, and the fulfillment of responsibilities and obligations, are more risk averse, and focused on avoiding negative outcomes (E. T. Higgins, 1997). In a promotion focus, people are concerned with growth, nurturance, opportunities and aspirations, the realization of their ambitions, dreams, and ideals, and attaining positive outcomes (E. T. Higgins, 1997). Of these two orientations, a promotion focus more strongly relates to openness. Individuals in a promotion focus are more willing to take risks and to explore and examine novel ideas and new possibilities (Baas et al., 2013; Friedman & Förster, 2010; Herman & Reiter-Palmon, 2011). For instance, people with a strong rather than a weak promotion focus were better at recognizing novelty (J. Zhou et al., 2017) and more motivated to acquire new skills and

master new situations (Lanaj et al., 2012). Openness also positively relates to the motivation to pursue opportunities, hopes and aspirations (Vaughn et al., 2008). Likewise, individual differences in promotion focus are positively related to openness to experience (Lanaj et al., 2012), curiosity (van Vianen et al., 2012), and epistemic motivation (Oiknine et al., 2021).

Promotion and prevention focus can be primed with incidental manipulations. For instance, in a classic study by Friedman and Förster (2001), participants saw a cartoon mouse trapped inside a maze and were instructed to find a way out for the mouse. In the promotion focus condition, a piece of Swiss cheese was lying outside the maze (attaining a positive outcome), while in the prevention focus condition, a dangerous owl hovered above the maze (preventing a negative outcome). In another study by Sacramento and colleagues (2013), participants first wrote an essay on how their hopes and aspirations (promotion focus) or duties and obligations (prevention focus) had changed since their childhood. After priming a promotion or prevention focus, participants solved creative insight problems or generated creative uses for an object (Friedman & Förster, 2001; Sacramento et al., 2013).

Openness and creativity. On the trait level, openness is considered the most robust personality-related predictor of creativity (e.g., Feist, 1998). On the state level, openness and related factors are associated with the neural, cognitive, and motivational processes that support creativity (Gołowska et al., 2019; McCrae, 1987; Rietzschel et al., 2019). Openness is related to variation in default network functioning (DeYoung, 2015), which is involved in creative thinking (Beaty et al., 2014). Openness is also associated with reduced latent inhibition: people high in openness show a reduced tendency to block irrelevant stimuli from entering awareness (Peterson et al., 2002; Peterson & Carson, 2000). As a result, more seemingly irrelevant stimuli enter attention, which increases the availability of elements to process, combine and integrate, resulting in more creative outcomes (e.g., Carson et al., 2003; Eysenck, 1995). Divergent thinking, the generation of multiple alternative solutions in

response to open-ended problems, is another cognitive process common to both openness and creativity (Gocłowska et al., 2019; McCrae, 1987).

Openness is related to an increased motivation to seek and explore a broad range of information and novel activities and ideas in particular. For instance, people scoring high rather than low on openness more often engage in creative activities during the day (Silvia et al., 2014). In addition, by seeking a broad range of information, people high in openness gain a greater variety of information that they can use to generate and evaluate new ideas (Hardy et al., 2017). Openness is also related to an increased motivation and ability to transform novel ideas into creative products (Jauk et al., 2014; Rietzschel et al., 2019; Thrash et al., 2010). Unsurprisingly, then, openness is positively related to a variety of creativity outcomes (Feist, 1998; Furnham & Bachtiar, 2008; Jauk et al., 2014; Wolfradt & Pretz, 2001).

Conclusion

Taken together, we believe that the four mechanisms unconstrained thought, abstraction, uniqueness and open-mindedness capture the broad range of research on contextual influences on state-level creativity. Thus, this framework can help us develop a deeper understanding of the nature of priming effects on creativity, as well as possible boundary conditions for these effects. We will now apply this framework to the research on priming and creativity.

Part 2. Meta-analysis of creativity priming effects

Priming research

Although certain priming effects have been proven hard to replicate (e.g., Doyen et al., 2012; Harris et al., 2013; Shanks et al., 2013), there is a consensus that priming effects as such exist. However, in general priming research has focused more on producing effects than on developing and testing theoretical frameworks (Bargh, 2006; Molden, 2014). Hence, it seems fair to conclude that the field of priming research could use a fresh look based on clear theoretical categories. Given the enormous number of priming studies, there seems to be enough substance to conduct a meta-analysis testing a theoretical approach. Indeed, several such meta-analyses exist (e.g., DeCoster & Claypool, 2004; Lodder et al., 2019; Shariff et al., 2016), although none has focused specifically on creativity. Thus, we conducted a meta-analysis on studies testing the effects of various priming manipulations on creativity, using our theoretical framework as organizing principle.

Priming can be defined as the impact of the incidental activation of a representation by a stimulus on subsequent thoughts and behaviors. Karl Lashley (1951) was most likely the first using the term priming for this phenomenon (for a more extensive discussion see Bargh, 2014). Early experimental research using priming studied language processing (Mackay, 1973), human memory (Tulving & Pearlstone, 1966), and soon thereafter person perception (E. T. Higgins et al., 1977). Higgins and Chaires (1980) conducted the first studies on the effect of priming on creativity. They confronted participants with either an undifferentiated linguistic construction (e.g., ‘tray of tomatoes’) or a differentiated linguistic construction (e.g., ‘tray and tomatoes’) before measuring creativity using the candle problem (Duncker, 1945). After being confronted with differentiated linguistic constructions, participants solved the problem faster than after being confronted with undifferentiated constructions.

This study not only formed the starting point for research on priming creativity, but also introduced a new type of priming research, namely procedural or mindset priming. Whereas earlier research primed semantics (e.g., activating certain words or concepts, which were then more likely to play a role in subsequent cognition or behavior), Higgins and Chaires (1980) compared two conditions in which the same content but different mental operations (i.e., differentiated vs. undifferentiated) were activated. The idea is that a mental operation is primed by using it, which then carries over and affects information processing in later tasks (if applicable; Gollwitzer, 1990; for an overview see Fujita & Trope, 2014). Studies priming creativity mostly make use of this approach.

In this paper, we distinguish between four types of priming paradigms, which vary according to the activity that is required of participants: observing, interacting, generating, and performing. The *observing* paradigm includes tasks in which participants merely observe a stimulus, without having to respond to it (e.g., read a text, watch a movie). The *interacting* paradigm includes tasks in which participants have to act upon a given stimulus, such as searching for something (e.g. a word) or completing something (e.g., word-stem completion). The *generating* paradigm includes tasks in which participants have to generate materials based on some question or cue, such as writing a story or reflection. The *performing* paradigm includes tasks in which participants are asked to perform some given task, such as a game or a motor task. Thus, these paradigms vary in how immersive they are and in how likely it is that they activate a semantic representation versus a mindset – the more active the paradigm, the more it is likely to prime a mindset. As we will argue below, it seems plausible that these methodological differences may also moderate priming effects on creativity.

Priming Creativity

The priming literature, even when looking only at studies that focus on creativity, is extremely diverse. For example, Gaither and colleagues (2015, experiment 1) asked mono-

cultural and bi-cultural participants to reflect on their identity (vs. on an average day), and to subsequently perform the RAT and the Duncker candle task. As another example, Kim and colleagues (2013, experiment 3) primed self-construal by asking participants to circle pronouns in a text: first person pronouns (e.g., *I, me*) to prime individualism or collective pronouns (e.g., *we, us*) to prime collectivism. They were then asked to draw a creature from a planet unlike earth. Finally, Zabelina and Robinson (2010) asked college students to write about what would happen if school was cancelled for a day. They either answered that question for ‘today’, or had to imagine that they were 7 years old. Participants then completed three divergent thinking tasks.

As can be seen from these examples, creativity priming studies vary in *what* they prime (cultural identity, independence, childhood), *how* they prime it (writing stories, circling pronouns), and how creativity is measured (RAT, drawing an alien, divergent thinking). As a result, it is difficult, if not impossible, to draw strong conclusions about the effects of priming on creativity, to develop a coherent understanding of how and which transient psychological states can be activated by priming, and to understand how these translate into performance on different types of creative tasks. Thus, we do not know how robust priming effects on creativity are, and we do not know *how* (i.e., through which mechanism) these effects may occur. To provide a first answer to both questions, our aim in this section is to classify and meta-analyze the existing research according to the framework developed above.

For the purposes of our meta-analysis, we grouped studies into four categories according to our four mechanisms (details of the categorization process are described in the Method section below), and formulated concrete hypotheses regarding priming effects among the studies within these four categories. Importantly, because authors rarely explicitly address the supposed mechanism responsible for the hypothesized or observed effects (and, if they do, rarely in terms of the broad mechanisms we propose), we decided to adopt an *a priori*

categorization, which (as well as our resulting hypotheses) may not always correspond with the mechanisms that authors of primary papers assumed. Briefly stated, we expect all four categories to show positive effects of priming on creativity, but we expect different patterns of moderation (by creativity measure and priming paradigm) across the categories. In these moderation hypotheses, we focus on effects of priming paradigm (observing, interacting, generating, performing), creativity task (divergent thinking, RAT, insight, and creative production), and creativity indicator (fluency, flexibility, originality, RAT, insight performance, and composite).

Hypotheses

Unconstrained thought. Overall, we expect that priming unconstrained thought (as compared to neutral states or constrained thought) leads to higher creativity; vice versa, we expect that priming constrained thought inhibits creativity (H1a). However, we also expect that these effects depend on the priming paradigm used and the way creative performance is operationalized. Unconstrained thought implies relaxed top-down control and enhanced bottom-up processing, which is a state induced by actually engaging in less goal-directed activities. Given the differences in active engagement between the four general priming paradigms described above (observing, interacting, generating, and performing), we expect that *performance* elicits stronger effects than other paradigms (H1b). Further, as suggested by the matched filter hypothesis for cognitive control and other theories (Amer et al., 2016; Beaty et al., 2016; Chrysikou, 2019; Chrysikou et al., 2014; Herz et al., 2020; Zhang et al., 2020), a state of relaxed top-down control is better suited for more open-ended, less goal-directed tasks. Thus, we expect stronger effects for divergent thinking than all other tasks (H1c). Finally, because unconstrained thought involves less reliance on existing cognitive schemas (e.g., past experiences, memory, and context) and allows for more bottom-up processing (i.e., input from our senses; reduced cognitive filtering), it should facilitate

generating ideas from different semantic categories and those that are more distantly related (Herz et al., 2020). Thus, flexibility and originality should show stronger effects than other creativity indicators (H1d).

Abstraction. In general, we expect that abstraction positively relates to creativity (H2a), but we also expect this effect to depend on priming paradigm and creativity operationalization. Similar to unconstrained thought, abstraction priming requires active processing of information, and we therefore expect stronger effects from generating and performing priming manipulations (H2b) than from priming manipulations in which less active engagement is required (e.g., observing). Further, we expect stronger effects in tasks where performance depends on surveying (and switching between) different categories of ideas or solutions, and in tasks that depend on overcoming functional fixedness and fixation by representing the problem at a more abstract level (Beda et al., 2020; Palmiero, 2020). Thus, we expect stronger effects on divergent thinking tasks, insight, and RAT tasks (H2c) than on other tasks (such as creative product tasks). For the same reason, flexibility indicators should show stronger effects than other indicators (H2d).

Uniqueness. On the whole, we expect that uniqueness priming leads to more creativity than neutral states, and that conformity priming leads to lower creativity than neutral states (H3a). We further expect that this effect depends on the operationalization of creativity; specifically, we hypothesize that uniqueness priming has stronger effects for creative product tasks than for other tasks (H3b), because being different from other people and deviating from the conventional norms matches with the emphasis on originality and uniqueness in these tasks (e.g., while coming up with a new product, making a sculpture, or creating a poem). Furthermore, because uniqueness manipulations emphasize individualism, individual goal striving and personal competition, creativity indicators that measure fluency

and originality (H3c) are expected to show a stronger effect than other indicators (such as flexibility).

Open-mindedness. We expect that priming a state of high open-mindedness leads to higher levels of creativity than priming a state of low open-mindedness or a control condition without such primes (H4a). We expect this effect to be particularly strong for divergent thinking, insight and RAT tasks (H4b), because these tasks rely especially strongly on the active search for new and different perspectives that characterizes a state of high open-mindedness. Furthermore, because open-mindedness is concerned with both novelty and the exploration and use of different perspectives, we expect the effect of open-mindedness primes to be stronger for originality and flexibility (H4c) indicators than for fluency, composite score, and other indicators.

Method

Inclusion criteria

We included both published and unpublished studies, conducted or published within any time period, reported in English. For unpublished studies, we also included several in German and Dutch. We included studies that met all of the criteria listed below. An overview of exclusion criteria is presented in the flowchart in Figure 1.

1. Priming task: The experimental design had to include a priming task or trial. To avoid overlap with previous meta-analyses on emotions and creativity (Baas et al., 2008; Davis, 2009), we excluded studies that manipulated affective states (affect, mood, emotions, e.g., Topolinski & Deutsch, 2012), as well as arousal through physical exercise (Frith, 2019, Study 1; Hutton & Sundar, 2010). However, we included studies in which affect was a by-product of a priming task. For example, included studies manipulated social approval or rejection via success or failure feedback (Kim et al., 2013, Experiment 1), asked participants to generate sarcastic responses (Huang et al., 2015), and exposed participants to anger or

rudeness (Miron-Spektor et al., 2011; Porath & Erez, 2009). Thus, included studies had to activate a meaningful concept or a mindset rather than elicit emotions exclusively.

Additionally, we excluded a study that compared a priming condition to a brain stimulation condition (Pick & Lavidor, 2019).

2. Creativity task: Creativity had to be measured through the generation of responses by an individual. Following the definition of creativity (generating novel and useful ideas; Amabile, 1983b), and because the priming literature investigates situational and relatively short-term effects, we excluded studies that used a global rating of an individual's creativity rather than creative performance in a task. Studies that measured creativity-related processes but did not include the generation of a response (e.g., evaluating the typicality of exemplars for a given category; Slepian & Ambady, 2012, Experiment 2) were excluded. We also excluded studies that allowed for the production of responses but not for the expression of novelty or usefulness. In these studies, participants generated synonyms or antonyms of words (Cretenet & Dru, 2009), converted lower-case letters into upper-case letters (Cretenet & Dru, 2011), generated words starting with a given letter (Birn et al., 2010), and generated typical associates (Madore et al., 2019).

3. Relationship between priming and creativity task: Because priming involves the influence of activated thoughts or mindsets on a *subsequent* and *unrelated* task (Bargh & Chartrand, 2014; Fujita & Trope, 2014; Weingarten et al., 2016), we only included studies in which the priming manipulation and the creativity measurement took place in separate tasks. We excluded studies in which the priming task and the creativity task overlapped temporally (i.e., manipulation lasts throughout the creativity task) or conceptually (i.e., manipulation changed the creativity task instruction, framing of the task, or the problem space; manipulation provided example solutions to the creativity task). Similar to Weingarten et al.,

(2016), we only included studies in which priming was incidental – without an explicit link between the priming task and creativity task.

4. Study design: Studies had to manipulate priming experimentally, using at least two experimental groups or one experimental and one control group in a between-subjects design, or a pre-test and a post-test creativity measurement with a priming task in between in a within-subjects design. We included field experiments but excluded observational, qualitative, survey, diary, and long-term creativity training studies. We also excluded studies on incubation, studies which present the instruction to the creativity task before the priming task (e.g., Sligte et al., 2013, Study 1), and studies which measured long-term effects of priming (e.g., F.-C. Chiu, 2015; Vezzali et al., 2016).

5. Population: Studies had to collect the data from non-clinical samples.

Excluded materials. We excluded indicators that were content-specific (e.g., hostile features in the drawing after hostility priming manipulation), that related to usefulness or elaboration, and that measured other constructs than creativity (e.g., scariness of drawings). We also excluded measures that took into account only the most creative ideas, that included impossible or nonsense ideas in the total score, and that were computed through transformation of other indicators of creativity (e.g., novelty multiplied by usefulness). We excluded the last three types of indicators only if indicators that were more appropriate were available in the same study (e.g., fluency, flexibility, originality).

Literature search

We started with the articles that we found manually in personal databases. Then, we searched via EBSCO in the following databases: Business Source Premier, ERIC, MEDLINE, OpenDissertations, PsychArticles, PsycINFO, and socINDEX. We also ran a backwards search of five theoretical papers and a forward search of five empirical papers included in the meta-analysis (via Web of Science). We also circulated the call for

unpublished studies on social media and through mailing lists of several psychological societies (e.g., European Association of Social Psychology). Finally, we searched for unpublished data in our personal archives.

Figure 1 shows a flow chart of the searching, screening, and inclusion procedure. Table 2 lists each of the searches and search terms. According to our working definition, a priming task needs to be completed before the start of a creativity task, and priming is expected to have a carryover effect on the creativity task. Because studies using this particular procedure might not always label the priming task as “priming”, we determined the search terms in a few steps.

Step 1: broad search. In the first step in October 2019, we generated as many terms as possible related to (1) creativity, (2) experimental methodology, and (3) priming. Creativity-related terms and priming-related terms were specified as “Subject Terms” and experiment-related terms were specified as “All Text”.

Step 2: building on previous searches. In December 2019, we searched using terms from representative meta-analyses published recently on the topic of creativity (Baas et al., 2016) and priming (Weingarten et al., 2016). Creativity-related terms were entered as “Subject terms” and priming-related terms were entered without specifying a field. For each of the databases, whenever possible, we selected the “empirical study” category, only “human population”, language: English, and adult population.

Step 3: updating search terms. A year later, in October 2020, we searched with the same keywords as in Step 2, but we also added “brainstorm”, “mindset”, and “scrambled sentences”, to maximize the number of eligible studies. We also decided to drop adult population as a restriction.

Step 4: Backward and forward search. In May 2021, we searched for eligible articles in the references of five theoretical articles (backward search; Amabile & Pratt, 2016;

Gocłowska et al., 2016; Lebuda et al., 2016; Sowden et al., 2015; Zhang et al., 2020). We also chose five empirical articles included in the meta-analysis and searched among the papers that cited these empirical articles (forward search; Förster et al., 2005; Friedman & Förster, 2001; Gino & Wiltermuth, 2014; Madore et al., 2015; Mayer & Mussweiler, 2011). We chose these papers because they were relevant to the priming-creativity literature and they covered diverse topics and lines of research, which might facilitate finding as many eligible papers as possible.

Articles were pre-screened by research assistants. Ambiguous cases were handled in two steps. In the first step, the first author resolved as many ambiguous cases as possible. In the second step, the remaining ambiguous cases were discussed by three authors, and exclusion rules were added and updated in several iterations. During coding, additional studies were identified as potentially ineligible, and their exclusion was verified in a discussion among three of the authors.

Figure 1

Flow chart of the searching, screening, and inclusion process. Due to technical issues with detecting duplicates, numbers are approximated.

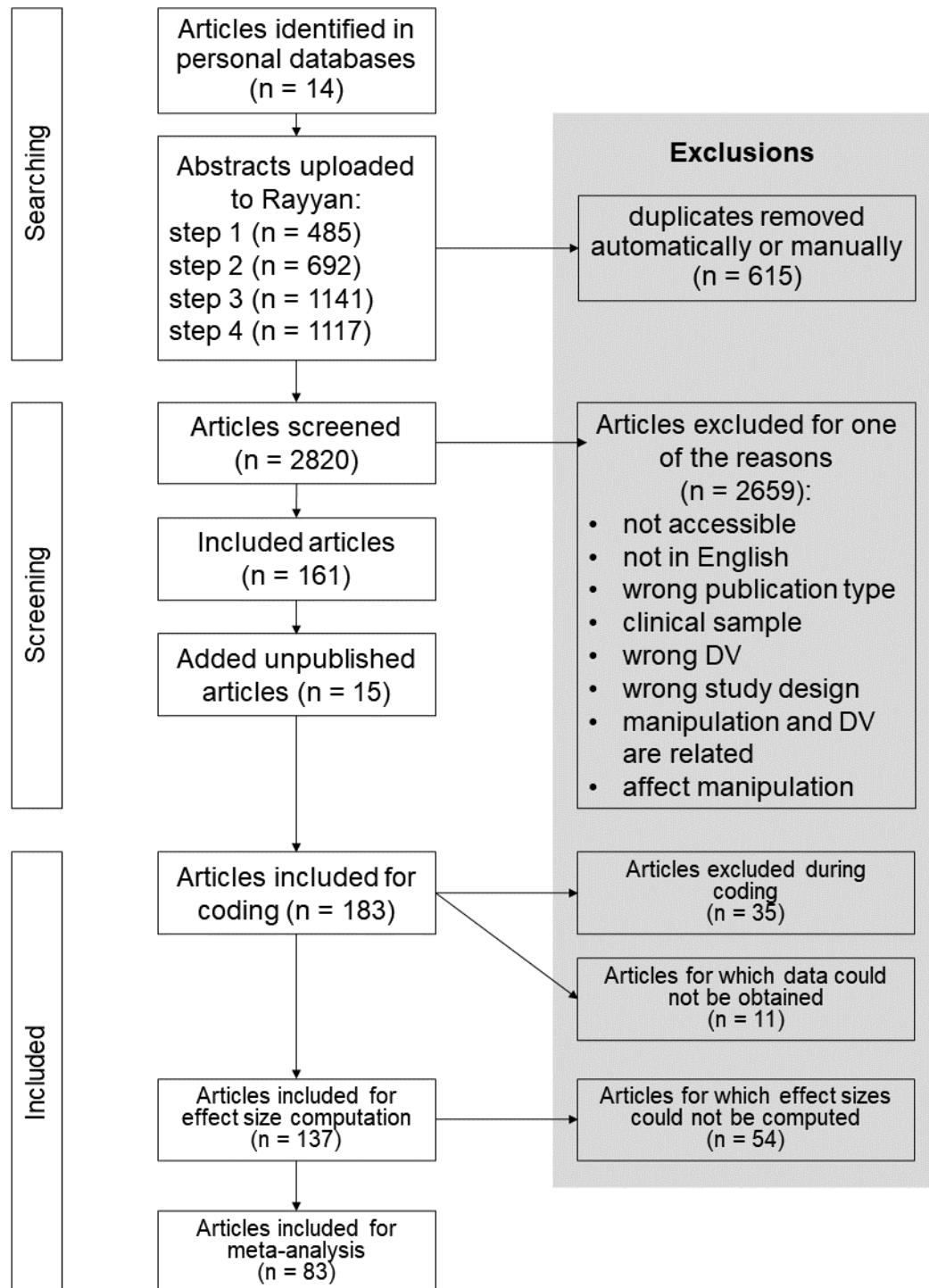


Table 2

Literature search terms. Studies had to mention at least one term from each column (using the “AND” operator).

Search number	Date of search	Search engines	Creativity	Experimental methodology	Priming
1	10.2019	PsycArticles PsycINFO	creativity creative performance creative outcomes creative behav* creative generation creative processes creative cognition divergent* divergent thinking divergent production convergent thinking fluency flexibility cognitive flexibility flexible thinking originality brainstorming insight alternative uses unusual uses alternate uses remote associat*	experiment* manipul* control group control condition experimental group experimental condition random assignment	priming prime primed mindset activat* unconscious* conscious* implicit* automatic* accidental* incidental* subliminal* goal priming procedural priming embodiment embodied cognition priming paradigm training induction
2	12.2019	Business Source Premier ERIC MEDLINE OpenDissertations PsychArticles PsycINFO socINDEX	creative creativity divergent thinking insight performance remote associates originality	-	prime priming primed automatic automatically nonconscious* incidental*
3	10.2020	Business Source Premier ERIC MEDLINE OpenDissertations PsychArticles PsycINFO socINDEX	creative creativity divergent thinking insight performance remote associates originality brainstorm*	-	prime priming primed automatic automatically nonconscious* incidental* mind-set mindset scrambled sentence sentence unscramble

Coding procedure

Qualitative coding. Before quantitative coding, two authors and research assistants systematically described all studies in a table that included methodology, variables, and results. This summary table was used for the following coding steps.

Quantitative coding. All authors performed data coding. The first author coded all studies and the other authors provided the second code (studies were equally distributed across authors). The first author resolved disagreements, and the other authors verified them. For classifying priming effects into our four theoretical mechanisms, each effect was coded by three coders (the first author coded all studies; other authors provided the second and the third code). When one coder disagreed, the code proposed by the two others was treated as final. In the rare cases when all coders disagreed, the first author proposed a final code, which was verified by two other authors. Articles omitted from the coding procedure due to programming errors were later coded by the first author and verified by two other authors. For theoretical mechanisms, some effects were coded into more than one category. To avoid the same effect size being coded into more than one category, the first author proposed which code should be retained. Two other authors verified and finalized these choices. Appendix A contains a list of all coded comparisons in each of the four categories.

Theoretical moderators

Priming mechanism category. The theoretical mechanisms we coded were (a) unconstrained thought, (b) abstraction, (c) uniqueness, and (d) open-mindedness. For each theoretical mechanism, subordinate codes were given. For *unconstrained thought*, a task was coded as activating bottom-up processing, broad attention, or not applicable. *Abstraction* was coded when the task manipulated visual global processing, temporal distance, spatial distance, social distance, hypotheticality, abstraction of semantic categories or abstraction of goals, or tasks were coded as not applicable. Tasks were coded as priming *uniqueness* when

they manipulated nonconformity or individualism. Otherwise, they were coded as not applicable to this category. The *open-mindedness* category was coded when the tasks manipulated promotion focus, knowledge expansion or knowledge restructuring, or otherwise not applicable (see Appendix B for coding protocols). We made conservative choices when assigning manipulation to a category, and we only did so when we could clearly argue a fit with that (sub)category based on a conceptual and operational definition.

Exploratory moderators

Priming characteristics. We coded the priming tasks with respect to (a) awareness level, (b) priming paradigm, and (c) priming modality. *Awareness level* was coded as either supraliminal (e.g., Lichtenfeld et al., 2012) or subliminal (e.g., (Mayer & Mussweiler, 2011)). To code the *priming paradigm*, we identified all tasks used in our sample, such as scrambled sentences (e.g., Zitek & Vincent, 2014) or the maze task (e.g., L. Liu et al., 2017). First, we coded each priming manipulation into one of these narrowly defined priming tasks (see Appendix C). Next, we subsumed these tasks into broader categories that describe what people were actually doing during the manipulation (see Appendix C, Table C1). We identified four of these superordinate categories: observing, interacting, generating, and performing. The observing category included tasks in which participants were presented with the content of a manipulation but were not asked to react in any specific way, such as simple presentation (e.g., watching a slideshow; (Tan et al., 2019), simple observation (e.g., witnessing another participant behaving in a rude way; Porath & Erez, 2009), and reading tasks (e.g., reading a description about why a product is both creative and efficient; Miron-Spektor, Gino, et al., 2011). The interacting category included tasks in which participants worked on a set of stimuli chosen by the researchers, such as visual search tasks (e.g., searching for the number “3” in a matrix of numbers; (Friedman et al., 2003), the Navon global-local task (i.e., detecting smaller or bigger letters; e.g., de Dreu et al., 2011), lexical

decision tasks (i.e., indicating whether a stimulus is a word or a non-word; e.g., Mayer & Mussweiler, 2011), word or sentence completion tasks (e.g., Sassenberg et al., 2017), scrambled sentences (i.e., creating sentences from a set of provided words; de Dreu et al., 2011), finding words in a word search (e.g., Steidle & Werth, 2013), and circling words in a text (e.g., Kim et al., 2013). The generating category included tasks in which researchers presented participants with a cue, but the main priming content itself was generated by the participants such as written recall of a specified event (e.g., when one behaved creatively; Sassenberg et al. 2017), written reflection on a given topic (e.g., describing one's culture to a friend; Cheng & Hong, 2017), imagining a hypothetical situation or scenario (e.g., writing about a day in the life of another person; Krause, 2015), and generating content (e.g., associations to stimulus words; Freedman, 1965). In the performing category, participants performed a certain task, such as the maze task (i.e., finding a way out of a maze; e.g., Friedman & Förster, 2005), motor tasks (e.g., arm flexion vs. extension; Cretenet & Dru, 2009), game tasks (e.g., building something with LEGO blocks; Wan & Chiu, 2002), guided attention tasks (e.g., mindfulness meditation; Baas et al., 2014), and solving a task with different instructions or approach (e.g., being told to join a group after some tasks vs. being not selected into the group; Kim et al., 2013). Finally, the *priming modality* was coded as either visual (e.g., watching pictures), linguistic (e.g., reading text), or mixed (i.e., containing elements of both).

Creativity task characteristics. Creativity tasks were coded according to (a) task type, (b) task modality, and (c) goal primed in the instruction. For *task type*, we distinguished between divergent thinking, creative product, RAT, and insight (see Appendix C, Table C2).. The divergent thinking category included tasks in which participants came up with multiple ideas, such as the unusual uses task (i.e., coming up with unusual uses of an object; Guilford, 1967b), other tasks that required participants to generate ideas, provide solutions or

brainstorm (e.g., new names for animals; Sligte et al., 2013), and the endings task (e.g., generating pasta names without using the endings provided in the examples; e.g., Sassenberg et al., 2017). The creative product category included tasks in which participants had to create a specified end result, such as developing a new product (e.g., Park et al., 2019), drawing figures (e.g., Tidikis et al., 2017), drawing an alien creature (e.g., Nelson & Guegan, 2019), and other artistic tasks (e.g., writing a poem; Greer & Levine, 1991). The RAT category referred to the (compound) remote associates test (S. A. Mednick, 1962) and adapted versions (e.g., Chinese RAT; Z. Zhou et al., 2019) in which participants have to find a common associate for three given words. The insight category included tasks in which participants have to find a single, predefined solution to a problem such as the Duncker candle problem (Duncker, 1945) or the snowy pictures test (e.g., Friedman & Förster, 2001). *Task modality* was coded as either verbal (i.e., providing verbal answers to a problem), figural (e.g., drawing something), or multimodal (i.e., involving more than one modality). The *goal primed in the instruction* of the creativity task contained several possible goals that were coded as either present or absent including fluency (e.g., generating as many ideas as possible), quality (e.g., doing one's best), and originality (e.g., generating new and creative ideas).

Creativity indicators. We distinguished the following creativity indicators: (a) fluency, (b) flexibility, (c) originality, (d) composite, (e) RAT, (f) insight, and (g) other. *Fluency* refers to the number of ideas, drawings, responses etc. generated. *Flexibility* denotes the number of uses that were different from each other, the number of categories, and the number of times when participants switched among idea categories. *Originality* includes Likert-scale ratings of, for instance, novelty or uniqueness, the infrequency of the responses, and the number of endings that differed from the example in the endings task. *Composite* was coded when Likert-scale ratings of overall creativity were given. For the *RAT* and *insight*

indicators, the number or percentage of correct responses was reported. An indicator was coded as *other*, if it did not fit any of these categories.

Methodological variables. We coded publication year, percentage of female participants, age of participants, publication type (journal article, conference paper, master thesis, PhD thesis), publication status (published, unpublished), setting of the study (laboratory study, data collected in class, field study, participants tested in groups, online study, other) and type of sample (students, children, elderly, employees, mixed, other).

Interrater reliability

Interrater reliability for priming mechanism category was moderate (Fleiss kappa = .44). It was also moderate for the comparison direction, which assessed whether higher creativity would be expected in the experimental condition (“+1”) or control condition (“-1”); kappa = .44, Landis & Koch, 1977)⁵. Interrater reliability for the subcategories (e.g., bottom-up processing or broad attention for the unconstrained thought category) ranged from fair to substantial (unconstrained thought: kappa = .65; abstraction: kappa = .50; uniqueness: kappa = .36; open-mindedness: kappa = .45). Interrater reliabilities for priming task awareness level (kappa = 0.82), priming paradigm (before recoding: kappa = 0.64, after recoding: kappa = 0.69) and priming modality (kappa = 0.64) ranged from moderate to almost perfect (Landis & Koch 1977). Interrater reliabilities for creative task type (before recoding: kappa = 0.88, after

⁵ While this may seem low, it is a consequence of the coding instructions that explicitly asked coders to *not* code into any category if they could not justify their choice. In most disagreements, one of the coders refrained from assigning a category code. When we excluded such cases from the sample, there were only 12 cases in which coders disagreed about comparison direction (“1” or “-1”). This suggests that when coders agreed that a comparison direction was clear, they also agreed on the direction. This was confirmed by a substantial agreement (kappa = .78) (Landis & Koch 1977), as well as 91.78% agreement. We found similar results for the priming mechanism category. When we excluded cases in which at least one of the coders did *not* assign a category code, Fleiss’ kappa indicated substantial agreement (kappa = .66) and there was 83.5% agreement among coders.

recoding: kappa = 0.86), creative task modality (kappa = 0.51), and creativity indicator (kappa = 0.91) ranged from moderate to almost perfect (Landis & Koch 1977).

Frequencies of codes

Priming mechanism category. We coded 234 comparisons into a meaningful category, while 213 comparisons were coded as “other”. This is not surprising, as the priming literature is extremely diverse and many of the studies were based on theories other than the four mechanisms that we proposed. Additionally, this reflects our conservative approach to coding: whenever uncertain, the coders coded a comparison as “other”. Most comparisons were coded as open-mindedness ($n = 155$), fewer as abstraction ($n = 29$) and uniqueness ($n = 32$) and the fewest as unconstrained thought ($n = 18$).

Priming task. The most common priming paradigm was “other” ($n = 47$), suggesting that priming effects are diverse not just in terms of primed content, but also in priming methodologies. This was followed by ‘generating’ (tasks where participants are given a cue and generate the content of the priming task themselves; $n = 45$). Priming tasks were mostly linguistic in nature ($n = 85$), with only 32 cases of mixed modality and 22 cases of visual modality. Contrary to some of the classic priming effects, all primes in the included studies were supraliminal. In other words, participants were aware of the primed content but not necessarily of the primed concept or the researcher’s hypothesis.

Creativity. Divergent thinking tasks were the most common task types ($n = 62$), followed by the RAT ($n = 33$). Insight tasks were less common in our sample ($n = 25$). An overwhelming majority of tasks required verbal responses ($n = 97$), some tasks asked for multimodal responses ($n = 35$), and only ten required figural responses. As for the creativity indicators, originality was most common ($n = 70$), followed by fluency ($n = 51$). Composite indicator, flexibility, insight, and RAT were used similarly often (around $n = 30$ for each).

Data preparation

Standardized mean differences with correction for small samples (Hedges' g) were computed from different statistics using the “esc” package in R (Lüdtke et al., 2019). When the effect sizes could not be computed (e.g., when the proportion of participants who solved a creativity task equaled zero), data was treated as missing. To compute effect sizes for within-subject designs, we used the following estimates of the pretest-posttest correlation (they were not available in our included papers): $r = .58$ for fluency indicators (Tanis, 2017), $r = .48$ for originality indicators based on frequency scoring (Tanis, 2017), $r = .43$ for originality and flexibility scores rated by judges (Tanis, 2017), $r = .53$ for the Remote Associates Test indicator (Takeuchi et al., 2020). When the data on post-test scores were available in the experimental and control group, we only included those scores (Cuijpers et al., 2017). When means and standard deviations per condition were not available, and the reported statistics reflected a negative effect on creativity, effect sizes were reversed, so a positive effect size would always mean a positive effect on creativity.

The first author prepared the data for computation of effect sizes and an R programmer prepared the script for data aggregation. Data cleaning and preparation was done by the first author and the script was verified by the third author. Three first authors verified the extreme or ambiguous cases (e.g., when effect sizes computed from two different statistics from the same study differed) and excluded extreme outliers (effect sizes above Hedge's $g = 4$).

Analytic strategy

Because the main purpose of this research was to test whether effect sizes differ across theoretical mechanisms, we excluded all comparisons that were not categorized as one of the four mechanisms. Five separate random-effects multilevel meta-analyses were conducted: one on a dataset of all effect sizes, to test the general effect of priming on

creativity, and separate meta-analyses on unconstrained thought, abstraction, uniqueness, and open-mindedness subsets, to test hypotheses. We used multilevel meta-analysis because it can handle multiple effect sizes from the same study and accounts for the fact that these effect sizes are not independent (Assink & Wibbelink, 2016; Cheung, 2014). This was crucial in our sample of included studies, because creativity is often measured with multiple indicators (e.g., fluency, flexibility, originality) and because the included studies often used more than one manipulation with more than two groups (e.g., 16 effect sizes in Ritter et al., 2012). In a regular, two-level meta-analysis participants (level 1, i.e., means and standard deviations reported in articles) are nested in studies (level 2, i.e., pooled mean effect size and standard error). In a three level meta-analysis, participants (level 1) are nested within clusters (level 2, effect sizes coming from the same study), and the clusters are pooled to compute the mean meta-analytical effect size and standard error (level 3).

Unless otherwise specified, we used the “metafor” package in R (Viechtbauer, 2010) for all analyses described below. We used “dmetar” package in R (Harrer et al., 2021) to compute I^2 (Cheung, 2014): heterogeneity of variance associated with level 2 (effect size differences within clusters) and level 3 (between-study variation). Following Harrer et al. (2021), we ran a two-level model with level 3 held constant at zero, and compared it with the three-level model using the “anova” function, Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). When adding the third level does not improve the fit of the model, using a simpler, 2-level model is justified.

Next, we tested moderators, each in a separate model using the “rma.mv” function. This resulted in multiple tests, so small effect sizes need to be interpreted with caution. Moderators were entered as dummy coded predictors and the biggest group was set as a reference group. Test of moderators shows whether there are any differences between subgroups, while the model results indicate which group’s results are significantly different

from the reference group. To obtain effect sizes and confidence intervals for each of the groups, we added their estimates to the one of the reference group.

We ran outlier analysis using influence diagnostics and Baujat plots using “metafor” (Viechtbauer, 2010) package and “ggplot2” package for data visualization (Wickham, 2016). However, we did not identify any cases that could be clearly classified as outliers and we retained all effect sizes.

To assess the publication bias, we planned to run funnel plots, Egger's test, trim and fill analysis, and p -curve analysis. However, none of the methods for assessing publication bias is reliable when between-study heterogeneity is high (Peters et al., 2007; Simonsohn et al., 2013, 2014; Terrin et al., 2003; van Aert et al., 2016). Because between-study heterogeneity in our sample was very high, we report funnel plot and Egger's test results and skip trim and fill analysis ($I^2 > 75\%$; Simonsohn et al., 2013), and p -curve analysis ($I^2 > 50\%$; van Aert et al., 2016).

Transparency and openness

We adhered to the PRISMA 2020 guidelines for systematic reviews (Page et al., 2021) and complied with the TOP guidelines (Nosek et al., 2015). Data were analyzed using R, version 4.2.2 (R Core Team, 2022) and the following packages: apa (Gromer, 2020), apaTables (Stanley, 2021), corrplot (Wei & Simko, 2021), dmetar (Harrer et al., 2019), dplyr (Wickham et al., 2023), esc (Lüdecke et al., 2019), flextable (Gohel & Skintzos, 2023), ggforestplot (Scheinin et al., 2023), ggplot2 (Wickham, 2016), ggrepel (Slowikowski, 2022), googlesheets4 (Bryan, 2022), meta (Balduzzi et al., 2019), metafor (Viechtbauer, 2010), rempsyc (Thériault, 2022), shiny (Chang et al., 2022), stargazer (Hlavac, 2022), tibble (Müller & Wickham, 2022), tidyverse (Wickham et al., 2019), tfse (Kearney, 2018), and writexl (Ooms, 2023).

Results

Overview

The Results section is organized in five subsections: a section on overall effects (across the entire database of coded studies), followed by sections on each of the four categories (unconstrained thought, abstraction, uniqueness, and open-mindedness). In each section, we first present the main results on the overall effect size and heterogeneity, and some tests of publication bias. Next, we further probe these overall effect sizes by conducting moderation analyses, in which we test whether effects depend on priming paradigm, priming modality, creativity task type, creativity task modality, and creativity indicator. In the first section, we also test whether the overall effect differs between the four priming mechanism categories and in the four later sections whether effects sizes differ among subcategories.

Overall effect size and heterogeneity

We conducted a multi-level meta-analysis, including effects that were coded into any of the four categories, but excluding effects that were coded as “other”. We found a significant small to medium (Cohen, 1988) positive effect size, Hedge’s $g = 0.29$ ($SE = 0.03$), 95% CI[0.22, 0.35]. The test for heterogeneity was significant ($Q(406) = 1542.61, p < .001$). The proportion of unexplained variance was high ($I^2 = 78.23\%$), and could be mostly attributed to differences between studies (level 3, 50.54%). A smaller percentage of unexplained variance (30.46%) could be attributed to differences within studies (level 2). This high total heterogeneity probably reflects the highly diverse methodologies and hypotheses tested by priming studies.

Additionally, we tested whether a three-level model fit the data better than a two-level model. Using the “metafor” package for R (Viechtbauer, 2010), we computed a two-level model and compared the two models using the “anova” function. We confirmed that the three-level model had a better fit: The Akaike (AIC) and Bayesian Information Criterion

(BIC) were lower for this model ($AIC_{3\text{-level}} = 523.22$, $AIC_{2\text{-level}} = 577.61$, $BIC_{3\text{-level}} = 535.24$, $BIC_{2\text{-level}} = 585.62$), and the likelihood ratio test comparing both models was significant ($\chi^2 = 56.39$, $p < .001$), further suggesting better performance of the three-level model (see Table 3). Thus, we used the three-level model in further analyses.

Table 3

Comparison of a Three-level Model with a Two-level Model

Model	<i>df</i>	AIC	BIC	LRT	<i>p</i>	QE
Full model (three-level)	3	523.22	535.24			1,542.61
Reduced model (two-level)	2	577.61	585.62	56.39	< .001	1,542.61

Note. Lower AIC and BIC indicate favorable performance of the model. AIC: Akaike Information Criterion; BIC: Bayesian Information Criterion; LRT: likelihood ratio test; QE: test statistic of the test for heterogeneity.

Publication bias

Effect sizes in our data were widely spread around the mean pooled effect size, independent of the standard error (see Figure 2a). We observed a rectangular rather than triangular shape, which was flat at the top. This is unusual, because studies with bigger samples and smaller standard error should be more precise in estimating the underlying true effect size. This likely is a consequence of the diversity of included studies, and suggests that there may be more than one true effect size underlying these results. Egger's regression test with Pustejovsky and Rodgers (2019) correction confirmed that the funnel plot is asymmetric ($z = 5.51$, $p < .001$, $b = -0.15$, 95% CI[-0.31, 0.01]). Additionally, a contour-enhanced funnel plot showed that many effects, especially positive ones, were clustered between $p < .05$ and $p < .01$ (see Figure 2b). It is possible that "just significant" results are published more often than non-significant or "highly significant" (i.e., $p < .001$) results, which might indicate publication bias (Peters et al., 2008).

Figure 2a

Funnel Plot Showing the Hedges' g Effect Size on the x-Axis, and the Standard Error of Hedges' g Effect Size on the y-Axis (all included effects)

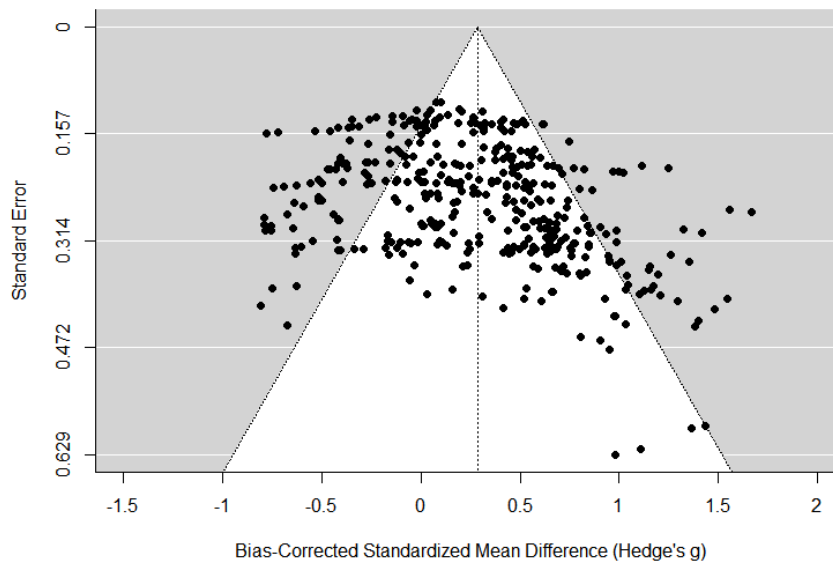
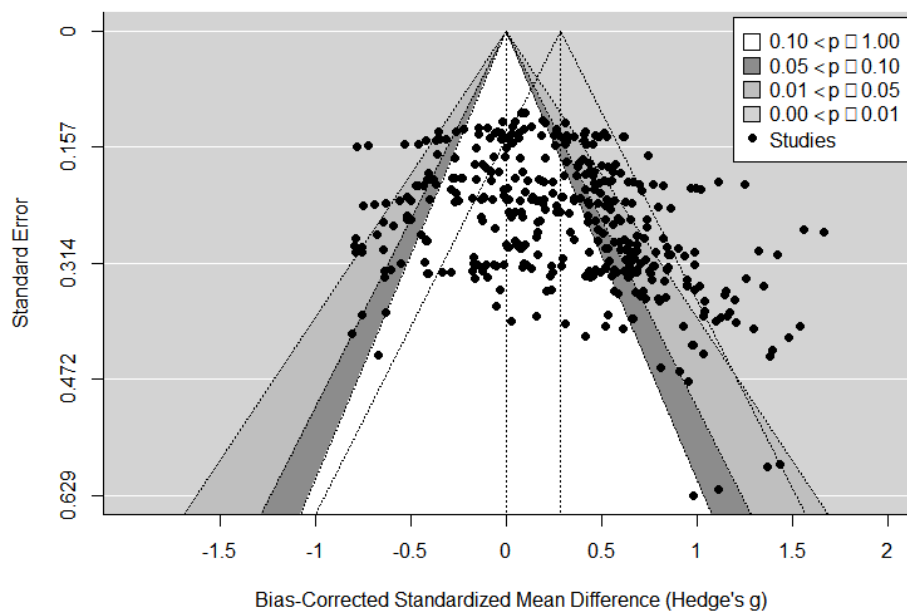


Figure 2b

Contour Enhanced Funnel Plot (all included effects)



Moderation analysis

To test whether the overall effect size differed among the four categories, we dummy coded each of the categories. In all moderation analyses, we used the category with most cases (effects) as the reference group; for this analysis, that was open-mindedness. This analysis indeed showed evidence of moderation, $F(3, 399) = 9.27, p < .001$. The test for heterogeneity was significant, $Q(399) = 1586.41, p < .001$, and there was a high amount of unexplained variance ($I^2 = 80.88\%$). We found that the effect size associated with open-mindedness was significantly larger than all other categories; $ps < .001$ (see Table 4). Specifically, open-mindedness had an effect size significantly different from zero, $g = 0.45$, 95% CI[0.35, 0.54], $p < .001$, while confidence intervals for all other categories included zero. In other words, overall there was a positive priming effect for those studies priming open-mindedness, but not for studies priming any of the other categories.

Table 4

Bias-corrected Effect Size Estimates (g), 95% Confidence Intervals and Numbers of Included Effects (k) for the Category of the Priming Mechanism

Category of the priming mechanism	<i>g</i>	95% CI	<i>k</i>
open-mindedness	0.45	[0.35, 0.54]	255
uniqueness*	0.17	[-0.10, 0.43]	58
abstraction*	0.06	[-0.24, 0.37]	49
unconstrained thought*	-0.00	[-0.34, 0.33]	45

Note: * the effect size differs from the reference group (open-mindedness) with $p < .05$. For uniqueness: 95% CI_{difference} [-0.46, -0.1]; for abstraction: 95% CI_{difference} [-0.59, -0.17]; for unconstrained thought: 95% CI_{difference} [-0.69, -0.21].

Exploratory moderation analyses

Creativity task modality

Creativity task modality was a significant moderator, $F(3, 399) = 3.06, p = .028$. All modalities (except from the studies we were not able to code, NA/other) had positive, significant effect sizes (verbal: $g = 0.25, p = .001, 95\% \text{ CI}[0.17, 0.34]$, figural: $g = 0.61, p = .009, 95\% \text{ CI}[0.26, 0.95]$, multimodal: $g = 0.41, p = .055, 95\% \text{ CI}[0.16, 0.65]$). Interestingly, using the largest category (verbal tasks) as reference group, the only effect that significantly differed from this was that for figural tasks ($p_{\text{difference}} = .009, 95\% \text{ CI}[0.09, 0.61]$, see Table 5), which showed a larger effect size.

Nonsignificant moderators

None of the factors priming paradigm ($F(4, 398) = 0.57, p = .687$), priming task modality ($F(2, 400) = 0.23, p = .794$), creativity task type ($F(4, 398) = 1.26, p = .284$), and creativity indicator ($F(6, 396) = 0.84, p = .543$) moderated the effects of priming on creativity.

Table 5

Bias-corrected Effect Size Estimates (g), 95% Confidence Intervals and Numbers of Included Effects (k) for Creativity Task Modality

Creativity task modality	<i>g</i>	95% CI	<i>k</i>
verbal	0.25	[0.17, 0.34]	268
figural*	0.61	[0.26, 0.95]	22
multimodal	0.41	[0.16, 0.65]	90
NA/other	0.20	[-0.11, 0.52]	27

Note. * the effect size is significantly different from the reference group (verbal) with $p < .05$. For figural: 95% $\text{CI}_{\text{difference}}$ [0.09, 0.61]; for multimodal: 95% $\text{CI}_{\text{difference}}$ [0, 0.31]; for NA/other: 95% $\text{CI}_{\text{difference}}$ [-0.28, 0.18].

Unconstrained thought

Overall effect and heterogeneity

Hypothesis 1a predicted that unconstrained thought would lead to higher creativity than control conditions or to conditions in which thought is constrained. However, and inconsistent with this hypothesis, a multi-level meta-analysis on the effects coded into the unconstrained thought category revealed a small (Cohen, 1988) and non-significant negative effect size, Hedge's $g = -0.01$ ($SE = 0.1$), 95% CI[-0.21, 0.2]. The test for heterogeneity was significant, $Q(44) = 156.45$, $p < .001$, with a high amount of unexplained variance ($I^2 = 76.96\%$), most of which could be attributed to differences between studies (level 3, 50.91%). A smaller percentage of unexplained variance (26.05%) was due to differences within studies (level 2). Figure D1 in Appendix D shows a graphical illustration of effect sizes and their confidence intervals, and suggests that a number of effect sizes were negative (i.e., a negative effect of unconstrained thought, or a positive effect of constrained thought; see below).

Publication bias

Because we observed high heterogeneity ($I^2 = 76.96\%$), we will only present exploratory results of a funnel plot and Egger's regression test. Effect sizes were spread around the mean effect size symmetrically, forming the expected funnel shape (see Figure E1a in Appendix E). Other than a few large effect sizes, most of the positive effects had counterparts below the mean effect size. Egger's regression test with Pustejovsky and Rodgers (2019) correction did not support an asymmetric funnel plot ($z = 1.27$, $p = .205$, $b = -0.3$, 95% CI[-0.82, 0.22]). Additionally, a contour-enhanced funnel plot did not reveal effects clustered in the "just significant" area (see Figure E1b in Appendix E).

Moderation analyses

Priming paradigm. Although we had expected active task performance (performing priming paradigm) to elicit stronger effects than all other priming paradigms (H1b), our moderation analysis showed that priming paradigm was not a significant moderator, although there was a slight trend in that direction ($F(2, 42) = 2.82, p = .071$). However, our sample did not allow for a reliable test of moderation: other than 26 effects coded as “performing”, we were unable to meaningfully code most of the other priming paradigms in our sample (only 1 effect coded as “generating”, and 18 effects coded as “other”).

Creativity task type. We also expected stronger effects for divergent thinking tasks than for the other creativity tasks (H1c). A moderation analysis with divergent thinking (the largest category) set as the reference group revealed evidence of moderation ($F(4, 40) = 2.83, p = .037$); specifically, effect sizes obtained with “other” creativity task types differed significantly from those obtained with divergent thinking tasks ($p_{\text{difference}} = .018, 95\% \text{ CI}[0.18, 1.85]$, see Table 6). However, none of the effect sizes for any of the task types were significantly different from zero ($g = -0.09, SE = 0.14, p = .518, 95\% \text{ CI}[-0.38, 0.19]$). Moreover, since only one effect size was classified as “other”, the significant difference with the reference category probably is not reliable. Given that Table 6 shows a small, non-significant effect size for divergent thinking tasks, H1c is rejected.

Table 6

Bias-corrected Effect Size Estimates (g), 95% Confidence Intervals and Numbers of Included Effects (k) for Creativity Task Type

Creativity task type	<i>g</i>	95% CI	<i>k</i>
divergent thinking	-0.09	[-0.38, 0.19]	31
creative product	0.41	[-0.49, 1.31]	4
insight	-0.12	[-1.04, 0.81]	3
other*	0.93	[-0.19, 2.04]	1
RAT	-0.31	[-0.88, 0.26]	6

Note: * = the effect size is significantly different with $p < .05$ from the reference group (divergent thinking). For creative product: 95% $CI_{\text{difference}}$ [-0.11, 1.12]; for insight: 95% $CI_{\text{difference}}$ [-0.67, 0.62]; for other: 95% $CI_{\text{difference}}$ [0.18, 1.85]; for RAT: 95% $CI_{\text{difference}}$ [-0.5, 0.07].

Creativity indicator. Finally, to test our expectation that that flexibility and originality would show stronger effects than other creativity indicators (H1d), we conducted a moderation analysis for type of creativity indicator used, but found no evidence for moderation, $F(5, 39) = 2.07, p = .09$.

Exploratory analyses

Priming task modality. We did not find evidence for moderation by priming task modality, $F(2, 42) = 0.52, p = .597$.

Creativity task modality. Although we found evidence for moderation by creativity task modality ($F(3, 41) = 4.1, p = .012$), the only category significantly different from the reference group (“verbal”) was the one for effects whose modality could not be coded (“NA”, $p_{\text{difference}} = .019, 95\% CI[-1.82, -0.17]$), suggesting that the difference may not be reliable or meaningful. Additionally, our analysis showed a positive, large effect size for verbal creativity task modality ($g = 0.87, SE = 0.41, p = .042, 95\% CI[0.03, 1.7]$). Confidence intervals of all other task modalities included zero (see Table 7).

Priming mechanism subcategory. Testing whether the effects in this category were moderated by the priming mechanism subcategory showed that this was the case ($F(1, 43) = 5.06, p = .03$). The effect size of broad attention ($g = 0.27$) was significantly larger than that of bottom-up processing ($g = -0.14, 95\% \text{ CI}_{\text{difference}}[0.04, 0.78]$) but confidence intervals of both subcategories included zero (broad attention: $95\% \text{ CI}[-0.3, 0.85]$, bottom-up processing: $95\% \text{ CI}[-0.35, 0.07]$). See Table 8.

Table 7

Bias-corrected Effect Size Estimates (g), 95% Confidence Intervals and Numbers of Included Effects (k) for Creativity Task Modality

Creativity task modality	<i>g</i>	95% CI	<i>k</i>
verbal	0.87	[0.03, 1.7]	38
figural	0.76	[-1.13, 2.65]	1
multimodal	-0.02	[-1.82, 1.77]	2
NA*	-0.13	[-1.79, 1.53]	4

Note: * the effect size is significantly different with $p < .05$ from the reference group (verbal). For figural: $95\% \text{ CI}_{\text{difference}}[-1.16, 0.95]$; for multimodal: $95\% \text{ CI}_{\text{difference}}[-1.85, 0.07]$; for NA: $95\% \text{ CI}_{\text{difference}}[-1.82, -0.17]$.

Table 8

Bias-corrected Effect Size Estimates (g), 95% Confidence Intervals and Numbers of Included Effects (k) for Priming Mechanism Subcategory

Priming mechanism subcategory	<i>g</i>	95% CI	<i>k</i>
bottom-up processing	-0.14	[-0.35, 0.07]	24
broad attention*	0.27	[-0.30, 0.85]	21

Note: * = effect size differs from bottom-up processing with $p < .05$. $95\% \text{ CI}_{\text{difference}}[0.04, 0.78]$.

Qualitative analysis of negative effect sizes

Overall, the results regarding unconstrained thought suggest a non-significant and heterogeneous effect. The large heterogeneity was caused by the presence of positive as well as negative effects. To explain these findings, we inspected more closely the studies classified as “bottom-up processing” that resulted in negative effect sizes (e.g., in which constrained thought led to *higher* creativity than unconstrained thought). In some of these studies, participants performed a task with or without restrictions (F. C. Chiu, 2014; F. C. Chiu et al., 2017). In other studies, before measuring creativity, researchers asked participants to perform another task with specified step-by-step instructions or without them (Fan, 2018; Moreau & Engeset, 2016; Park et al., 2019). Therefore, in these studies, constrained thought was primed more actively, by adding restrictions, while unconstrained thought implied that these restrictions did not apply.

One explanation is that unconstrained thought cannot be activated by removing or not having constraints, but that it needs to be primed by the active processing of bottom-up stimuli. A closer inspection of the studies classified as “broad attention” supports this explanation: broad attention manipulations resulted in higher creativity than focused attention or control manipulations, but control manipulations did not result in higher creativity than focused attention manipulations (Baas et al., 2014; Colzato et al., 2012, 2017; Ostafin & Kassman, 2012). A related possibility is that constrained and unconstrained thought may work through different mechanisms. Actively priming unconstrained thought may activate a state of broad attention, which carries over onto a subsequent creativity task. However, actively constraining people may create a motivational state that does not carry over, but rather, results in a rebound effect. For example, building a Lego figure with a step-by-step instruction may temporarily create a state of heightened top-down control. As soon as the task is over, control may be released, which may result in a state of relaxed cognitive control.

To test this, we coded unconstrained thought manipulations into three types. Active constrained thought was coded when the restrictions imposed in the constrained thought condition were not present in the other condition. Active unconstrained thought was coded when active priming of bottom-up processing or broad attention was not present in the control condition. Active unconstrained vs. active constrained thought was coded when both conditions were actively primed.

We found evidence for assimilation effect of unconstrained thought *as well as* contrast effect of constrained thought. Test of moderators was significant, $F(2, 42) = 19.78, p < .001$ and the effect size associated with active constrained thought ($g = -0.30$) was negative and significantly different from active unconstrained thought ($g = 0.75$), and from active unconstrained vs. active constrained thought ($g = 0.36$), $ps < .001$ (see Table 9). Thus, the effect size for constrained thought was negative and significant, suggesting that introducing rules and constraints in one task can *boost* creativity (rather than harm it) in a subsequent task. However, the opposite effect— of active unconstrained thought — was positive and significant, showing that active processing of bottom-up stimuli and broadening attention can also be conducive to creativity. Additionally, including this moderator drastically decreased heterogeneity: I^2 dropped from 76.96% in the overall analysis to 58.99% in this analysis, with most heterogeneity coming from the variance between studies (level 3, 56.64%). We will return to this important result in the discussion.

Table 9

Bias-corrected Effect Size Estimates (g), 95% Confidence Intervals and Numbers of Included Effects (k) for Manipulation Type (Unconstrained thought)

Manipulation type	<i>g</i>	95% CI	<i>k</i>
active constrained thought	-0.30	[-0.49, -0.11]	25
active unconstrained thought*	0.75	[0.18, 1.33]	5
active unconstrained vs. active constrained thought*	0.36	[-0.11, 0.84]	15

Note: * = the effect size is significantly different with $p < .05$ from the reference group (active constrained thought).

Abstraction

Overall effect and heterogeneity

Hypothesis 2a predicted a positive effect of abstraction priming relative to control conditions. For the subset of effects coded into the abstraction category, we found a small and non-significant positive effect size, Hedge's $g = 0.18$ ($SE = 0.11$), 95% CI[-0.04, 0.40], and Hypothesis 2a is rejected. The test for heterogeneity was significant, $Q(48) = 190.36$, $p < .001$, with a high amount of unexplained variance ($I^2 = 80.94\%$), most of which could be attributed to differences between studies (level 3, 48.54%). A smaller percentage of unexplained variance (32.4%) could be attributed to differences within studies (level 2). See Figure D2 in Appendix D for a Forrest plot of effect sizes and their confidence intervals.

Publication bias

Because we observed very high heterogeneity ($I^2 = 80.94\%$), we only present exploratory results of a funnel plot and Egger's regression test. An Egger's regression test with Pustejovsky and Rodgers (2019) correction did not provide evidence for an asymmetric

funnel plot ($z = 0.84, p = .401, b = -0.12, 95\% \text{ CI}[-0.82, 0.58]$). A contour-enhanced funnel plot did not show signs of publication bias (see Figures E2a and E2b in Appendix E).

Moderation analyses

Priming paradigm. Although we expected that effects in this category should be stronger for performing priming manipulations than for other manipulations (H2b), we did not find evidence for moderation by priming paradigm ($F(4, 44) = 0.29, p = .883$).

Creativity task type. We expected that effects in the abstraction category would be stronger for divergent thinking tasks, RAT and insight performance (H2c). However, we did not find evidence for moderation by creativity task type ($F(4, 44) = 2.01, p = .11$).

Creativity indicator. Similarly, we predicted that flexibility, RAT and insight indicators would show stronger effects of abstraction priming than all other indicators (H2d). However, even though creativity indicator significantly moderated the effects of abstraction priming on creativity, $F(5, 43) = 9.48, p < .001$, we did not find the expected differences. In fact, confidence intervals of all the creativity indicators included zero (see Table 10). It seems that the significant moderation effect was driven by the composite indicator, whose effect size was significantly different from that of originality ($p_{\text{difference}} = .012, 95\% \text{ CI}[0.22, 1.61]$).

Table 10

Bias-corrected Effect Size Estimates (g), 95% Confidence Intervals and Numbers of Included Effects (k) for Creativity indicator

Creativity indicator	<i>g</i>	95% CI	<i>k</i>
originality	-0.01	[-0.28, 0.26]	15
composite*	0.90	[-0.06, 1.86]	5
flexibility	-0.04	[-0.65, 0.56]	3
fluency	-0.06	[-0.55, 0.44]	11
insight	-0.12	[-1.01, 0.78]	9
RAT	-0.26	[-0.86, 0.34]	6

Note: * = effect size differs from the reference group (originality) with $p < .05$; for composite: 95% CI_{difference}[0.22, 1.61]; for flexibility: 95% CI_{difference} [-0.37, 0.31]; for fluency: 95% CI_{difference} [-0.27, 0.18]; for insight: 95% CI_{difference} [-0.73, 0.52]; for RAT: 95% CI_{difference} [-0.58, 0.08].

Exploratory analyses

Nonsignificant moderators. Neither priming task modality ($F(2, 46) = 2.92, p = .064$) nor creativity task modality ($F(3, 45) = 0.46, p = .712$) moderated the effects of abstraction priming on creativity.

Priming mechanism subcategory. The effects of abstraction priming on creativity depended on priming mechanism subcategory ($F(4, 44) = 4.53, p = .004$). Specifically, the only subcategory of abstraction that had a significant, positive effect size was temporal distance ($g = 0.21, SE = 0.1, p = .048, 95\% CI[0, 0.41]$), although this effect was small (Cohen, 1988). All other effect sizes contained zero, but only the effect size for social distance significantly differed from that of temporal distance ($p_{difference} = .24, 95\% CI[-0.26, 10]$). See Table 11.

Table 11

Bias-corrected Effect Size Estimates (g), 95% Confidence Intervals and Numbers of Included Effects (k) for Priming Mechanism Subcategory

Priming mechanism subcategory	<i>g</i>	95% CI	<i>k</i>
temporal distance	0.21	[0, 0.41]	29
abstraction of semantic categories	0.57	[-0.12, 1.26]	6
social distance*	-0.61	[-1.3, 0.08]	5
spatial distance	0.58	[-0.25, 1.4]	3
visual global processing	0.20	[-0.42, 0.83]	6

Note: * = effect size differs with $p < .05$ from the reference group (temporal distance). For abstraction of semantic categories: 95% CI_{difference}[-0.12, 0.85]; for social distance: 95% CI_{difference}[-1.30, -0.33]; for spatial distance: 95% CI_{difference}[-0.26, 1.0].

Qualitative analysis of negative effect sizes

The effect size for abstraction priming was non-significant, and demonstrated large heterogeneity (including positive and negative effect sizes). To explain these findings, we more closely inspected the studies with negative effect sizes (e.g., in which abstraction led to lower creativity than concreteness). What is most noteworthy is one cluster of negative effect sizes in the subcategory of social distance. In these studies, participants wrote about themselves (low social distance) or another person's (high social distance) multiple identities (vs. an average day; Gaither et al., 2015), or performed a manipulation (an atypical behavior) themselves or watched someone else perform it (Ritter et al., 2012). Although there is meta-analytic evidence that social distance increases abstraction (Soderberg et al., 2015), these manipulations also prime other things, such as multiple identities and atypical activities. Higher social distance may make the effects of the other manipulation less personally relevant, and thus, weaker, while lower social distance may facilitate higher engagement in

the manipulation task and produce stronger effects. There is also a possibility that focusing on the self may not prime low social distance.

To test how social distance affects the meta-analytic effect size for abstraction, we reran the analysis excluding comparisons coded as “social distance”, and found a small to medium (Cohen, 1988) positive effect size, Hedge’s $g = 0.28$ ($SE = 0.09$), 95% CI[0.1, 0.46]. Test for heterogeneity was significant, $Q(43) = 145.8$, $p < .001$, and there was a high amount of unexplained variance ($I^2 = 74.26\%$). In contrast to the analysis including “social distance”, a much smaller percentage of unexplained variance could be attributed to differences between studies (level 3, 22.31%, compared to 48.54% in the full model). Larger percentage of unexplained variance (51.95%) could be attributed to differences within studies (level 2). Thus, excluding “social distance” from the abstraction meta-analysis drastically reduced between-study variance, suggesting that social distance may not be a reliable way of inducing abstraction. This also suggests support for Hypothesis 2a when social distance is not taken into consideration.

Uniqueness

Overall effect and heterogeneity

A multi-level meta-analysis on the subset of effects coded into the uniqueness category revealed a small (Cohen, 1988) positive effect size, Hedge’s $g = 0.19$ ($SE = 0.08$), 95% CI[0.02, 0.35], confirming Hypothesis 3a. The test for heterogeneity was significant, $Q(57) = 246.32$, $p < .001$, with a high amount of unexplained variance ($I^2 = 83.73\%$), most of which could be attributed to differences between studies (level 3, 74.5%). A smaller percentage of unexplained variance (9.23%) could be attributed to differences within studies (level 2). See Figure D3 (Appendix D) for Forrest plots of effect sizes and their confidence intervals.

Publication bias

As in the previous categories, because we observed very high heterogeneity ($I^2 = 83.73\%$), we will only present exploratory results of a funnel plot and an Egger's regression test. Similarly to the other categories, the Egger's regression test with Pustejovsky and Rodgers (2019) correction did not yield evidence of an asymmetric funnel plot ($z = -0.46$, $p = .644$, $b = 0.33$, 95% CI[-0.09, 0.74]), and a contour-enhanced funnel plot did not reveal signs of publication bias (see Figure E3a and E3b in Appendix E).

Moderation analyses

Creativity task type. We had expected uniqueness priming to be particularly effective for creative product tasks (H3b); however, we found no evidence of such moderation ($F(3, 54) = 0.3$, $p = .825$).

Creativity indicator. We further anticipated that the effects of uniqueness priming would be stronger for fluency and originality indicators (H3c). However, we found no evidence for such moderation ($F(5, 52) = 0.24$, $p = .942$).

Exploratory analyses

Nonsignificant moderators. None of the factors priming paradigm ($F(4, 53) = 1.74$, $p = .155$), priming task modality ($F(2, 55) = 0.1$, $p = .907$), creativity task modality ($F(3, 54) = 1.31$, $p = .282$), or priming mechanism subcategory ($F(1, 56) = 3.64$, $p = .062$) moderated the effects of uniqueness priming on creativity.

Qualitative analysis of negative effect sizes

As previously, we inspected the studies with negative effect sizes, and found that all of them were coded as individualism. Operational criteria for coding a study as individualism included freedom, self-sufficiency, and control over one's life (see individualism-collectivism scales, Oyserman et al., 2002). Thus, a manipulation was coded as individualism when it primed abundance (vs. scarcity; Mehta & Zhu, 2016), competition (vs. cooperation; Bittner et

al., 2016) or high power (vs. low power, Sligte et al., 2011). One explanation of these negative effects may be that, similar to unconstrained thought, priming individualism may result in both carry-over and rebound effects. For example, thinking about growing up with scarce resources may activate a motivational state, such as need for achievement and control, which may subsequently facilitate performance in the creativity task. Similarly, competing or being in power may activate a transient individualism mindset, but as soon as the task is completed, the need to be individualistic may not be salient any more. Future research should carefully study when uniqueness, and especially individualism primes, lead to carry-over vs. rebound effects.

Open-mindedness

Overall effect and heterogeneity

Consistent with Hypothesis 4a, a multi-level meta-analysis on the subset of effects coded into the open-mindedness category revealed a small to medium (Cohen, 1988) positive effect size, Hedge's $g = 0.37$ ($SE = 0.04$), 95% CI[0.29, 0.45]. The test for heterogeneity was significant, $Q(254) = 902.32$, $p < .001$, with a high amount of unexplained variance ($I^2 = 74.24\%$), most of which could be attributed to differences between studies (level 3, 41.61%). A smaller percentage of unexplained variance (32.63%) could be attributed to differences within studies (level 2). See Figure D4 in Appendix D for a graphical illustration of effect sizes and their confidence intervals.

Publication bias

Because we observed very high heterogeneity ($I^2 = 74.24\%$), we will only present exploratory results of a funnel plot and an Egger's regression test. The effect sizes in this category form a rectangular rather than triangular shape (see Figure E4a in Appendix E). Effect sizes with smallest standard error in the sample are widely spread around the mean

effect size, similar to effect sizes with larger standard errors. Some effects with large standard error and large, positive effect sizes do not have counterparts on the negative side of the plot. Indeed, the Egger's regression test with Pustejovsky and Rodgers (2019) correction confirmed that the funnel plot was asymmetric ($z = 5.48, p < .001, b = -0.18, 95\% \text{ CI}[-0.38, 0.02]$). Additionally, a contour-enhanced funnel plot revealed a high concentration of studies in the $.05 < p < .01$ area (see Figure E4b in Appendix E). Many of the effects are situated on the line representing $p = .05$, suggesting that the literature of studies priming open-mindedness is potentially biased.

Moderation analyses

Creativity task type. We expected that open-mindedness manipulation would be particularly effective for divergent thinking, insight, and RAT tasks (H4b). However, we did not find evidence for a moderation of open-mindedness priming effects by creativity task type ($F(4, 246) = 0.21, p = .932$).

Creativity indicator. We predicted that open-mindedness priming would show stronger effects on originality, flexibility, insight and RAT than on other indicators (H4c). Contrary to these expectations, creativity indicator did not moderate the effects of priming on creativity ($F(6, 248) = 0.43, p = .856$).

Exploratory analyses

Nonsignificant moderators. None of the factors priming mechanism ($F(2, 252) = 0.93, p = .397$), priming paradigm ($F(4, 246) = 0.3, p = .88$), priming task modality ($F(2, 248) = 0, p = .997$) and creativity task modality ($F(3, 247) = 1.33, p = .266$) moderated the effects of open-mindedness on creativity.

Qualitative analysis of negative effect sizes

As previously, we more closely inspected the studies that resulted in negative effect sizes (e.g., in which closed-mindedness led to higher creativity than open-mindedness). These studies manipulated counterfactual thinking (Kray et al., 2006; Markman et al., 2007), multiple social identities (Gaither et al., 2015), and multiculturalism (Leung & Chiu, 2010). A common feature of these studies is that open-mindedness was defined in several different ways and not all of them were expected to facilitate creativity. For example, Markman et al., (2007) differentiated between subtractive and additive counterfactuals, and made differential hypotheses depending on the creativity task type. However, in our coding, both types of counterfactuals were coded as facilitating open-mindedness. Therefore, it is likely that other factors for which we did not control obscured the moderation effects for creativity task type

and creativity indicator. A more fine-grained conceptualization of open-mindedness subcategories in the future research might contribute to a better understanding of how open-mindedness interacts with creativity.

Discussion

People's ability to generate new and useful ideas (creativity) can dramatically vary from person to person and from moment to moment. Thus, not everybody is a creative genius and all people, whether they are highly creative or not, will experience times in which their creativity peaks and times in which it dwindles. Indeed, creativity depends on relatively long-lasting environmental factors, such as work demands and job characteristics (see e.g., Anderson et al., 2014), but also on short-term psychological states (e.g., Baas et al., 2008). This paper was concerned with these fleeting and short-term effects on creativity and had two broad goals. First, we aimed to develop theory about which transient psychological states can explain these short-term effects on human creativity. Second, we wanted to provide an initial test of our ideas using a meta-analysis of studies that used priming methodology to investigate the effects of transient psychological states on creativity. We now evaluate these two aims in turn.

Theory Development

We developed a set of four mechanisms that are strongly rooted in psychological theories (see Table 1 for an overview): unconstrained thought, abstraction, uniqueness and open-mindedness. Our requirement was that each mechanism can plausibly be triggered by environmental stimuli, and each should be plausibly related to creative functioning. We believe that a main advantage of this approach is that it achieves coherence (and parsimony) in the field of incidental effects on creativity, which is characterized by a wide variety of manipulations, assumed mechanisms, and creativity measures. In reflecting on this theoretical framework, a few issues deserve attention.

The first main issue is whether the four proposed mechanisms provide a good representation of temporary psychological states that relate to creativity. Questions are whether mechanisms are independent (versus overlapping), whether any important mechanisms are missing, and whether we combined into one category mechanisms that are in fact different.

We believe, firstly, that it is unlikely that these mechanisms are completely unrelated. Take open-mindedness as an example. We proposed that open-mindedness is related to creativity partly because openness has an association with default network functioning (DeYoung, 2015) and reduced latent inhibition (Peterson & Carson, 2000; Peterson et al., 2002). Both these processes also operate in unconstrained thought. Further, we proposed that promotion focus is associated with openness, but promotion focus also has links with uniqueness. In promotion focus, people are concerned with achieving their (individual) hopes and aspirations (Higgins, 1997), and because these are (or can be) individual and idiosyncratic, they may trigger the motivation to express one's unique identity. Additionally, we do not exclude the possibility that different priming mechanisms trigger a similar overarching state, such as a broad state of mind (Herz et al., 2020). Despite these overlaps and similarities, distinguishing between priming mechanisms may bring some crucial benefits. For example, when creativity is needed, the four mechanisms can be viewed as *resources* that may be easier or more difficult to draw upon depending on the (work) context, personal situation, personality traits, or even culture. Based on our review, these resources include the ability to broadly observe basic properties of the environment, to abstract prototypical characteristics of objects and situations, to propose one's own unique ideas despite norms and restrictions, and to draw inspiration from novelty and unusual perspectives.

Consequently, the set of four mechanisms may be not exhaustive, and other fleeting states may influence creativity. For example, in recent years an approach to creativity has gained momentum that sees creativity as a paradoxical phenomenon that is characterized by conflicting demands and tensions (e.g., Bledow et al., 2009; Potocnik et al., 2022, for an overview). According to this perspective, creativity involves competing demands (e.g., be original *and* practical; Miron-Spektor et al., 2018; Miron-Spektor, Gino, et al., 2011; Rietzschel et al., 2019), can be stimulated by both autonomy *and* constraints (e.g., Acar et al., 2019), and involves conflicting mental processes (e.g., flexibility *and* persistence; Nijstad et al., 2010). To deal with these tensions, it has been proposed that people need a paradox mindset (Miron-Spektor et al., 2018; also see Kleiman & Enisman, 2018), which refers to an open-minded state of embracing uncertainty and synthesizing contradicting elements. This mindset can be activated as a temporary mental state (see Miron-Spektor et al., 2011), and could therefore be seen as a separate fifth mechanism. However, it could also fall under the more general category of open-mindedness, assuming that it triggers a switch in perspective and knowledge restructuring (which is how we treated it). Nonetheless, it cannot be excluded that other mechanisms exist that cannot be easily captured by our four mechanisms.

It may also be the case that we subsumed within our categories mechanisms that are, in fact, distinct. For example, based on construal level theory (Trope & Liberman, 2010), we assumed that psychological distance effects could be subsumed under the broader category of abstraction, which may or may not be fully justified. Similarly, we categorized promotion focus in the category of open-mindedness, even though the phenomenological state of promotion focus may have unique attributes that are not captured by the general state of open-mindedness. Our reason for doing so was that effects appeared to rely on similar mechanisms, and that we strived for a limited number of categories for reasons of parsimony.

Altogether, future studies can systematically examine whether the current set of mechanisms shows consistent effects on (different aspects of) creativity.

A second main issue is that our four mechanisms are biased towards originality to the neglect of usefulness. That is, each of the mechanisms can potentially trigger novelty and originality, but is not in particular aimed at balancing originality with usefulness. Sometimes it may even be the case that the opposite psychological state may be positively related to usefulness. For example, evaluating the usefulness of ideas has been proposed to rely on the coupling of default (resting) and executive (control) networks in the brain, in contrast to generating alternative ideas, which relies more heavily on the default mode network (related to more unconstrained thought, Beaty et al., 2016). On the other hand, it is not uncommon for creativity theories to focus on originality as an outcome, and originality is perhaps a more defining attribute of creativity than usefulness (with usefulness often only established after the fact, when others agree to the value of an idea; see e.g., Csikszentmihalyi, 1999). It is also important to note that in (organizational) practice, usefulness and originality do not need to be achieved in the same moment, the same psychological state, or even by the same person (cf. To et al., 2021).

In sum, the advantages of our approach are (1) that it resulted in a relatively parsimonious set of four mechanisms; (2) that these mechanisms are rooted in basic psychological theories; (3) that there is evidence that these mechanisms can be triggered by situational variables and are reliably related to creativity; and (4) that it provides an overarching agenda for future priming research. Thus, we cannot and do not maintain that this review will be the definitive answer to the question: which transient psychological states affect human creative functioning? It is, however, a start.

Priming Creativity

One way to examine how creativity can fluctuate over time, and how fleeting psychological states may influence it, is to use priming methods. Many studies have used such methods; the current study systematically analyzed 83 papers (with 234 effect sizes) that examined the effects of priming on creativity. The main issue with this literature, however, is that it is methodologically very diverse, which makes it hard to draw broader conclusions on results and the underlying mechanisms. In an attempt to improve our understanding of priming effects, we coded priming manipulations according to the four mechanisms that we identified (i.e., unconstrained thought, abstraction, uniqueness, and open-mindedness) and meta-analyzed the studies that fell into one of these categories. We also qualitatively assessed patterns of results, and tried to explain inconsistencies and emerging patterns.

We will first review our general findings and the findings with regard to each of the four mechanisms, and evaluate their usefulness in explaining the priming literature. We will then draw broader conclusions and propose a systematic way of conducting priming studies in future research on creativity.

Main overall results

About half of the effect sizes in our database (234 out of 447, or 52%) could be reliably assigned to one of our four mechanisms, with open-mindedness being the largest category by far (66% of coded effect sizes). We found a positive overall effect of priming on creativity, but also that effect sizes differed across theoretical categories (with a stronger effect for open-mindedness than for other categories). However, and perhaps more importantly, effect sizes were very heterogeneous and – based on our coding of studies – many effect sizes were negative. We believe that this heterogeneity provides important information about how priming may affect transient psychological states, and how these

states, in turn, may influence creativity. In fact, more fine-grained analyses within each of the four categories yielded important insights.

Results for the four categories

Unconstrained thought

The first of our proposed mechanisms is unconstrained thought: relaxing cognitive control, activating bottom-up processing, and inducing broad awareness. Despite the large body of theoretical work on cognitive control and creativity (Amer et al., 2016; Chrysikou, 2019; Chrysikou et al., 2014; Kolańczyk, 2011; Lippelt et al., 2014; Zhang et al., 2020), studies priming unconstrained thought turned out to be relatively rare (eleven articles) and inconsistent (they showed high heterogeneity). Probably because of this, the overall effect in this category was non-significant. We found no evidence for our moderation hypotheses regarding the nature of the priming paradigm and the creativity tasks and indicators.

To explore these null findings, we distinguished between different types of manipulations (actively unconstrained thought and actively constrained thought). We conducted a follow-up moderation analysis, with striking results. As compared to control conditions, both actively unconstrained thought (e.g., actively engaging participants in bottom-up processing or open monitoring meditation) and actively *constrained* thought (i.e., actively constraining people in a prior task, before measuring their creativity) stimulated creativity. One possible explanation is that constraining thought in one task leads to a rebound, rather than a carry-over effect (Bless & Burger, 2016), which would then manifest as unconstrained thought in the subsequent creativity task. Another possibility is that constraining the thinking process in one task elicits a certain motivation that energizes people to perform the creativity task. A final possibility is that active unconstrained thought manipulations enhance cognitive flexibility, whereas actively constraining thought processes stimulates cognitive persistence (i.e., sustained and focused attention); according to the dual

pathway to creativity model, both these pathways can eventually lead to creativity (see Nijstad et al., 2010). Future research should investigate which specific mechanisms are responsible for these effects.

Abstraction

The second mechanism we proposed was abstraction: priming broad, inclusive, and abstract semantic categories and mental representations or activating abstract, high-level construal. Largely rooted in construal level theory (Burgoon et al., 2013; Trope & Liberman, 2010), this category included effect sizes from thirteen articles. The overall effect size for abstraction priming was non-significant, most likely due to high heterogeneity and a small sample. Similar to the previous category, none of our moderation hypotheses regarding priming paradigms, creativity tasks and indicators were supported.

However, a significant moderation by subcategories gave us an insight into possible reasons for the non-significant overall effect size. Temporal distance, the largest subcategory ($n = 29$), was the only one with a significant, positive effect size. A negative effect size was found for social distance. Because social distance was often manipulated as part of another manipulation, we tested the effect of excluding social distance manipulations from the abstraction meta-analysis and found that the effect size became positive and significant. Excluding social distance also substantially decreased between-study heterogeneity, further suggesting that social distance did not fit within the abstraction category, especially when in combination with another manipulation. Thus, it seems that abstraction has a positive effect on creativity, but the relationship between social distance and creativity is more complex.

Uniqueness

Uniqueness was defined as activating the motive of being different from other people, deviating from the conventional norms, and acting as an independent self. This category contained 15 articles, and the majority of the effects was classified as individualism, with

only six effects classified as nonconformity. The overall effect size was small, but it was significant and positive, and the observed heterogeneity was high, especially between studies. None of our moderation hypotheses regarding creative tasks or indicators were supported.

To understand these results, we examined the studies with a negative effect size, and found that all of them were categorized as individualism. One possibility is that these manipulations resulted in a contrast effect rather than a carry-over effect. For example, priming cooperation or group-dependency in one task (i.e., low uniqueness) might have triggered a rebound effect, increasing the need for uniqueness in a subsequent creativity task. This would mean that certain manipulations do not trigger a *state* of feeling unique, but rather, a motivational *deficit* that drives the uniqueness-seeking behavior in a subsequent creativity task (cf. reactance; Brehm & Brehm, 2013). This would be consistent with ideas from optimal distinctiveness theory and theory on the need for uniqueness, which assume that when a sense of uniqueness is thwarted, people are motivated to restore it (see Brewer, 1991, Snyder & Fromkin, 1977). However, it is equally possible that certain manipulations work through a carry-over effect; for example, priming cooperation (i.e., low individualism) may elicit feelings of safety and freedom to experiment, which in turn improves creativity (cf. literature on psychological safety and creativity; Edmondson, 1999; Newman et al., 2017). Thus, future studies should determine what gets primed with uniqueness priming: the state of feeling unique, the need to be unique, or something else.

Open-mindedness

Open-mindedness was the largest priming mechanism category, including effect sizes from 53 articles. We defined open-mindedness as encouraging interest, exploration, and reaching out for new information or offering new information and new perspectives directly. It was the only priming mechanism category with a clearly positive and significant effect size. It also was the only one with evidence of publication bias, with multiple effect sizes just

below $p = .05$. This suggests that the overall effect size of open-mindedness should be treated with caution, as the literature may be missing studies with non-significant effect sizes (i.e., the file-drawer problem). The effects were highly heterogeneous, mostly at the between-study level, although the amount of unexplained within-study heterogeneity was larger than in other categories. We had several moderation hypotheses, but found no support for them.

The high heterogeneity in this category may partly be a consequence of the coding process, such as our decision to code effects regardless of the interaction hypotheses made by the authors. In this category especially, experimental designs were often relatively complex, and often these were studies with unexpected negative effect sizes. Specifically, these studies tested interaction hypotheses (e.g., Chua, 2013; Ritter et al., 2014; Sligte et al., 2013) or used multiple conditions, only one of which was hypothesized to improve creativity (e.g., Huang et al., 2015; Maddux et al., 2010; Markman et al., 2007). On the one hand, this suggests that the state of open-mindedness does not always stimulate creativity, and for some open-mindedness manipulations, boundary conditions may limit or even reverse the effects. On the other hand, it is also possible that these effects work through a different mechanism than open-mindedness, and thus, should not be included in the overarching open-mindedness category. This suggests that we may need a more fine-grained conceptualization of open-mindedness, based on the systematic study of boundary conditions and underlying mechanisms in the future research. Nevertheless, the overall effect was clearly positive, regardless of these issues.

Overall conclusions

Priming studies are extremely heterogeneous

Overall, the finding that stands out is that the effects of priming on creativity are extremely diverse. A clear sign of heterogeneity is that some manipulations undermined rather than stimulated creativity. Another is the high percentage of unexplained variance

between studies and, sometimes, within studies. Lastly, heterogeneity showed up in the fact that roughly half of the included effects could not be unambiguously coded into our proposed categories of priming mechanisms, even though these categories covered as diverse areas of psychology as social cognition, motivational psychology, cognitive neuroscience, and personality psychology.

Some possible reasons for which a big part of the literature was left unclassified was that (1) studies did not prime a clear psychological construct, and that (2) studies were not designed by the authors to find out a fundamental truth about creativity. For example, many of the manipulations were impossible to classify because they were multidimensional interventions rather than priming manipulations of a single construct (e.g., cognitive training, Abraham et al., 2019; episodic memory retrieval, Madore et al., 2016). Other studies could not be classified because they tested theories from other fields that were only loosely connected to the literature on creativity (e.g., forgiveness, Fehr, 2010), or because their relationship to psychological constructs was ambiguous and indirect (e.g., color green, Lichtenfeld et al., 2012; fluid movements, Slepian & Ambady, 2012; love and sex, Förster, Epstude, et al., 2009).

At the same time, the multitude of unclassified studies can be seen as a limitation of our methodology. We coded a manipulation into a category (e.g., visual global processing in abstraction) only if it matched a specific operational example from our coding protocols (e.g., focusing on a big vs. small area of the map; see Appendix B). This limited the number of studies we were able to code, because many (or maybe even most) of the studies were not specifically designed to test one of the four priming mechanisms. This does, however, not imply that one (or more) of the mechanisms did not operate in these studies; rather, this could not unambiguously be established. Given these difficulties, to what extent is the proposed

categorization useful? In the following, we reflect on the limitations and strengths of the proposed priming mechanism categories.

Can the four categories explain the diverse effects of priming on creativity?

Several findings speak to this issue of how useful our approach was to understand priming effects on creativity. First, on the positive side, we were able to categorize more than half of the effect sizes in a limited number of four categories. This suggests that the very diverse methods in priming studies can, in fact, be analyzed at a higher level of abstraction. Also, we need to keep in mind that the effects were often coded based on the descriptions of the experimental procedures alone. In other words, the whole study context, hypotheses, and conceptual background were usually not taken into account in the coding process (although coders could look them up, if needed). In our view, this constitutes a strength of the coding, since it means our process coding was independent from authors' theories and findings, and purely based on a theoretical interpretation of what actually happened in the manipulations. Yet, despite any differences that may have occurred between our coding and authors' expectations, our analysis still resulted in significant positive effect sizes, which indicates that our coding system can indeed effectively synthesize diverse priming effects.

Positive overall effects of uniqueness and open-mindedness also speak in favor of our categorization system. Moreover, although unconstrained thought and abstraction resulted in overall null-effects, we were able to pinpoint the studies that have likely caused this. Thus, even though our initial conceptualization produced consistently positive outcomes in the uniqueness and open-mindedness categories alone, follow-up analysis based on our a priori subcategories (in the case of abstraction) and further theorizing within the framework (in the case of unconstrained thought) allowed us to identify sources of inconsistency. The fact that our initial assumptions about the two categories needed revisions can be seen as an important avenue for future research. Although the proposed categorization system may not be ideal for

a retrospective classification of priming research, we believe it can provide a useful framework for designing future priming studies.

On the more critical side, one may doubt whether coders assigned the included studies to the right priming mechanism categories, and if the decisions made during the coding process were always justified. Coding was a complex process, which sometimes meant multiple iterations of improving the coding criteria and updating the codes. However, we have also ensured that the process was objective and well-documented. For example, coding criteria were not based on our definitions alone, but rather, on existing theories and literature reviews (e.g., on the literature review of abstraction manipulations by Burgoon et al., 2013). To ensure objectivity in the coding process, we developed subcategories for each category (e.g., “nonconformity” and “individualism” in the “uniqueness” category) and established clear operational examples for each subcategory (e.g., “breaking vs. following the rules” for “nonconformity”, see Appendix B). We instructed the coders to assign a study into a category only if it closely resembled one of the listed operational examples. Thus, while coding such a diverse pool of studies into four categories posed a challenge, we ensured that our decisions were based on the literature and verified in multiple ways and by multiple coders.

Another potential issue is that we found no supporting evidence for the moderation hypotheses, and categorizing studies into priming mechanism categories did not clearly reduce the amount of unexplained variance. This may be interpreted as a weakness of the category system, and perhaps its inability to meaningfully synthesize the literature. We see the categories, however, as a first step in creating more coherence and integration in this literature. That in many cases (e.g., in the unconstrained thought and abstraction categories) we could pinpoint a set of studies that was responsible for negative effect sizes and between-study heterogeneity can also be seen as a major step forward. For example, our follow-up

analyses suggested the possibility of rebound effects, which clearly deserves future research attention.

In the next section, we present recommendations for future research and in doing so highlight promising research themes.

Designing successful priming studies using the four priming mechanism categories

Our findings on the priming mechanism categories revealed the blind spots of the current literature on creativity and priming. Rather than concluding with a slightly pessimistic view on the priming and creativity field, we would like to encourage researchers to explore the breadth of exciting new research opportunities. Importantly, our findings can be directly used to improve theorizing, generate new hypotheses, and use more coherent methodology to conduct future studies. Below, we present how each stage of the research process can be conducted and which research themes may yield particularly fruitful outcomes.

- 1. Conceptualization.** It might be useful to consider a broader theoretical framework early on. Whether the focus is on testing a completely novel phenomenon or closely following-up on prior studies, we believe that situating the topic of interest within broader frameworks, such as open-mindedness or unconstrained thought, would bring much progress to the field. If a topic of interest is too far from the four priming mechanisms, it could still be useful to consider the conceptual similarities and differences between the topic of interest and the four priming mechanisms, or look for an alternative broader theory. Some promising areas for further research could be the effects of abstraction, unconstrained thought, and nonconformity on creativity, for which we found surprisingly little evidence.
- 2. Operationalization.** Once the broader theoretical framework is established, we believe it is vital to find an operationalization that is not only clearly and unambiguously linked to the researched construct (content validity), but also reliably found to trigger the

hypothesized mechanism (construct validity). To illustrate, take the example of social distance. Participants may be asked to choose a present for a distant relative (high social distance, high abstraction) or for a close friend (low social distance, low abstraction; (Burgoon et al., 2013). Some useful considerations here may be:

- What are the arguments that choosing a gift for a distant relative (vs. for a close friend) induces the state of higher abstraction? Are there also arguments for the opposite effect? What is empirical evidence for these effects on abstraction? Evidence may be obtained from the prior literature as well as from well-designed manipulation checks (see a thorough guide on manipulation checks by Fiedler et al., 2021).
- How will participants experience the manipulation (i.e., response process; Cook & Beckman, 2006)? For example, participants may think of the gifts for a distant relative from the perspective of what gifts people like to receive in general (vs. specific preferences of a close friend), but might also consider concrete behaviors of a distant relative (vs. personality of a close friend). The distant relative condition would trigger a state of elevated abstraction in the first case and diminished abstraction in the second case. A way to resolve this might be to ask participants to think aloud during the experimental procedure (Ericsson & Simon, 1984).

Overall, it can be useful to gain a deep understanding of how the chosen manipulation activates the construct we intend to research, as this would strengthen the conclusions we can draw from priming studies.

- 3. Type of experimental effect.** One problem we encountered in the process of coding was whether the manipulation results in a state that carries over, if it evokes an opposite state in a subsequent creativity task, or if yet another type of effect is at work. For example,

introducing a priming task with rules or constraints (e.g., writing a story without a certain character, building a LEGO figure according to a step-by-step instruction, sorting beans by color; Chiu et al., 2017; Moreau & Engeset, 2016; Park et al., 2019) may result in at least four types of experimental effects:

- (1) *a carry-over effect*: solving a task with constraints induces a state of constrained thought which carries over onto the subsequent creativity task. This, according to the Dual Pathway to Creativity Model (B. A. Nijstad et al., 2010), should result in a persistent thinking style that increases creativity when motivation is high or decreases it when motivation is low.
- (2) *a rebound (contrast) effect*: solving a task with constraints mobilizes resources and elevates constrained thinking during the priming task. However, once the priming task is completed, cognitive control is released, and thus, thought becomes unconstrained in the subsequent creativity task (e.g., Chiu, 2014; Radel et al., 2015; Taylor, 2021). According to the Dual Pathway to Creativity Model (B. A. Nijstad et al., 2010), this would increase creativity via flexibility pathway.
- (3) *a conscious strategy*: in contrast to the carry-over and rebound effects, solving a task with constraints may elicit a conscious realization that tasks may be limited in certain ways. This observation may inspire to self-impose constraints in the subsequent creativity task and improve performance (e.g., Rietzschel et al., 2014).
- (4) *a motivational effect*: in contrast to the unconstrained task, it is relatively easy to evaluate one's performance in a constrained task (e.g., have I managed to restrict myself from using a specific character when writing this story?). Therefore, successful completion of a constrained (but not unconstrained) task may improve the feeling of efficiency and agency, and thus, improve creative thinking. However, this effect may reverse if the priming task is not completed successfully.

Overall, a variety of experimental effects may play out as a result of using the same manipulation. Bless and Burger (2016) recommend using subtle, subliminal and self-generated primes to trigger a carry-over effect, or blatant, extreme, and external primes to induce a contrast effect. Additionally, several theories proposed that very strong or extreme primes may have a reverse effect on creativity (Förster et al., 2010; Gocłowska et al., 2016; Gutnick et al., 2012); however, this has rarely been tested directly. Thus, designing a line of research specifically aimed to test which of these effects are at work and when may be an intriguing idea for future research.

- 4. Sample size.** Another improvement in researching the effects of priming on creativity would be collecting data from larger samples. We found that many studies in our sample produced large effects despite their small sample sizes; we also observed multiple effects just at the threshold of a significant p-value ($p = .05$). On average, $n = 44$ participants were recruited per group in the included studies, although in many cases we combined results from the second experimental factor, so the actual number of participants per cell was lower. Assuming alpha level = .05 and desired statistical power = 0.8, one should collect $n = 188$ participants to run a study with expected effect size of $g = 0.29$, in line with what we found for the overall sample meta-analysis. To put this in context, Weingarten et al., (2016) recommended collecting $n = 143$ participants per condition, based on the meta-analytic effect size of priming words on behaviors. Thus, it seems that the problem of underpowered studies also occurs in the priming creativity literature (e.g., Button et al., 2013; Ioannidis, 2005) and that the field would benefit from more studies with larger sample sizes, as well as more studies with nonsignificant effect sizes being accepted for publication (Lakens, 2013).
- 5. Methods.** While we found high heterogeneity in included studies, we have also found those studies to be surprisingly homogenous in terms of used methods. In a typical

priming creativity study, manipulation is linguistic and supraliminal, and creativity is measured with a linguistic divergent thinking task. Even though few studies used figural creativity tasks, we found stronger effects for that modality, and it is unclear why certain methods are used more often than others. One reason might be convenience. For example, research groups establish their own practices and continue using tasks that have worked in the past (Brenninkmeijer et al., 2019). However, there may be theoretical reasons for choosing a specific modality. For example, visual modality may be better suited for testing the effects of bottom-up processing, because (visual) perception is more primary and less influenced by top-down processes than language (e.g., Shokrkon & Nicoladis, 2022). Indeed, modality might be a particularly intriguing moderator, as Chen et al., (2020) found larger effects for goals primed visually than linguistically. Therefore, exploring the match between the hypothesized mechanism and choosing the methods more intentionally might be an interesting future research direction.

- 6. Data analysis.** Fluency and originality are used the most often, while flexibility is neglected. Using the full potential of the data may help the field move forward and make findings more comparable across studies.

Conclusion

Incidental psychological states can have sometimes strong effects on human creativity. From previous work we already knew that being in a positive mood helps (Baas et al., 2008), and even a slight alcohol intoxication may be beneficial (e.g., (Benedek et al., 2017; Jarosz et al., 2012)). The current research demonstrates that psychological states characterized by unconstrained thought (but also constrained thought), a tendency towards abstraction (but this is not brought about by social distance manipulations), and the motives to be unique and open-minded can help generate creative ideas, insights, and problem

solutions. Thus, next time creativity is needed, it would be advisable to engage in open monitoring meditation, think about the distant future, see yourself as a unique individual, and think about the positive new things that will happen to you or how you will realize your aspirations.

References

- Abraham, A., Asquith, S., Ahmed, H., & Bourisly, A. K. (2019). Comparing the Efficacy of Four Brief Inductions in Boosting Short-Term Creativity. *Journal of Cognitive Enhancement*, 3(1), 85–93. <https://doi.org/10.1007/s41465-018-0085-0>
- Acar, O. A., Tarakci, M., & van Knippenberg, D. (2019). Creativity and Innovation Under Constraints: A Cross-Disciplinary Integrative Review. *Journal of Management*, 45(1), 96–121. <https://doi.org/10.1177/0149206318805832>
- Allen, V. L., & Levine, J. M. (1969). Consensus and conformity. *Journal of Experimental Social Psychology*, 5(4), 389–399. [https://doi.org/10.1016/0022-1031\(69\)90032-8](https://doi.org/10.1016/0022-1031(69)90032-8)
- Amabile, T. M. (1979). Effects of External Evaluation on Artistic Creativity. *Journal of Personality and Social Psychology*, 37(2), 221–233.
- Amabile, T. M. (1983a). The social psychology of creativity: A componential conceptualization. *Journal of Personality and Social Psychology*, 45(2), 357–376. <https://doi.org/10.1037/0022-3514.45.2.357>
- Amabile, T. M. (1983b). *The social psychology of creativity*. Springer.
- Amabile, T. M. (1996). Creativity in context: Update to “The Social Psychology of Creativity.” In *Creativity in context: Update to “The Social Psychology of Creativity.”* Westview Press.
- Amabile, T. M., Barsade, S. G., Mueller, J. S., & Staw, B. M. (2005). Affect and creativity at work. *Administrative Science Quarterly*, 50(3), 367–403.
- Amabile, T. M., Berglas, S., & Handel, M. (1982). *Social Psychology of Creativity: A Consensual Assessment Technique*.
- Amabile, T. M., & Gitomer, J. (1984). Children’s Artistic Creativity. [Http://Dx.Doi.Org.Proxy-Ub.Rug.Nl/10.1177/0146167284102006](http://Dx.Doi.Org.Proxy-Ub.Rug.Nl/10.1177/0146167284102006), 10(2), 209–215. <https://doi.org/10.1177/0146167284102006>

- Amabile, T. M., & Pratt, M. G. (2016). The dynamic componential model of creativity and innovation in organizations: Making progress, making meaning. *Research in Organizational Behavior*, *36*, 157–183. <https://doi.org/10.1016/j.riob.2016.10.001>
- Amer, T., Campbell, K. L., & Hasher, L. (2016). Cognitive Control As a Double-Edged Sword. *Trends in Cognitive Sciences*, *20*(12), 905–915. <https://doi.org/10.1016/j.tics.2016.10.002>
- Anderson, N., Potočnik, K., & Zhou, J. (2014). Innovation and Creativity in Organizations. *Journal of Management*, *40*(5), 1297–1333. <https://doi.org/10.1177/0149206314527128>
- Asch, S. E. (1955). Opinions and social pressure. *Scientific American*, *193*(5), 31–35. <https://doi.org/10.1038/scientificamerican1155-31>
- Assink, M., & Wibbelink, C. J. M. (2016). Fitting three-level meta-analytic models in R: A step-by-step tutorial. *The Quantitative Methods for Psychology*, *12*(3), 154–174. <https://doi.org/10.20982/tqmp.12.3.p154>
- Baas, M., De Dreu, C. K. W., & Nijstad, B. A. (2008). A meta-analysis of 25 years of mood-creativity research: Hedonic tone, activation, or regulatory focus? *Psychological Bulletin*, *134*(6), 779–806. <https://doi.org/10.1037/a0012815>
- Baas, M., De Dreu, C. K. W. W., Nijstad, B. A., Baas Matthijs, M., De Dreu, C. K. W. W., & Nijstad, B. A. (2011). When prevention promotes creativity: the role of mood, regulatory focus, and regulatory closure. *Journal of Personality and Social Psychology*, *100*(5), 794–809. <https://doi.org/10.1037/a0022981>
- Baas, M., Nevicka, B., & Ten Velden, F. S. (2014). Specific Mindfulness Skills Differentially Predict Creative Performance. *Personality and Social Psychology Bulletin*, *40*(9), 1092–1106. <https://doi.org/10.1177/0146167214535813>
- Baas, M., Nijstad, B. A., Boot, N. C., & De Dreu, C. K. W. (2016). Mad Genius Revisited: Vulnerability to Psychopathology, Biobehavioral Approach-Avoidance, and Creativity.

Psychological Bulletin. <https://doi.org/10.1037/bul0000049>

Baas, M., Roskes, M., Sligte, D., Nijstad, B. A., & De Dreu, C. K. W. (2013). Personality and

Creativity: The Dual Pathway to Creativity Model and a Research Agenda. *Social and*

Personality Psychology Compass, 7(10), 732–748. <https://doi.org/10.1111/spc3.12062>

Balduzzi, S., Rucker, G., & Schwarzer, G. (2019). How to perform a meta-analysis with {R}:

a practical tutorial. *Evidence-Based Mental Health*, 22, 153–160.

Bargh, J. A. (2006). What have we been priming all these years? On the development,

mechanisms, and ecology of nonconscious social behavior. *European Journal of Social*

Psychology, 36(2), 147–168. <https://doi.org/10.1002/ejsp.336>

Bargh, J. A. (2014). The historical origins of priming as the preparation of behavioral

responses: Unconscious carryover and contextual influences of real-world importance.

In D. C. Molden (Ed.), *Understanding priming effects in social psychology*. (pp. 218–

233). The Guilford Press. [http://search.ebscohost.com.proxy-](http://search.ebscohost.com.proxy-ub.rug.nl/login.aspx?direct=true&db=psyh&AN=2014-44089-014&site=ehost-live&scope=site)

[ub.rug.nl/login.aspx?direct=true&db=psyh&AN=2014-44089-014&site=ehost-](http://search.ebscohost.com.proxy-ub.rug.nl/login.aspx?direct=true&db=psyh&AN=2014-44089-014&site=ehost-live&scope=site)

[live&scope=site](http://search.ebscohost.com.proxy-ub.rug.nl/login.aspx?direct=true&db=psyh&AN=2014-44089-014&site=ehost-live&scope=site)

Bargh, J. A., & Chartrand, T. L. (2014). The Mind in the Middle. *Handbook of Research*

Methods in Social and Personality Psychology, 311–344.

<https://doi.org/10.1017/cbo9780511996481.017>

Barron, F., & Harrington, D. M. (1981). Creativity, Intelligence, and Personality. *Annual*

Review of Psychology, 32(1), 439–476.

<https://doi.org/10.1146/annurev.ps.32.020181.002255>

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal

attachments as a fundamental human motivation. *Psychological Bulletin*, 117(3), 497–

529. <https://doi.org/10.1037/0033-2909.117.3.497>

Beaty, R. E., Benedek, M., Silvia, P. J., & Schacter, D. L. (2016). Creative Cognition and

Brain Network Dynamics. *Trends in Cognitive Sciences*, 20(2), 87–95.

<https://doi.org/10.1016/j.tics.2015.10.004>

Beaty, R. E., Benedek, M., Wilkins, R. W., Jauk, E., Fink, A., Silvia, P. J., Hodges, D. A., Koschutnig, K., & Neubauer, A. C. (2014). Creativity and the default network: A functional connectivity analysis of the creative brain at rest. *Neuropsychologia*, 64, 92–98. <https://doi.org/10.1016/j.neuropsychologia.2014.09.019>

Bechtoldt, M. N., Choi, H.-S., & Nijstad, B. A. (2012). Individuals in mind, mates by heart: Individualistic self-construal and collective value orientation as predictors of group creativity. *Journal of Experimental Social Psychology*, 48(4), 838–844.

<https://doi.org/10.1016/j.jesp.2012.02.014>

Beda, Z., Smith, S. M., & Orr, J. (2020). Creativity on demand – Hacking into creative problem solving. In *NeuroImage* (Vol. 216). Academic Press Inc.

<https://doi.org/10.1016/j.neuroimage.2020.116867>

Benedek, M., Panzierer, L., Jauk, E., & Neubauer, A. C. (2017). Creativity on tap? Effects of alcohol intoxication on creative cognition. *Consciousness and Cognition*, 56, 128–134.

<https://doi.org/10.1016/j.concog.2017.06.020>

Beukeboom, C. J. (2014). Mechanisms of linguistic bias: How words reflect and maintain stereotypic expectancies. In *Social cognition and communication*. (pp. 313–330).

Psychology Press.

Binnewies, C., & Wörnlein, S. C. (2011). What makes a creative day? A diary study on the interplay between affect, job stressors, and job control. *Journal of Organizational Behavior*, 32(4), 589–607. <https://doi.org/10.1002/job.731>

<https://doi.org/10.1002/job.731>

Birn, R. M., Kenworthy, L., Case, L., Caravella, R., Jones, T. B., Bandettini, P. A., & Martin, A. (2010). Neural systems supporting lexical search guided by letter and semantic category cues: A self-paced overt response fMRI study of verbal fluency. *NeuroImage*,

49(1), 1099–1107. <https://doi.org/10.1016/j.neuroimage.2009.07.036>

Bittner, J. V., Bruena, M., & Rietzschel, E. F. (2016a). Cooperation goals, regulatory focus, and their combined effects on creativity. *Thinking Skills and Creativity, 19*, 260–268.

<https://doi.org/10.1016/j.tsc.2015.12.002>

Bittner, J. V., Bruena, M., & Rietzschel, E. F. (2016b). Cooperation goals, regulatory focus, and their combined effects on creativity. *Thinking Skills and Creativity, 19*, 260–268.

<https://doi.org/10.1016/j.tsc.2015.12.002>

Bledow, R., Frese, M., Anderson, N., Erez, M., & Farr, J. (2009). A Dialectic Perspective on

Innovation: Conflicting Demands, Multiple Pathways, and Ambidexterity. *Industrial*

and Organizational Psychology, 2(03), 305–337. [https://doi.org/10.1111/j.1754-](https://doi.org/10.1111/j.1754-9434.2009.01154.x)

[9434.2009.01154.x](https://doi.org/10.1111/j.1754-9434.2009.01154.x)

Bless, H., & Burger, A. M. (2016). Assimilation and contrast in social priming. *Current*

Opinion in Psychology, 12, 26–31. <https://doi.org/10.1016/j.copsyc.2016.04.018>

Brandt, M. J., Chambers, J. R., Crawford, J. T., Wetherell, G., & Reyna, C. (2015). Bounded

openness: The effect of openness to experience on intolerance is moderated by target

group conventionality. *Journal of Personality and Social Psychology, 109*(3), 549–568.

<https://doi.org/10.1037/pspp0000055>

Brehm, S. S., & Brehm, J. W. (2013). *Psychological reactance: A theory of freedom and*

control. Academic Press.

Brennikmeijer, J., Derksen, M., & Rietzschel, E. (2019). Informal Laboratory Practices in

Psychology. *Collabra: Psychology, 5*(1), 45. <https://doi.org/10.1525/collabra.221>

Brewer, M. B. (1991). The Social Self: On Being the Same and Different at the Same Time.

[Http://Dx.Doi.Org/10.1177/0146167291175001](http://Dx.Doi.Org/10.1177/0146167291175001), *17*(5), 475–482.

<https://doi.org/10.1177/0146167291175001>

Brewer, M. B., & Chen, Y.-R. (2007). Where (Who) Are Collectives in Collectivism?

- Toward Conceptual Clarification of Individualism and Collectivism. *Psychological Review*, 114(1), 133–151. <https://doi.org/10.1037/0033-295X.114.1.133>
- Bryan, J. (2022). *googlesheets4: Access Google Sheets using the Sheets API V4*.
<https://cran.r-project.org/package=googlesheets4>
- Burgoon, E. M., Henderson, M. D., & Markman, A. B. (2013). There Are Many Ways to See the Forest for the Trees. *Perspectives on Psychological Science*, 8(5), 501–520.
<https://doi.org/10.1177/1745691613497964>
- Button, K. S., Ioannidis, J. P. A., Mokrysz, C., Nosek, B. A., Flint, J., Robinson, E. S. J., & Munafò, M. R. (2013). Power failure: Why small sample size undermines the reliability of neuroscience. *Nature Reviews Neuroscience*, 14(5), 365–376.
<https://doi.org/10.1038/nrn3475>
- Calderon, S., Giolla, E. Mac, Ask, K., Granhag, P. A., Wakslak, C. J., Trope, Y., Liberman, N., & Alony, R. (2006). *Subjective Likelihood and the Construal Level of Future Events: A Replication Study of Wakslak, Trope, Liberman, and Alony (2006)*.
<https://doi.org/10.1037/pspa0000214>
- Carson, S. H., Peterson, J. B., & Higgins, D. M. (2003). Decreased Latent Inhibition Is Associated With Increased Creative Achievement in High-Functioning Individuals. *Journal of Personality and Social Psychology*, 85(3), 499–506.
<https://doi.org/10.1037/0022-3514.85.3.499>
- Chang, W., Cheng, J., Allaire, J. J., Sievert, C., Schloerke, B., Xie, Y., Allen, J., McPherson, J., Dipert, A., & Borges, B. (2022). *shiny: Web Application Framework for R*.
<https://cran.r-project.org/package=shiny>
- Chen, X., Latham, G. P., Piccolo, R. F., & Itzhakov, G. (2020). An Enumerative Review and a Meta-Analysis of Primed Goal Effects on Organizational Behavior. *Applied Psychology*, 0(June), apps.12239. <https://doi.org/10.1111/apps.12239>

- Chen, Y., Spagna, A., Wu, T., Kim, T. H., Wu, Q., Chen, C., Wu, Y., & Fan, J. (2019). Testing a Cognitive Control Model of Human Intelligence. *Scientific Reports*, 9(1).
<https://doi.org/10.1038/s41598-019-39685-2>
- Cheng, C. Y., & Hong, Y. Y. (2017). Kiasu and Creativity in Singapore: An Empirical Test of the Situated Dynamics Framework. *Management and Organization Review*, 13(4), 871–894. <https://doi.org/10.1017/mor.2017.41>
- Cheng, C. Y., & Leung, A. K. Y. (2013). Revisiting the Multicultural Experience-Creativity Link: The Effects of Perceived Cultural Distance and Comparison Mind-Set. *Social Psychological and Personality Science*, 4(4), 475–482.
<https://doi.org/10.1177/1948550612462413>
- Cheung, M. W.-L. (2014). Modeling dependent effect sizes with three-level meta-analyses: A structural equation modeling approach. In *Psychological Methods* (Vol. 19, pp. 211–229). American Psychological Association. <https://doi.org/10.1037/a0032968>
- Chiu, F.-C. (2015). Improving your creative potential without awareness: Overinclusive thinking training. *Thinking Skills and Creativity*, 15, 1–12.
<https://doi.org/10.1016/j.tsc.2014.11.001>
- Chiu, F. C. (2012). Fit between future thinking and future orientation on creative imagination. *Thinking Skills and Creativity*, 7(3), 234–244. <https://doi.org/10.1016/j.tsc.2012.05.002>
- Chiu, F. C. (2014). The effects of exercising self-control on creativity. *Thinking Skills and Creativity*, 14, 20–31. <https://doi.org/10.1016/j.tsc.2014.06.003>
- Chiu, F. C. (2015). Improving your creative potential without awareness: Overinclusive thinking training. *Thinking Skills and Creativity*, 15, 1–12.
<https://doi.org/10.1016/j.tsc.2014.11.001>
- Chiu, F. C., Hsu, C. C., Lin, Y. N., Chen, H. C., & Liu, C. H. (2017). Effects of the interaction between exercising self-control and PhoPhiKat on divergent and convergent

thinking. *Thinking Skills and Creativity*, 24(April), 286–298.

<https://doi.org/10.1016/j.tsc.2017.05.001>

Chiu, F., Hsu, C., Lin, Y., Chen, H., & Liu, C.-H. (2017). Effects of the interaction between exercising self-control and PhoPhiKat on divergent and convergent thinking. *Thinking Skills and Creativity*, 24, 286–298. <https://doi.org/10.1016/j.tsc.2017.05.001>

Cho, J., Tadmor, C. T., & Morris, M. W. (2018). Are All Diversity Ideologies Creatively Equal? The Diverging Consequences of Colorblindness, Multiculturalism, and Polyculturalism. *Journal of Cross-Cultural Psychology*, 49(9), 1376–1401.

<https://doi.org/10.1177/0022022118793528>

Chrysikou, E. G. (2019). Creativity in and out of (cognitive) control. *Current Opinion in Behavioral Sciences*, 27, 94–99. <https://doi.org/10.1016/j.cobeha.2018.09.014>

Chrysikou, E. G., Weber, M. J., & Thompson-Schill, S. L. (2014). A matched filter hypothesis for cognitive control. *Neuropsychologia*, 62, 341–355.

<https://doi.org/10.1016/j.neuropsychologia.2013.10.021>

Chua, R. Y. J. (2013). The Costs of Ambient Cultural Disharmony: Indirect Intercultural Conflicts in Social Environment Undermine Creativity. *Academy of Management Journal*, 56(6), 1545–1577. <https://doi.org/10.5465/amj.2011.0971>

Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences. In *Statistical Power Analysis for the Behavioral Sciences*. Routledge.

<https://doi.org/10.4324/9780203771587>

Colzato, L. S., Ozturk, A., & Hommel, B. (2012). Meditate to create: The impact of focused-attention and open-monitoring training on convergent and divergent thinking. *Frontiers in Psychology*, 3(APR), 1–5. <https://doi.org/10.3389/fpsyg.2012.00116>

Colzato, L. S., Szapora, A., Lippelt, D., & Hommel, B. (2017). Prior Meditation Practice Modulates Performance and Strategy Use in Convergent- and Divergent-Thinking

- Problems. *Mindfulness*, 8(1), 10–16. <https://doi.org/10.1007/s12671-014-0352-9>
- Colzato, L. S., van der Wel, P., Sellaro, R., & Hommel, B. (2016). A single bout of meditation biases cognitive control but not attentional focusing: Evidence from the global–local task. *Consciousness and Cognition*, 39, 1–7. <https://doi.org/10.1016/J.CONCOG.2015.11.003>
- Cook, D. A., & Beckman, T. J. (2006). *Current Concepts in Validity and Reliability for Psychometric Instruments: Theory and Application*. <https://doi.org/10.1016/j.amjmed.2005.10.036>
- Corbetta, M., & Shulman, G. L. (2002). Control of goal-directed and stimulus-driven attention in the brain. *Nature Reviews Neuroscience* 2002 3:3, 3(3), 201–215. <https://doi.org/10.1038/nrn755>
- Costa, P. T., & McCrae, R. R. (2014). The NEO Inventories I. In Ro. P. Archer & S. R. Smith (Eds.), *Personality Assessment* (p. 32). Routledge.
- Courtright, S. H., Thurgood, G. R., Stewart, G. L., & Pierotti, A. J. (2015). Structural interdependence in teams: An integrative framework and meta-analysis. *Journal of Applied Psychology*, 100(6), 1825–1846. <https://doi.org/10.1037/apl0000027>
- Cretenet, J., & Dru, V. (2009). Influence of peripheral and motivational cues on rigid–flexible functioning: Perceptual, behavioral, and cognitive aspects. *Journal of Experimental Psychology: General*, 138(2), 201–217. <https://doi.org/10.1037/a0015379>
- Cretenet, J., & Dru, V. (2011). Influence of bilateral motor behaviors on flexible functioning: An embodied perspective. *Cognitive Science*, 35(6), 1139–1161. <https://doi.org/10.1111/j.1551-6709.2010.01166.x>
- Criscuolo, P., Salter, A., & Ter Wal, A. L. J. (2014). Going Underground: Bootlegging and Individual Innovative Performance. *Organization Science*, 25(5), 1287–1305. <https://doi.org/10.1287/orsc.2013.0856>

- Cropley, A. (2006). In Praise of Convergent Thinking. *Creativity Research Journal*, 18(3), 391–404. https://doi.org/10.1207/s15326934crj1803_13
- Csikszentmihalyi, M. (1999). Implications of a systems perspective for the study of creativity. In *Handbook of creativity*. (pp. 313–335). Cambridge University Press.
- Cuijpers, P., Weitz, E., Cristea, I. A., & Twisk, J. (2017). Pre-post effect sizes should be avoided in meta-analyses. *Epidemiology and Psychiatric Sciences*, 26(4), 364–368. <https://doi.org/10.1017/S2045796016000809>
- Davis, M. a. (2009). Understanding the relationship between mood and creativity: A meta-analysis. *Organizational Behavior and Human Decision Processes*, 108(1), 25–38. <https://doi.org/10.1016/j.obhdp.2008.04.001>
- de Dreu, C. K. W., Nijstad, B. A., & Baas, M. (2011). Behavioral activation links to creativity because of increased cognitive flexibility. *Social Psychological and Personality Science*, 2(1), 72–80. <https://doi.org/10.1177/1948550610381789>
- DeCoster, J., & Claypool, H. M. (2004). A Meta-Analysis of Priming Effects on Impression Formation Supporting a General Model of Informational Biases. In *Personality and Social Psychology Review* (Vol. 8, Issue 1). https://doi.org/10.1207/S15327957PSPR0801_1
- DeYoung, C. G. (2013). The neuromodulator of exploration: A unifying theory of the role of dopamine in personality. *Frontiers in Human Neuroscience*, 7. <https://doi.org/10.3389/fnhum.2013.00762>
- DeYoung, C. G. (2015). Openness/intellect: A dimension of personality reflecting cognitive exploration. In *APA handbook of personality and social psychology, Volume 4: Personality processes and individual differences*. (pp. 369–399). American Psychological Association. <https://doi.org/10.1037/14343-017>
- DeYoung, C. G., Peterson, J. B., & Higgins, D. M. (2005). Sources of Openness/Intellect:

- Cognitive and Neuropsychological Correlates of the Fifth Factor of Personality. *Journal of Personality*, 73(4), 825–858. <https://doi.org/10.1111/j.1467-6494.2005.00330.x>
- Dollinger, S. J. (2003). Need for uniqueness, need for cognition, and creativity. *Journal of Creative Behavior*, 37(2), 99–116. <https://doi.org/10.1002/j.2162-6057.2003.tb00828.x>
- Doyen, S., Klein, O., Pichon, C.-L., & Cleeremans, A. (2012). Behavioral Priming: It's All in the Mind, but Whose Mind? *PLoS ONE*, 7(1), e29081. <https://doi.org/10.1371/journal.pone.0029081>
- Duncker, K. (1945). On problem-solving. *Psychological Monographs*, 58(5), i–113. <https://doi.org/10.1037/h0093599>
- Edmondson, A. (1999). Psychological Safety and Learning Behavior in Work Teams. *Administrative Science Quarterly*, 44(2), 350–383. <https://doi.org/10.2307/2666999>
- Ericsson, K. A., & Simon, H. A. (1984). *Protocol analysis: Verbal reports as data*. MIT Press.
- Eyal, T., Liberman, N., & Trope, Y. (2008). Judging near and distant virtue and vice. *Journal of Experimental Social Psychology*, 44(4), 1204–1209. <https://doi.org/10.1016/J.JESP.2008.03.012>
- Eysenck, H. J. (1995). *Genius: The natural history of creativity*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511752247>
- Fan, Y. (2018). *Creativity Differences Between Open-Ended and Well-Defined Tasks in a Virtual Environment*.
- Fehr, R. (2010). *On the (Un)intended Consequences of Forgiveness: Creativity After Conflict* [University of Maryland, College Park]. file:///C:/Users/youhe/Downloads/kdoc_o_00042_01.pdf
- Feist, G. J. (1998). A meta-analysis of personality in scientific and artistic creativity. *Personality and Social Psychology Review*, 290–309.

- Fiedler, K., McCaughey, L., & Prager, J. (2021). Quo Vadis, Methodology? The Key Role of Manipulation Checks for Validity Control and Quality of Science. *Perspectives on Psychological Science*, *16*(4), 816–826. <https://doi.org/10.1177/1745691620970602>
- Förster, J., & Dannenberg, L. (2010). GLOMO sys: A systems account of global versus local processing. *Psychological Inquiry*, *21*(3), 175–197. <https://doi.org/10.1080/1047840X.2010.487849>
- Förster, J., Epstude, K., & Özelsel, A. (2009). Why love has wings and sex has not: How reminders of love and sex influence creative and analytic thinking. *Personality and Social Psychology Bulletin*, *35*(11), 1479–1491. <https://doi.org/10.1177/0146167209342755>
- Förster, J., Friedman, R. S., Butterbach, E. B., & Sassenberg, K. (2005a). Automatic effects of deviancy cues on creative cognition. *European Journal of Social Psychology*, *35*(3), 345–359. <https://doi.org/10.1002/ejsp.253>
- Förster, J., Friedman, R. S., Butterbach, E. B., & Sassenberg, K. (2005b). Automatic effects of deviancy cues on creative cognition. *European Journal of Social Psychology*, *35*(3), 345–359. <https://doi.org/10.1002/ejsp.253>
- Förster, J., Friedman, R. S., & Liberman, N. (2004). Temporal construal effects on abstract and concrete thinking: Consequences for insight and creative cognition. *Journal of Personality and Social Psychology*, *87*(2), 177–189. <https://doi.org/10.1037/0022-3514.87.2.177>
- Förster, J., Friedman, R. S., Özelsel, A., & Denzler, M. (2006). Enactment of approach and avoidance behavior influences the scope of perceptual and conceptual attention. *Journal of Experimental Social Psychology*, *42*(2), 133–146. <https://doi.org/10.1016/j.jesp.2005.02.004>
- Förster, J., & Liberman, N. (2007). Knowledge activation. In *Social psychology: Handbook*

of basic principles, 2nd ed. (pp. 201–231). The Guilford Press.

Förster, J., Liberman, N., & Friedman, R. S. (2007). Seven Principles of Goal Activation: A Systematic Approach to Distinguishing Goal Priming From Priming of Non-Goal Constructs. *Personality and Social Psychology Review, 11*(3), 211–233.
<https://doi.org/10.1177/1088868307303029>

Förster, J., Liberman, N., & Shapira, O. (2009). Preparing for novel versus familiar events: Shifts in global and local processing. *Journal of Experimental Psychology: General, 138*(3), 383–399. <https://doi.org/10.1037/a0015748>

Förster, J., Marguc, J., & Gillebaart, M. (2010). Novelty Categorization Theory. *Social and Personality Psychology Compass, 4*(9), 736–755. <https://doi.org/10.1111/j.1751-9004.2010.00289.x>

Fox, K. C. R., Dixon, M. L., Nijeboer, S., Girn, M., Floman, J. L., Lifshitz, M., Ellamil, M., Sedlmeier, P., & Christoff, K. (2016). Functional neuroanatomy of meditation: A review and meta-analysis of 78 functional neuroimaging investigations. *Neuroscience and Biobehavioral Reviews, 65*, 208–228. <https://doi.org/10.1016/j.neubiorev.2016.03.021>

Freedman, J. L. (1965). Increasing creativity by free-association training. In *Journal of Experimental Psychology* (Vol. 69, Issue 1). <https://doi.org/10.1037/h0021659>

Friedman, R. S., Fishbach, A., Förster, J., & Werth, L. (2003). Attentional priming effects on creativity. *Creativity Research Journal, 15*(2–3), 277–286.
<https://doi.org/10.1080/10400419.2003.9651420>

Friedman, R. S., & Förster, J. (2001). The effects of promotion and prevention cues on creativity. *Journal of Personality and Social Psychology, 81*(6), 1001–1013.
<https://doi.org/10.1037//0022-3514.81.6.1001>

Friedman, R. S., & Förster, J. (2005). The influence of approach and avoidance cues on attentional flexibility. *Motivation and Emotion, 29*(2), 69–81.

<https://doi.org/10.1007/s11031-005-7954-4>

Friedman, R. S., & Förster, J. (2010). Implicit affective cues and attentional tuning: An integrative review. *Psychological Bulletin*, *136*(5), 875–893.

<https://doi.org/10.1037/a0020495>

Frith, E. M. (2019). Acute Exercise and Creativity: Embodied Cognition Approaches.

ProQuest Dissertations and Theses, 295. [https://www.proquest.com/dissertations-](https://www.proquest.com/dissertations-theses/acute-exercise-creativity-embodied-cognition/docview/2276900548/se-2?accountid=8144%0Ahttp://sfx.aub.aau.dk/sfxaub?url_ver=Z39.88-)

[theses/acute-exercise-creativity-embodied-cognition/docview/2276900548/se-](https://www.proquest.com/dissertations-theses/acute-exercise-creativity-embodied-cognition/docview/2276900548/se-2?accountid=8144%0Ahttp://sfx.aub.aau.dk/sfxaub?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:dissertation&genre=dissertations+%26+thes)

[2?accountid=8144%0Ahttp://sfx.aub.aau.dk/sfxaub?url_ver=Z39.88-](https://www.proquest.com/dissertations-theses/acute-exercise-creativity-embodied-cognition/docview/2276900548/se-2?accountid=8144%0Ahttp://sfx.aub.aau.dk/sfxaub?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:dissertation&genre=dissertations+%26+thes)

[2004&rft_val_fmt=info:ofi/fmt:kev:mtx:dissertation&genre=dissertations+%26+thes](https://www.proquest.com/dissertations-theses/acute-exercise-creativity-embodied-cognition/docview/2276900548/se-2?accountid=8144%0Ahttp://sfx.aub.aau.dk/sfxaub?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:dissertation&genre=dissertations+%26+thes)

Fujita, K., & Trope, Y. (2014). Structured versus unstructured regulation: On procedural mindsets and the mechanisms of priming effects. In *Social Cognition* (Vol. 32, Issue SPEC. ISSUE). <https://doi.org/10.1521/soco.2014.32.suppl.68>

Fujita, K., Trope, Y., Liberman, N., & Levin-Sagi, M. (2006). Construal levels and self-control. *Journal of Personality and Social Psychology*, *90*(3), 351–367.

<https://doi.org/10.1037/0022-3514.90.3.351>

Furnham, A., & Bachtiar, V. (2008). Personality and intelligence as predictors of creativity.

Personality and Individual Differences, *45*(7), 613–617.

<https://doi.org/10.1016/j.paid.2008.06.023>

Gaither, S. E., Fan, S. P., & Kinzler, K. D. (2020). Thinking about multiple identities boosts children’s flexible thinking. *Developmental Science*, *23*(1), 1–11.

<https://doi.org/10.1111/desc.12871>

Gaither, S. E., Remedios, J. D., Sanchez, D. T., & Sommers, S. R. (2015). Thinking Outside the Box: Multiple Identity Mind-Sets Affect Creative Problem Solving. *Social Psychological and Personality Science*, *6*(5), 596–603.

Psychological and Personality Science, *6*(5), 596–603.

<https://doi.org/10.1177/1948550614568866>

Ganesan, S., Beyer, E., Moffat, B., Van Dam, N. T., Lorenzetti, V., & Zalesky, A. (2022).

Focused attention meditation in healthy adults: A systematic review and meta-analysis of cross-sectional functional MRI studies. *Neuroscience & Biobehavioral Reviews*, *141*(January), 104846. <https://doi.org/10.1016/j.neubiorev.2022.104846>

Gardner, W. L., Gabriel, S., & Lee, A. Y. (1999). “I” Value Freedom, but “We” Value

Relationships: Self-Construal Priming Mirrors Cultural Differences in Judgment.

Psychological Science, *10*(4), 321–326. <https://doi.org/10.1111/1467-9280.00162>

Gaspar, K., & Clore, G. L. (2002). Attending to the big picture: Mood and global versus local processing of visual information. *Psychological Science*, *13*(1), 34–40.

<https://doi.org/10.1111/1467-9280.00406>

George, J. M., & Zhou, J. (2007). Dual Tuning in a Supportive Context: Joint Contributions of Positive Mood, Negative Mood, and Supervisory Behaviors to Employee Creativity.

Https://Doi.Org/10.5465/Amj.2007.25525934, *50*(3), 605–622.

<https://doi.org/10.5465/AMJ.2007.25525934>

Gillebaart, M., Förster, J., Rotteveel, M., & Jehle, A. C. M. (2013). Unraveling Effects of Novelty on Creativity. *Creativity Research Journal*, *25*(3), 280–285.

<https://doi.org/10.1080/10400419.2013.813781>

Gino, F., & Ariely, D. (2012). The Dark Side of Creativity: Original Thinkers Can Be More Dishonest. *Journal of Personality and Social Psychology*, *102*(3), 445–459.

<https://doi.org/10.1037/a0026406>

Gino, F., & Wiltermuth, S. S. (2014). Evil Genius? How Dishonesty Can Lead to Greater Creativity. *Psychological Science*, *25*(4), 973–981.

<https://doi.org/10.1177/0956797614520714>

Gocłowska, M. A., Baas, M., Elliot, A. J., & De Dreu, C. K. W. (2017). Why schema-violations are sometimes preferable to schema-consistencies: The role of interest and

openness to experience. *Journal of Research in Personality*, 66, 54–69.

<https://doi.org/10.1016/j.jrp.2016.12.005>

Gołowska, M. A., & Crisp, R. J. (2013). On counter-stereotypes and creative cognition: When interventions for reducing prejudice can boost divergent thinking. *Thinking Skills and Creativity*, 8(1), 72–79. <https://doi.org/10.1016/j.tsc.2012.07.001>

Gołowska, M. A., Crisp, R. J., & Labuschagne, K. (2013). Can counter-stereotypes boost flexible thinking? *Group Processes & Intergroup Relations*, 16(2), 217–231. <https://doi.org/10.1177/1368430212445076>

Gołowska, M. A., Damian, R. I., & Mor, S. (2016). The Diversifying Experience Model: Taking a Broader Conceptual View of the Multiculturalism – Creativity Link. *Journal of Cross-Cultural Psychology*. <https://doi.org/10.1177/0022022116650258>

Gołowska, M. A., Ritter, S. M., Elliot, A. J., & Baas, M. (2019). Novelty seeking is linked to openness and extraversion, and can lead to greater creative performance. *Journal of Personality*, 87(2), 252–266. <https://doi.org/10.1111/jopy.12387>

Gohel, D., & Skintzos, P. (2023). *flextable: Functions for Tabular Reporting*. <https://cran.r-project.org/package=flextable>

Gollwitzer, P. M. (1990). Action phases and mind-sets. In *Handbook of motivation and cognition: Foundations of social behavior, Vol. 2.* (pp. 53–92). The Guilford Press.

Goncalo, J. A., & Katz, J. H. (2020). Your Soul Spills Out: The Creative Act Feels Self-Disclosing. *Personality and Social Psychology Bulletin*, 46(5), 679–692. <https://doi.org/10.1177/0146167219873480>

Goncalo, J. A., & Staw, B. M. (2006). Individualism–collectivism and group creativity. *Organizational Behavior and Human Decision Processes*, 100(1), 96–109. <https://doi.org/10.1016/j.obhdp.2005.11.003>

Gordon, C. L., & Luo, S. (2011). The Personal Expansion Questionnaire: Measuring one’s

- tendency to expand through novelty and augmentation. *Personality and Individual Differences*, 51(2), 89–94. <https://doi.org/10.1016/j.paid.2011.03.015>
- Greer, M., & Levine, E. (1991). Enhancing Creative Performance in College Students. *The Journal of Creative Behavior*, 25(3), 250–255. <https://doi.org/10.1002/j.2162-6057.1991.tb01377.x>
- Greving, H., & Epstude, K. (n.d.). *Music and mind-sets: The influence of music on creative idea generation*. Unpublished study.
- Groborz, M., & Necka, E. (2003). Creativity and Cognitive Control: Explorations of Generation and Evaluation Skills. *Creativity Research Journal*, 15, 183–197.
- Gromer, D. (2020). *apa: Format Outputs of Statistical Tests According to APA Guidelines*. <https://cran.r-project.org/package=apa>
- Guilford, J. P. (1950). Creativity. *American Psychologist*, 9(5), 444–454.
- Guilford, J. P. (1967a). *The nature of human intelligence*. McGraw-Hill.
- Guilford, J. P. (1967b). Creativity: Yesterday, Today and Tomorrow. *The Journal of Creative Behavior*, 1(1), 3–14. <https://doi.org/10.1002/j.2162-6057.1967.tb00002.x>
- Gutnick, D., Walter, F., Nijstad, B. A., & De Dreu, C. K. W. (2012). Creative performance under pressure: An integrative conceptual framework. *Organizational Psychology Review*, 2(3), 189–207. <https://doi.org/10.1177/2041386612447626>
- Haase, J. (2020). *How games spoil creativity : a creative mindset priming study*. June.
- Hao, N., Qiao, X., Cheng, R., Lu, K., Tang, M., & Runco, M. A. (2020). Approach motivational orientation enhances malevolent creativity. *Acta Psychologica*, 203(3663), 102985. <https://doi.org/10.1016/j.actpsy.2019.102985>
- Hardy, J. H., Ness, A. M., & Mecca, J. (2017). Outside the box: Epistemic curiosity as a predictor of creative problem solving and creative performance. *Personality and Individual Differences*, 104, 230–237. <https://doi.org/10.1016/j.paid.2016.08.004>

- Harrer, M., Cuijpers, P., Furukawa, T. A., & Ebert, D. D. (2021). *Doing Meta-Analysis with R*. Chapman and Hall/CRC. <https://doi.org/10.1201/9781003107347>
- Harrer, M., Cuijpers, P., Furukawa, T., & Ebert, D. D. (2019). *dmetar: Companion R Package For The Guide "Doing Meta-Analysis in R."* <http://dmetar.protectlab.org/>
- Harrington, J. R., & Gelfand, M. J. (2014). Tightness–looseness across the 50 united states. *Proceedings of the National Academy of Sciences*, *111*(22), 7990–7995. <https://doi.org/10.1073/pnas.1317937111>
- Harris, C. R., Coburn, N., Rohrer, D., & Pashler, H. (2013). Two Failures to Replicate High-Performance-Goal Priming Effects. *PLoS ONE*, *8*(8), e72467. <https://doi.org/10.1371/journal.pone.0072467>
- Herman, A., & Reiter-Palmon, R. (2011). The effect of regulatory focus on idea generation and idea evaluation. *Psychology of Aesthetics, Creativity, and the Arts*, *5*(1), 13–20. <https://doi.org/10.1037/a0018587>
- Herz, N., Baror, S., & Bar, M. (2020). Overarching States of Mind. *Trends in Cognitive Sciences*, *24*(3), 184–199. <https://doi.org/10.1016/j.tics.2019.12.015>
- Higgins, E. T. (1996). *The "Self Digest": Self-Knowledge Serving Self-Regulatory Functions*.
- Higgins, E. T. (1997). Beyond Pleasure and Pain. In *American Psychologist* (Vol. 52, Issue 12). Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199765829.001.0001>
- Higgins, E. T., & Chaires, W. M. (1980). Accessibility of interrelational constructs: Implications for stimulus encoding and creativity. *Journal of Experimental Social Psychology*, *16*(4), 348–361. [https://doi.org/10.1016/0022-1031\(80\)90027-X](https://doi.org/10.1016/0022-1031(80)90027-X)
- Higgins, E. T., Rholes, W. S., & Jones, C. R. (1977). Category accessibility and impression formation. *Journal of Experimental Social Psychology*, *13*(2), 141–154. [https://doi.org/10.1016/S0022-1031\(77\)80007-3](https://doi.org/10.1016/S0022-1031(77)80007-3)

Hlavac, M. (2022). *stargazer: Well-Formatted Regression and Summary Statistics Tables*.

<https://cran.r-project.org/package=stargazer>

Hofstede, G. (2001). *Culture's consequences : comparing values, behaviors, institutions, and organizations across nations*. Sage.

<http://catdir.loc.gov/catdir/enhancements/fy0656/00010498-t.html>

Hommel, B. (2015). Between Persistence and Flexibility: The Yin and Yang of Action Control. *Advances in Motivation Science*, 2, 33–67.

<https://doi.org/10.1016/bs.adms.2015.04.003>

Hornsey, M. J., Jetten, J., McAuliffe, B. J., & Hogg, M. A. (2006). The impact of individualist and collectivist group norms on evaluations of dissenting group members. *Journal of Experimental Social Psychology*, 42(1), 57–68.

<https://doi.org/10.1016/j.jesp.2005.01.006>

Huang, L. (2020). Mind–Body Dissonance: A Catalyst to Creativity. *Personality and Social Psychology Bulletin*, 46(5), 754–768. <https://doi.org/10.1177/0146167219875145>

Huang, L., Gino, F., & Galinsky, A. D. (2015). The highest form of intelligence: Sarcasm increases creativity for both expressers and recipients. *Organizational Behavior and Human Decision Processes*, 131, 162–177. <https://doi.org/10.1016/j.obhdp.2015.07.001>

Hutton, E., & Sundar, S. S. (2010). Can video games enhance creativity? Effects of emotion generated by dance dance revolution. *Creativity Research Journal*, 22(3), 294–303.

<https://doi.org/10.1080/10400419.2010.503540>

Ioannidis, J. P. A. (2005). Why most published research findings are false. In *PLoS Medicine* (Vol. 2, Issue 8, pp. 0696–0701). <https://doi.org/10.1371/journal.pmed.0020124>

Isen, A. M., & Daubman, K. A. (1984). The influence of affect on categorization. *Journal of Personality and Social Psychology*, 47(6), 1206–1217. <https://doi.org/10.1037//0022-3514.47.6.1206>

- Jackson, J. C., Gelfand, M., De, S., & Fox, A. (2019). The loosening of American culture over 200 years is associated with a creativity–order trade-off. *Nature Human Behaviour*, 3(3), 244–250. <https://doi.org/10.1038/s41562-018-0516-z>
- Janis, I. L. (1972). *Victims of groupthink: A psychological study of foreign-policy decisions and fiascoes*. Houghton Mifflin. <http://search.ebscohost.com.proxy-ub.rug.nl/login.aspx?direct=true&db=psyh&AN=1975-29417-000&site=ehost-live&scope=site>
- Jarosz, A. F., Colflesh, G. J. H., & Wiley, J. (2012). Uncorking the muse: Alcohol intoxication facilitates creative problem solving. *Consciousness and Cognition*, 21(1), 487–493. <https://doi.org/10.1016/j.concog.2012.01.002>
- Jauk, E., Benedek, M., & Neubauer, A. C. (2014). The Road to Creative Achievement : A Latent Variable Model of Ability and Personality Predictors. *European Journal of Personality*, 28(1), 95–105. <https://doi.org/10.1002/per.1941>
- Jia, L., Hirt, E. R., & Karpen, S. C. (2009). Lessons from a Faraway land: The effect of spatial distance on creative cognition. *Journal of Experimental Social Psychology*, 45(5), 1127–1131. <https://doi.org/10.1016/j.jesp.2009.05.015>
- Jin, X., Wang, L., & Dong, H. (2016). The relationship between self-construal and creativity - Regulatory focus as moderator. *Personality and Individual Differences*, 97, 282–288. <https://doi.org/10.1016/j.paid.2016.03.044>
- Jones, E. E., & Davis, K. E. (1965). *From Acts To Dispositions The Attribution Process In Person Perception* (pp. 219–266). [https://doi.org/10.1016/S0065-2601\(08\)60107-0](https://doi.org/10.1016/S0065-2601(08)60107-0)
- Kearney, M. W. (2018). *tfse: Various Useful Functions*. <https://tfse.mikewk.com>
- Kim, S. H., Vincent, L. C., & Goncalo, J. A. (2013a). Outside advantage: Can social rejection fuel creative thought? *Journal of Experimental Psychology: General*, 142(3), 605–611. <https://doi.org/10.1037/a0029728>

- Kim, S. H., Vincent, L. C., & Goncalo, J. a. (2013b). Outside advantage: Can social rejection fuel creative thought? *Journal of Experimental Psychology: General*, *142*(3), 605–611.
<https://doi.org/10.1037/a0029728>
- Klauer, K. C., & Singmann, H. (2015). Does global and local vision have an impact on creative and analytic thought? Two failed replications. *PLoS ONE*, *10*(10), 1–10.
<https://doi.org/10.1371/journal.pone.0132885>
- Kleiman, T., & Enisman, M. (2018). The conflict mindset: How internal conflicts affect self-regulation. *Social and Personality Psychology Compass*, *12*(5), 1–10.
<https://doi.org/10.1111/spc3.12387>
- Koh, B., & Leung, A. K. y. (2019). A time for creativity: How future-oriented schemas facilitate creativity. *Journal of Experimental Social Psychology*, *84*(May), 103816.
<https://doi.org/10.1016/j.jesp.2019.103816>
- Kolańczyk, A. (2011). Uwaga ekstensywna. Model ekstensywności vs. intensywności uwagi [Extensive attention. Model of extensiveness vs. intensiveness of attention]. *Studia Psychologiczne*, *49*(3), 7–27.
- Krause, V. (2015). *Creative in someone else's shoes?: The effect of perspective taking on creativity*. Cornell University.
- Kray, L. J., Galinsky, A. D., & Wong, E. M. (2006a). Thinking within the box: The relational processing style elicited by counterfactual mind-sets. *Journal of Personality and Social Psychology*, *91*(1), 33–48. <https://doi.org/10.1037/0022-3514.91.1.33>
- Kray, L. J., Galinsky, A. D., & Wong, E. M. (2006b). Thinking within the box: The relational processing style elicited by counterfactual mind-sets. *Journal of Personality and Social Psychology*, *91*(1), 33–48. <https://doi.org/10.1037/0022-3514.91.1.33>
- Kruglanski, A. W. (1990). Lay epistemic theory in social cognitive psychology. *Psychological Inquiry*, *1*(3), 181–197. <http://www.jstor.org/stable/1449747>

- Kruglanski, A. W. (2004). *The Psychology of Closed Mindedness* (Vol. 27, Issue 3).
<https://doi.org/10.1111/j.1467-9221.2006.00515.x>
- Kruglanski, A. W., Dechesne, M., Orehek, E., & Pierro, A. (2009). Three decades of lay epistemics: The why, how, and who of knowledge formation. *European Review of Social Psychology*, 20(1), 146–191. <https://doi.org/10.1080/10463280902860037>
- Kruglanski, A. W., Orehek, E., Dechesne, M., & Pierro, A. (2010). Lay Epistemic Theory: The Motivational, Cognitive, and Social Aspects of Knowledge Formation. *Social and Personality Psychology Compass*, 4(10), 939–950. <https://doi.org/10.1111/j.1751-9004.2010.00308.x>
- Kruglanski, A. W., & Webster, D. M. (1996). Motivated closing of the mind: “seizing” and “freezing”. *Psychological Review*, 103(2), 263–283.
<http://www.ncbi.nlm.nih.gov/pubmed/8637961>
- Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Frontiers in Psychology*, 4(NOV), 1–12.
<https://doi.org/10.3389/fpsyg.2013.00863>
- Lanaj, K., Chang, C.-H. “Daisy,” & Johnson, R. E. (2012). Regulatory focus and work-related outcomes: A review and meta-analysis. *Psychological Bulletin*, 138(5), 998–1034. <https://doi.org/10.1037/a0027723>
- Landis, J. R., & Koch, G. G. (1977). An Application of Hierarchical Kappa-type Statistics in the Assessment of Majority Agreement among Multiple Observers. *Biometrics*, 33(2), 363. <https://doi.org/10.2307/2529786>
- Landkammer, F., & Sassenberg, K. (2016). Competing while cooperating with the same others: The consequences of conflicting demands in co-opetition. *Journal of Experimental Psychology: General*, 145(12), 1670–1686.
<https://doi.org/10.1037/xge0000232>

- Lashley, K. S. (1951). The problem of serial order in behavior. In *Cerebral mechanisms in behavior; the Hixon Symposium*. (pp. 112–146). Wiley.
- Lebuda, I., Zabelina, D. L., & Karwowski, M. (2016). Mind full of ideas: A meta-analysis of the mindfulness–creativity link. *Personality and Individual Differences, 93*, 22–26.
<https://doi.org/10.1016/j.paid.2015.09.040>
- Leonardelli, G. J., Pickett, C. L., & Brewer, M. B. (2010). Optimal Distinctiveness Theory. A Framework for Social Identity, Social Cognition, and Intergroup Relations. In *Advances in Experimental Social Psychology* (Vol. 43, Issue C, pp. 63–113). Academic Press Inc.
[https://doi.org/10.1016/S0065-2601\(10\)43002-6](https://doi.org/10.1016/S0065-2601(10)43002-6)
- Leung, A. K. Y., Liou, S., Miron-Spektor, E., Koh, B., Chan, D., Eisenberg, R., & Schneider, I. (2018). Middle Ground Approach to Paradox: Within-and between-culture examination of the creative benefits of paradoxical frames. *Journal of Personality and Social Psychology, 114*(3), 443–464. <https://doi.org/10.1037/pspp0000160>
- Leung, A. K. yee, & Chiu, C. Y. (2010). Multicultural Experience, Idea Receptiveness, and Creativity. *Journal of Cross-Cultural Psychology, 41*(5), 723–741.
<https://doi.org/10.1177/0022022110361707>
- Liberman, N., Polack, O., Hameiri, B., & Blumenfeld, M. (2012a). Priming of spatial distance enhances children’s creative performance. *Journal of Experimental Child Psychology, 111*(4), 663–670. <https://doi.org/10.1016/j.jecp.2011.09.007>
- Liberman, N., Polack, O., Hameiri, B., & Blumenfeld, M. (2012b). Priming of spatial distance enhances children’s creative performance. *Journal of Experimental Child Psychology, 111*(4), 663–670. <https://doi.org/10.1016/j.jecp.2011.09.007>
- Liberman, N., & Trope, Y. (1998). The Role of Feasibility and Desirability Considerations in Near and Distant Future Decisions: A Test of Temporal Construal Theory. *Journal of Personality and Social Psychology, 75*(1), 5–18.

- Liberman, N., Trope, Y., McCrea, S. M., & Sherman, S. J. (2007). The effect of level of construal on the temporal distance of activity enactment. *Journal of Experimental Social Psychology, 43*(1), 143–149. <https://doi.org/10.1016/J.JESP.2005.12.009>
- Lichtenfeld, S., Elliot, A. J., Maier, M. A., & Pekrun, R. (2012). Fertile Green: Green Facilitates Creative Performance. *Personality and Social Psychology Bulletin, 38*(6), 784–797. <https://doi.org/10.1177/0146167212436611>
- Limb, C. J., & Braun, A. R. (2008). Neural substrates of spontaneous musical performance: An fMRI study of jazz improvisation. *PLoS ONE, 3*(2), 1679. <https://doi.org/10.1371/journal.pone.0001679>
- Lippelt, D. P., Hommel, B., & Colzato, L. S. (2014). Focused attention, open monitoring and loving kindness meditation: effects on attention, conflict monitoring, and creativity - A review. *Frontiers in Psychology, 5*(September), 1083. <https://doi.org/10.3389/fpsyg.2014.01083>
- Litchfield, R. C., Gilson, L. L., & Gilson, P. W. (2015). Defining Creative Ideas: Toward a More Nuanced Approach. *Group & Organization Management, 40*(2), 238–265. <https://doi.org/10.1177/1059601115574945>
- Litman, J. A., & Silvia, P. J. (2006). The Latent Structure of Trait Curiosity: Evidence for Interest and Deprivation Curiosity Dimensions. *Journal of Personality Assessment, 86*(3), 318–328. https://doi.org/10.1207/s15327752jpa8603_07
- Liu, L., Wang, L., Ren, J., & Liu, C. (2017). Promotion/prevention focus and creative performance: Is it moderated by evaluative stress? *Personality and Individual Differences, 105*, 185–193. <https://doi.org/10.1016/j.paid.2016.09.054>
- Liu, S. (2016a). Broaden the mind before ideation: The effect of conceptual attention scope on creativity. *Thinking Skills and Creativity, 22*, 190–200. <https://doi.org/10.1016/j.tsc.2016.10.004>

- Liu, S. (2016b). Broaden the mind before ideation: The effect of conceptual attention scope on creativity. *Thinking Skills and Creativity*, 22, 190–200.
<https://doi.org/10.1016/j.tsc.2016.10.004>
- Liu, S., Chow, H. M., Xu, Y., Erkkinen, M. G., Swett, K. E., Eagle, M. W., Rizik-Baer, D. A., & Braun, A. R. (2012). Neural correlates of lyrical improvisation: An fMRI study of freestyle rap. *Scientific Reports*, 2. <https://doi.org/10.1038/srep00834>
- Liu, S., Erkkinen, M. G., Healey, M. L., Xu, Y., Swett, K. E., Chow, H. M., & Braun, A. R. (2015). Brain activity and connectivity during poetry composition: Toward a multidimensional model of the creative process. *Human Brain Mapping*, 36(9), 3351–3372. <https://doi.org/10.1002/HBM.22849>
- Liviatan, I., Trope, Y., & Liberman, N. (2008). Interpersonal similarity as a social distance dimension: Implications for perception of others' actions. *Journal of Experimental Social Psychology*, 44(5), 1256–1269. <https://doi.org/10.1016/J.JESP.2008.04.007>
- Lodder, P., Ong, H. H., Grasman, R. P. P. P., & Wicherts, J. M. (2019). A comprehensive meta-analysis of money priming. *Journal of Experimental Psychology: General*, 148(4), 688–712. <https://doi.org/10.1037/xge0000570>
- Lu, J. G., Brockner, J., Vardi, Y., & Weitz, E. (2017). The dark side of experiencing job autonomy: Unethical behavior. *Journal of Experimental Social Psychology*, 73(September), 222–234. <https://doi.org/10.1016/j.jesp.2017.05.007>
- Lu, J. G., Hafenbrack, A. C., Eastwick, P. W., Wang, D. J., Maddux, W. W., & Galinsky, A. D. (2017). “Going out” of the box: Close intercultural friendships and romantic relationships spark creativity, workplace innovation, and entrepreneurship. *Journal of Applied Psychology*, 102(7), 1091–1108. <https://doi.org/10.1037/apl0000212>
- Lüdecke, D., Lüdecke, M. D., & Calculator'from David, B. W. (2019). Package ‘esc.’ *R Package Version 0.5, 1*, 2019.

- Lutz, A., Slagter, H. A., Dunne, J. D., & Davidson, R. J. (2008). Attention regulation and monitoring in meditation. *Trends in Cognitive Sciences, 12*(4), 163–169.
<https://doi.org/10.1016/j.tics.2008.01.005>
- Lynn, M., & Snyder, C. R. (2002). Uniqueness seeking. In C. R. Snyder & S. J. Lopez (Eds.), *Handbook of Positive Psychology* (pp. 395–410). Oxford University Press.
- Maass, A. (1999). Linguistic Intergroup Bias: Stereotype Perpetuation Through Language. *Advances in Experimental Social Psychology, 31*, 79–121.
[https://doi.org/10.1016/S0065-2601\(08\)60272-5](https://doi.org/10.1016/S0065-2601(08)60272-5)
- Mackay, D. G. (1973). Aspects of the Theory of Comprehension, Memory and Attention. *Quarterly Journal of Experimental Psychology, 25*(1), 22–40.
<https://doi.org/10.1080/14640747308400320>
- Macrae, C. N., & Lewis, H. L. (2002). Do I Know You? Processing Orientation and Face Recognition. *Psychological Science, 13*(2), 194–196. <https://doi.org/10.1111/1467-9280.00436>
- Maddux, W. W., Adam, H., & Galinsky, A. D. (2010). When in rome . . . learn why the romans do what they do: How multicultural learning experiences facilitate creativity. *Personality and Social Psychology Bulletin, 36*(6), 731–741.
<https://doi.org/10.1177/0146167210367786>
- Maddux, W. W., & Galinsky, A. D. (2009). Cultural Borders and Mental Barriers: The Relationship Between Living Abroad and Creativity. *Journal of Personality and Social Psychology, 96*(5), 1047–1061. <https://doi.org/10.1037/a0014861>
- Madjar, N., Greenberg, E., & Chen, Z. (2011). Factors for radical creativity, incremental creativity, and routine, noncreative performance. *Journal of Applied Psychology, 96*(4), 730–743. <https://doi.org/10.1037/a0022416>
- Madore, K. P., Addis, D. R., & Schacter, D. L. (2015). Creativity and Memory: Effects of an

- Episodic-Specificity Induction on Divergent Thinking. *Psychological Science*, 2014, 0956797615591863-. <https://doi.org/10.1177/0956797615591863>
- Madore, K. P., Jing, H. G., & Schacter, D. L. (2016). Divergent creative thinking in young and older adults: Extending the effects of an episodic specificity induction. *Memory and Cognition*, 44(6), 974–988. <https://doi.org/10.3758/s13421-016-0605-z>
- Madore, K. P., Thakral, P. P., Beaty, R. E., Addis, D. R., & Schacter, D. L. (2019). Neural Mechanisms of Episodic Retrieval Support Divergent Creative Thinking. *Cerebral Cortex*, 29(1), 150–166. <https://doi.org/10.1093/cercor/bhx312>
- Mainemelis, C. (2010). Stealing Fire: Creative Deviance in the Evolution of New Ideas. *Academy of Management Review*, 35(4), 558–578. <https://doi.org/10.5465/amr.35.4.zok558>
- Markman, K. D., Lindberg, M. J., Kray, L. J., & Galinsky, A. D. (2007). Implications of counterfactual structure for creative generation and analytical problem solving. *Personality and Social Psychology Bulletin*, 33(3), 312–324. <https://doi.org/10.1177/0146167206296106>
- Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, 98(2), 224–253. <https://doi.org/10.1037/0033-295X.98.2.224>
- Martin, R., & Hewstone, M. (2008). Majority Versus Minority Influence, Message Processing and Attitude Change: The Source-Context-Elaboration Model. *Advances in Experimental Social Psychology*, 40, 237–326. [https://doi.org/10.1016/S0065-2601\(07\)00005-6](https://doi.org/10.1016/S0065-2601(07)00005-6)
- Marzetti, L., Di Lanzo, C., Zappasodi, F., Chella, F., Raffone, A., & Pizzella, V. (2014). Magnetoencephalographic alpha band connectivity reveals differential default mode network interactions during focused attention and open monitoring meditation. *Frontiers*

in Human Neuroscience, 8(OCT), 832.

<https://doi.org/10.3389/FNHUM.2014.00832/BIBTEX>

Mayer, J., & Mussweiler, T. (2011). Suspicious spirits, flexible minds: When distrust

enhances creativity. *Journal of Personality and Social Psychology*, 101(6), 1262–1277.

<https://doi.org/10.1037/a0024407>

McCrae, R. R. (1987). Creativity, divergent thinking, and openness to experience. *Journal of*

Personality and Social Psychology, 52(6), 1258–1265. [https://doi.org/10.1037//0022-](https://doi.org/10.1037//0022-3514.52.6.1258)

[3514.52.6.1258](https://doi.org/10.1037//0022-3514.52.6.1258)

McCrae, R. R., & Greenberg, D. M. (2014). Openness to Experience. In *The Wiley Handbook*

of Genius (pp. 222–243). John Wiley & Sons, Ltd.

<https://doi.org/10.1002/9781118367377.ch12>

Mednick, M. T., Mednick, S. A., & Mednick, E. V. (1964). Incubation of creative

performance and specific associative priming. *Journal of Abnormal and Social*

Psychology, 69(1), 84–88. <https://doi.org/10.1037/h0045994>

Mednick, S. A. (1962). The associative basis of the creative process. *Psychological Review*,

69(3), 220–232.

Mehta, R., & Zhu, M. (2016). Creating when you have less: The impact of resource scarcity

on product use creativity. *Journal of Consumer Research*, 42(5), 767–782.

<https://doi.org/10.1093/jcr/ucv051>

Memmert, D. (2007). Can Creativity Be Improved by an Attention-Broadening Training

Program? An Exploratory Study Focusing on Team Sports. *Creativity Research Journal*,

19(2–3), 281–291. <https://doi.org/10.1080/10400410701397420>

Memmert, D., Hüttermann, S., & Orliczek, J. (2013). Decide like Lionel Messi! The impact

of regulatory focus on divergent thinking in sports. *Journal of Applied Social*

Psychology, 43(10), 2163–2167. <https://doi.org/10.1111/jasp.12159>

- Minas, R. K. (2014). *Designing for the subconscious: a neurosis study of priming and idea generation in electronic brainstorming*. Indiana University.
- Miron-spektor, E., & Argote, L. (2008). The effect of paradoxical cognition on individual and team innovation. *Academy of Management Annual Meeting Proceedings, 2008(1)*, 1–6.
- Miron-Spektor, E., Efrat-Treister, D., Rafaeli, A., & Schwarz-Cohen, O. (2011). Others' anger makes people work harder not smarter: The effect of observing anger and sarcasm on creative and analytic thinking. *Journal of Applied Psychology, 96(5)*, 1065–1075.
<https://doi.org/10.1037/a0023593>
- Miron-Spektor, E., Gino, F., & Argote, L. (2011). Paradoxical frames and creative sparks: Enhancing individual creativity through conflict and integration. *Organizational Behavior and Human Decision Processes, 116(2)*, 229–240.
<https://doi.org/10.1016/j.obhdp.2011.03.006>
- Miron-Spektor, E., Ingram, A., Keller, J., Smith, W. K., & Lewis, M. W. (2018). Microfoundations of organizational paradox: The problem is how we think about the problem. *Academy of Management Journal, 61(1)*, 26–45.
<https://doi.org/10.5465/amj.2016.0594>
- Molden, D. C. (2014). Understanding Priming Effects in Social Psychology: What is “Social Priming” and How does it Occur? *Social Cognition, 32(Supplement)*, 1–11.
<https://doi.org/10.1521/soco.2014.32.sup.1>
- Moreau, C. P., & Engeset, M. G. (2016). The downstream consequences problem- solving mindsets: How playing with LEGO influences creativity. *Journal of Marketing Research, 53(1)*, 18–30. <https://doi.org/10.1509/jmr.13.0499>
- Moscovici, S., & Lage, E. (1976). Studies in social influence III: Majority versus minority influence in a group. *European Journal of Social Psychology, 6(2)*, 149–174.
<https://doi.org/10.1002/ejsp.2420060202>

- Moscovici, S., Lage, E., & Naffrechoux, M. (1969). Influence of a Consistent Minority on the Responses of a Majority in a Color Perception Task. *Sociometry*, 32(4), 365.
<https://doi.org/10.2307/2786541>
- Müller, K., & Wickham, H. (2022). *tibble: Simple Data Frames*. <https://cran.r-project.org/package=tibble>
- Mumford, M. D., & Gustafson, S. B. (1988). Creativity Syndrome: Integration, Application, and Innovation. *Psychological Bulletin*, 103(1), 27–43.
- Navon, D. (1977). Forest before trees: The precedence of global features in visual perception. *Cognitive Psychology*, 9(3), 353–383. [https://doi.org/10.1016/0010-0285\(77\)90012-3](https://doi.org/10.1016/0010-0285(77)90012-3)
- Nelson, J., & Guegan, J. (2019). “I’d like to be under the sea”: Contextual cues in virtual environments influence the orientation of idea generation. *Computers in Human Behavior*, 90(June 2017), 93–102. <https://doi.org/10.1016/j.chb.2018.08.001>
- Nemeth, C. J. (1986). Differential contributions of majority and minority influence. *Psychological Review*, 93(1), 23–32. <https://doi.org/10.1037/0033-295X.93.1.23>
- Nemeth, C. J., & Chiles, C. (1988). Modelling courage: The role of dissent in fostering independence. *European Journal of Social Psychology*, 18(3), 275–280.
<https://doi.org/10.1002/ejsp.2420180306>
- Nemeth, C. J., & Kwan, J. L. (1987). Minority Influence, Divergent Thinking and Detection of Correct Solutions. *Journal of Applied Social Psychology*, 17(9), 788–799.
<https://doi.org/10.1111/j.1559-1816.1987.tb00339.x>
- Newman, A., Donohue, R., & Eva, N. (2017). Psychological safety: A systematic review of the literature. *Human Resource Management Review*, 27(3), 521–535.
<https://doi.org/10.1016/j.hrmr.2017.01.001>
- Nijstad, B. A., De Dreu, C. K. W., Rietzschel, E. F., & Baas, M. (2010). The dual pathway to creativity model: Creative ideation as a function of flexibility and persistence. *European*

Review of Social Psychology, 21(1), 34–77.

<https://doi.org/10.1080/10463281003765323>

Nosek, B. A., Alter, G., Banks, G. C., Borsboom, D., Bowman, S. D., Breckler, S. J., Buck, S., Chambers, C. D., Chin, G., Christensen, G., Contestabile, M., Dafoe, A., Eich, E., Freese, J., Glennerster, R., Goroff, D., Green, D. P., Hesse, B., Humphreys, M., ... Yarkoni, T. (2015). Promoting an open research culture. *Science*, 348(6242), 1422–1425. <https://doi.org/10.1126/science.aab2374>

Oiknine, A. H., Pollard, K. A., Khooshabeh, P., & Files, B. T. (2021). Need for Cognition Is Positively Related to Promotion Focus and Negatively Related to Prevention Focus. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.606847>

Oleynick, V. C., DeYoung, C. G., Hyde, E., Kaufman, S. B., Beaty, R. E., & Silvia, P. J. (2017). Openness/intellect: The core of the creative personality. In *The Cambridge Handbook of Creativity and Personality Research*. <https://doi.org/10.1017/9781316228036.002>

Olszewska, A., & Sobkow, A. (2021). Can observing a Necker cube (really) make you more insightful? The evidence from objective and subjective indicators of insight. *Polish Psychological Bulletin*, 52(No 4), 311–321. <https://doi.org/10.24425/ppb.2021.139164>

Ooms, J. (2023). *writexl: Export Data Frames to Excel “xlsx” Format*. <https://cran.r-project.org/package=writexl>

Ostafin, B. D., & Kassman, K. T. (2012a). Stepping out of history: Mindfulness improves insight problem solving. *Consciousness and Cognition*, 21(2), 1031–1036. <https://doi.org/10.1016/j.concog.2012.02.014>

Ostafin, B. D., & Kassman, K. T. (2012b). Stepping out of history: mindfulness improves insight problem solving. *Consciousness and Cognition*, 21(2), 1031–1036. <https://doi.org/10.1016/j.concog.2012.02.014>

- Oyserman, D., Coon, H. M., & Kemmelmeier, M. (2002). *Rethinking Individualism and Collectivism: Evaluation of Theoretical Assumptions and Meta-Analyses*.
<https://doi.org/10.1037/0033-2909.128.1.3>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *International Journal of Surgery*, 88, 105906. <https://doi.org/10.1016/j.ijssu.2021.105906>
- Palmiero, M. (2020). The relationships between abstraction and creativity. In D. D. Preiss, D. Cosmelli, & J. C. Kaufman (Eds.), *Creativity and the Wandering Mind: Spontaneous and Controlled Cognition* (pp. 73–90). Elsevier. <https://doi.org/10.1016/B978-0-12-816400-6.09001-5>
- Park, G., Lim, B.-C., & Oh, H. S. (2019). Why Being Bored Might Not Be a Bad Thing after All. *Academy of Management Discoveries*, 5(1), 78–92.
<https://doi.org/10.5465/amd.2017.0033>
- Peters, J. L., Sutton, A. J., Jones, D. R., Abrams, K. R., & Rushton, L. (2007). Performance of the trim and fill method in the presence of publication bias and between-study heterogeneity. *Statistics in Medicine*, 26(25), 4544–4562.
<https://doi.org/10.1002/sim.2889>
- Peters, J. L., Sutton, A. J., Jones, D. R., Abrams, K. R., & Rushton, L. (2008). Contour-enhanced meta-analysis funnel plots help distinguish publication bias from other causes of asymmetry. *Journal of Clinical Epidemiology*, 61(10), 991–996.
<https://doi.org/10.1016/j.jclinepi.2007.11.010>
- Peterson, J. B., & Carson, S. (2000). Latent Inhibition and Openness to Experience in a high-

- achieving student population. *Personality and Individual Differences*, 28(2), 323–332.
[https://doi.org/10.1016/S0191-8869\(99\)00101-4](https://doi.org/10.1016/S0191-8869(99)00101-4)
- Peterson, J. B., Smith, K. W., & Carson, S. (2002). Openness and extraversion are associated with reduced latent inhibition: replication and commentary. *Personality and Individual Differences*, 33(7), 1137–1147. [https://doi.org/10.1016/S0191-8869\(02\)00004-1](https://doi.org/10.1016/S0191-8869(02)00004-1)
- Piaget, J. (1969). The Mechanisms of Perception. In *The Mechanisms of Perception*.
Rutledge & Kegan Paul. <https://doi.org/10.4324/9780203715758>
- Pick, H., & Lavidor, M. (2019). Modulation of automatic and creative features of the Remote Associates Test by angular gyrus stimulation. *Neuropsychologia*, 129(April), 348–356.
<https://doi.org/10.1016/j.neuropsychologia.2019.04.010>
- Pinho, A. L., Ullén, F., Castelo-Branco, M., Fransson, P., & De Manzano, Ö. (2016).
Addressing a Paradox: Dual Strategies for Creative Performance in Introspective and
Extrospective Networks. *Cerebral Cortex*, 26(7), 3052–3063.
<https://doi.org/10.1093/CERCOR/BHV130>
- Porath, C. L., & Erez, A. (2009a). Overlooked but not untouched: How rudeness reduces
onlookers' performance on routine and creative tasks. *Organizational Behavior and
Human Decision Processes*, 109(1), 29–44. <https://doi.org/10.1016/j.obhdp.2009.01.003>
- Porath, C. L., & Erez, A. (2009b). Overlooked but not untouched: How rudeness reduces
onlookers' performance on routine and creative tasks. *Organizational Behavior and
Human Decision Processes*, 109(1), 29–44. <https://doi.org/10.1016/j.obhdp.2009.01.003>
- Potocnik, K., Verwaeren, B., & Nijstad, B. (2022). Tensions and Paradoxes in Creativity and
Innovation. *Revista de Psicología Del Trabajo y de Las Organizaciones*, 38(3), 149–
163. <https://doi.org/10.5093/jwop2022a19>
- Pustejovsky, J. E., & Rodgers, M. A. (2019). Testing for funnel plot asymmetry of
standardized mean differences. *Research Synthesis Methods*, 10(1), 57–71.

<https://doi.org/10.1002/jrsm.1332>

- R Core Team. (2022). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. <https://www.r-project.org/>
- Radel, R., Davranche, K., Fournier, M., & Dietrich, A. (2015). The role of (dis)inhibition in creativity: Decreased inhibition improves idea generation. *Cognition*, *134*, 110–120. <https://doi.org/10.1016/j.cognition.2014.09.001>
- Rauss, K., & Pourtois, G. (2013). What is bottom-up and what is top-down in predictive coding. *Frontiers in Psychology*, *4*(MAY). <https://doi.org/10.3389/fpsyg.2013.00276>
- Reiter-Palmon, R., Forthmann, B., & Barbot, B. (2019). Scoring divergent thinking tests: A review and systematic framework. *Psychology of Aesthetics, Creativity, and the Arts*, *13*(2), 144–152. <https://doi.org/10.1037/aca0000227>
- Rietzschel, E. F., Nijstad, B. A., & Stroebe, W. (2019). Why Great Ideas are Often Overlooked: A Review and Theoretical Analysis of Research on Idea Evaluation and Selection. In P. B. Paulus & B. A. Nijstad (Eds.), *The Oxford Handbook of Group Creativity*.
- Rietzschel, E. F., Slijkhuis, J. M., & Van Yperen, N. W. (2014). Task structure, need for structure, and creativity. *European Journal of Social Psychology*, *44*(4), 386–399. <https://doi.org/10.1002/ejsp.2024>
- Rinne, T., Steel, D., & Fairweather, J. (2013). The role of Hofstede's individualism in national-level creativity. *Creativity Research Journal*, *25*(1), 129–136. <https://doi.org/10.1080/10400419.2013.752293>
- Ritter, S. M., Damian, R. I., Simonton, D. K., van Baaren, R. B., Strick, M., Derks, J., & Dijksterhuis, A. (2012a). Diversifying experiences enhance cognitive flexibility. *Journal of Experimental Social Psychology*, *48*(4), 961–964. <https://doi.org/10.1016/j.jesp.2012.02.009>

- Ritter, S. M., Damian, R. I., Simonton, D. K., van Baaren, R. B., Strick, M., Derks, J., & Dijksterhuis, A. (2012b). Diversifying experiences enhance cognitive flexibility. *Journal of Experimental Social Psychology, 48*(4), 961–964.
<https://doi.org/10.1016/j.jesp.2012.02.009>
- Ritter, S. M., Kühn, S., Müller, B. C. N., van Baaren, R. B., Brass, M., & Dijksterhuis, A. (2014a). The Creative Brain: Corepresenting Schema Violations Enhances TPJ Activity and Boosts Cognitive Flexibility. *Creativity Research Journal, 26*(2), 144–150.
<https://doi.org/10.1080/10400419.2014.901061>
- Ritter, S. M., Kühn, S., Müller, B. C. N., van Baaren, R. B., Brass, M., & Dijksterhuis, A. (2014b). The Creative Brain: Corepresenting Schema Violations Enhances TPJ Activity and Boosts Cognitive Flexibility. *Creativity Research Journal, 26*(2), 144–150.
<https://doi.org/10.1080/10400419.2014.901061>
- Rook, L. (2014). Exposure to the Color Red Enhances Creative Thinking Depending on Appetitive-Aversive Cues. *Creativity Research Journal, 26*(1), 124–130.
<https://doi.org/10.1080/10400419.2014.873672>
- Rook, L., & van Knippenberg, D. (2011). Creativity and Imitation: Effects of Regulatory Focus and Creative Exemplar Quality. *Creativity Research Journal, 23*(4), 346–356.
<https://doi.org/10.1080/10400419.2011.621844>
- Rosch, E. (1975). Cognitive representations of semantic categories. *Journal of Experimental Psychology: General, 104*(3), 192–233. <https://doi.org/10.1037/0096-3445.104.3.192>
- Rosch, E., Mervis, C. B., Gray, W. D., Johnson, D. M., & Boyes-Braem, P. (1976). Basic objects in natural categories. *Cognitive Psychology, 8*(3), 382–439.
[https://doi.org/10.1016/0010-0285\(76\)90013-X](https://doi.org/10.1016/0010-0285(76)90013-X)
- Rosen, D. S., Oh, Y., Erickson, B., Zhang, F. (Zoe), Kim, Y. E., & Kounios, J. (2020). Dual-process contributions to creativity in jazz improvisations: An SPM-EEG study.

- NeuroImage*, 213, 116632. <https://doi.org/10.1016/J.NEUROIMAGE.2020.116632>
- Rosenbaum, M. E., Arenson, S. J., & Panman, R. A. (1964). Training and instructions in the facilitation of originality. *Journal of Verbal Learning and Verbal Behavior*, 3(1), 50–56. [https://doi.org/10.1016/S0022-5371\(64\)80058-X](https://doi.org/10.1016/S0022-5371(64)80058-X)
- Runco, M. (2001). Introduction to the Special Issue: Commemorating Guilford's 1950 Presidential Address. *Creativity Research Journal*, 13(3 & 4), 247–248. <https://doi.org/10.4324/9781410608604-2>
- Runco, M. a., & Jaeger, G. J. (2012). The Standard Definition of Creativity. *Creativity Research Journal*, 24(1), 92–96. <https://doi.org/10.1080/10400419.2012.650092>
- Sacramento, C. A., Fay, D., & West, M. A. (2013). Workplace duties or opportunities? Challenge stressors, regulatory focus, and creativity. *Organizational Behavior and Human Decision Processes*, 121(2), 141–157. <https://doi.org/10.1016/j.obhdp.2013.01.008>
- Sassenberg, K. (n.d.). *Creativity priming*. Unpublished study.
- Sassenberg, K., Moskowitz, G. B., Fetterman, A., & Kessler, T. (2017). Priming creativity as a strategy to increase creative performance by facilitating the activation and use of remote associations. *Journal of Experimental Social Psychology*, 68, 128–138. <https://doi.org/10.1016/j.jesp.2016.06.010>
- Sassenberg, K., Winter, K., Becker, D., Ditrich, L., Scholl, A., & Moskowitz, G. B. (2021). Flexibility mindsets: Reducing biases that result from spontaneous processing. *European Review of Social Psychology*, 00(00), 1–43. <https://doi.org/10.1080/10463283.2021.1959124>
- Scheinin, I., Kalimeri, M., Jagerroos, V., Parkkinen, J., Tikkanen, E., Würtz, P., & Kangas, A. (2023). *ggforestplot: Forestplots of Measures of Effects and Their Confidence Intervals*.

- Schul, Y. (1983). Integration and abstraction in impression formation. *Journal of Personality and Social Psychology*, *44*(1), 45–54. <https://doi.org/10.1037/0022-3514.44.1.45>
- Schwarz, N. (1990). Feelings as information: Informational and motivational functions of affective states. In *Handbook of motivation and cognition: Foundations of social behavior, Vol. 2.* (pp. 527–561). The Guilford Press.
- Schwarz, N., & Clore, G. L. (2007). Feelings and phenomenal experiences. In *Social psychology: Handbook of basic principles, 2nd ed.* (pp. 385–407). The Guilford Press.
- Semin, G. R., & Fiedler, K. (1991). The Linguistic Category Model, its Bases, Applications and Range. *European Review of Social Psychology*, *2*(1), 1–30.
<https://doi.org/10.1080/14792779143000006>
- Shane, S. A. (1992). Why do some societies invent more than others? *Journal of Business Venturing*, *7*(1), 29–46. [https://doi.org/10.1016/0883-9026\(92\)90033-N](https://doi.org/10.1016/0883-9026(92)90033-N)
- Shanks, D. R., Newell, B. R., Lee, E. H., Balakrishnan, D., Ekelund, L., Cenac, Z., Kavvadia, F., & Moore, C. (2013). Priming Intelligent Behavior: An Elusive Phenomenon. *PLoS ONE*, *8*(4), e56515. <https://doi.org/10.1371/journal.pone.0056515>
- Shao, Y., Nijstad, B. A., & Täuber, S. (2018). Linking self-construal to creativity: The role of approach motivation and cognitive flexibility. *Frontiers in Psychology*, *9*(OCT), 1–11.
<https://doi.org/10.3389/fpsyg.2018.01929>
- Shao, Y., Nijstad, B. A., & Täuber, S. (2019). Creativity under workload pressure and integrative complexity: The double-edged sword of paradoxical leadership. *Organizational Behavior and Human Decision Processes*.
<https://doi.org/10.1016/j.obhdp.2019.01.008>
- Shapira, O., Liberman, N., Trope, Y., & Rim, S. (2012). *The SAGE Handbook of Social Cognition*. SAGE Publications Ltd. <https://doi.org/10.4135/9781446247631>
- Shariff, A. F., Willard, A. K., Andersen, T., & Norenzayan, A. (2016). Religious Priming: A

- Meta-Analysis With a Focus on Prosociality. *Personality and Social Psychology Review*, 20(1), 27–48. <https://doi.org/10.1177/1088868314568811>
- Sher, K. B.-T., Levi-Keren, M., & Gordon, G. (2019). Priming, enabling and assessment of curiosity. *Educational Technology Research and Development*, 67(4), 931–952. <https://doi.org/10.1007/s11423-019-09665-4>
- Shokrkon, A., & Nicoladis, E. (2022). The Directionality of the Relationship Between Executive Functions and Language Skills: A Literature Review. *Frontiers in Psychology*, 13, 3657. <https://doi.org/10.3389/FPSYG.2022.848696>
- Silvia, P. J., Beaty, R. E., Nusbaum, E. C., Eddington, K. M., Levin-Aspenson, H., & Kwapil, T. R. (2014). Everyday Creativity in Daily Life: An Experience-Sampling Study of “Little c” Creativity. *Psychology of Aesthetics, Creativity, and the Arts*. <https://doi.org/10.1037/a0035722>
- Silvia, P. J., Winterstein, B. P., Willse, J. T., Barona, C. M., Cram, J. T., Hess, K. I., Martinez, J. L., & Richard, C. A. (2008). Assessing creativity with divergent thinking tasks: Exploring the reliability and validity of new subjective scoring methods. *Psychology of Aesthetics, Creativity, and the Arts*, 2(2), 68–85. <https://doi.org/10.1037/1931-3896.2.2.68>
- Simons, D. J., & Chabris, C. F. (1999). Gorillas in Our Midst: Sustained Inattentional Blindness for Dynamic Events. *Perception*, 28(9), 1059–1074. <https://doi.org/10.1068/p281059>
- Simonsohn, U., Nelson, L. D., & Simmons, J. P. (2013). *P-Curve: A Key to the File-Drawer*. <https://doi.org/10.1037/a0033242.supp>
- Simonsohn, U., Nelson, L. D., & Simmons, J. P. (2014). p -Curve and Effect Size. *Perspectives on Psychological Science*, 9(6), 666–681. <https://doi.org/10.1177/1745691614553988>

Simonton, D. K. (2000). *Creativity Cognitive, Personal, Developmental, and Social Aspects*.

<https://doi.org/10.1037/0003>

Singelis, T. M. (1994). The Measurement of Independent and Interdependent Self-Construals.

Personality and Social Psychology Bulletin, 20(5), 580–591.

<https://doi.org/10.1177/0146167294205014>

Slepian, M. L., & Ambady, N. (2012). Fluid movement and creativity. *Journal of*

Experimental Psychology: General, 141(4), 625–629. <https://doi.org/10.1037/a0027395>

Sligte, D. J., de Dreu, C. K. W., & Nijstad, B. A. (2011). Power, stability of power, and creativity. *Journal of Experimental Social Psychology*, 47(5), 891–897.

<https://doi.org/10.1016/j.jesp.2011.03.009>

Sligte, D. J., Nijstad, B. A., & De Dreu, C. K. W. (2013). Leaving a Legacy Neutralizes

Negative Effects of Death Anxiety on Creativity. *Personality and Social Psychology*

Bulletin, 39(9), 1152–1163. <https://doi.org/10.1177/0146167213490804>

Slowikowski, K. (2022). *ggrepel: Automatically Position Non-Overlapping Text Labels with*

“*ggplot2*.” <https://cran.r-project.org/package=ggrepel>

Smith, S. M., Ward, T. B., & Finke, R. A. (1995). *The creative cognition approach* (S. M.

Smith, T. B. Ward, & R. A. Finke (eds.)). The MIT Press.

<http://search.ebscohost.com.proxy->

[ub.rug.nl/login.aspx?direct=true&db=psyh&AN=1995-97533-000&site=ehost-](http://search.ebscohost.com.proxy-ub.rug.nl/login.aspx?direct=true&db=psyh&AN=1995-97533-000&site=ehost-)

[live&scope=site](http://search.ebscohost.com.proxy-ub.rug.nl/login.aspx?direct=true&db=psyh&AN=1995-97533-000&site=ehost-live&scope=site)

Snyder, C. R., & Fromkin, H. L. (1977). Abnormality as a Positive Characteristic: The

Development and Validation of a Scale Measuring Need for Uniqueness. *Journal of Abnormal Psychology*, 86(5), 518–527.

Soderberg, C. K., Callahan, S. P., Kochersberger, A. O., Amit, E., & Ledgerwood, A. (2015).

The effects of psychological distance on abstraction: Two meta-analyses. *Psychological*

Bulletin, 141(3), 525–548. <https://doi.org/10.1037/bul0000005>

Sowden, P. T., Pringle, A., & Gabora, L. (2015). The shifting sands of creative thinking:

Connections to dual-process theory. *Thinking & Reasoning*, 21(1), 40–60.

<https://doi.org/10.1080/13546783.2014.885464>

Stajkovic, A. D., Locke, E. A., & Blair, E. S. (2006). A first examination of the relationships between primed subconscious goals, assigned conscious goals, and task performance.

Journal of Applied Psychology, 91(5), 1172–1180. [https://doi.org/10.1037/0021-](https://doi.org/10.1037/0021-9010.91.5.1172)

9010.91.5.1172

Stanley, D. (2021). *apaTables: Create American Psychological Association (APA) Style*

Tables. <https://cran.r-project.org/package=apaTables>

Steidle, A., & Werth, L. (2013). Freedom from constraints: Darkness and dim illumination promote creativity. *Journal of Environmental Psychology*, 35, 67–80.

<https://doi.org/10.1016/j.jenvp.2013.05.003>

Sternberg, R. J., & Lubart, T. I. (1999). The concept of creativity: Prospects and paradigms.

In *Handbook of creativity*. Cambridge University Press.

<http://books.google.com/books?hl=it&lr=&id=d1KTEQpQ6vsC&pgis=1>

Szumowska, E., & Kruglanski, A. W. (2020). Curiosity as end and means. *Current Opinion*

in Behavioral Sciences, 35, 35–39. <https://doi.org/10.1016/j.cobeha.2020.06.008>

Tadmor, C. T., Chao, M. M., Hong, Y. yi, & Polzer, J. T. (2013). Not Just for Stereotyping

Anymore: Racial Essentialism Reduces Domain-General Creativity. *Psychological*

Science, 24(1), 99–105. <https://doi.org/10.1177/0956797612452570>

Takeuchi, H., Taki, Y., Matsudaira, I., Ikeda, S., Kelssy, K. H., Nouchi, R., Sakaki, K.,

Nakagawa, S., Nozawa, T., Yokota, S., Araki, T., Hanawa, S., Ishibashi, R., Yamazaki,

S., & Kawashima, R. (2020). Convergent creative thinking performance is associated

with white matter structures: Evidence from a large sample study. *NeuroImage*, 210,

116577. <https://doi.org/10.1016/J.NEUROIMAGE.2020.116577>

Tan, L., Wang, X., Guo, C., Zeng, R., Zhou, T., & Cao, G. (2019). Does exposure to foreign culture influence creativity? Maybe it's not only due to concept expansion. *Frontiers in Psychology, 10*(APR), 1–11. <https://doi.org/10.3389/fpsyg.2019.00537>

Tanis, C. (2017). *The Alternative Uses Task: A Comparison between various Scoring Method.*

Taylor, C. L. (2021). Task instructions influence the effects of impaired self-control on creative cognition. *Psychology of Aesthetics, Creativity, and the Arts, 15*(1), 165–175. <https://doi.org/10.1037/aca0000249>

Terrin, N., Schmid, C. H., Lau, J., & Olkin, I. (2003). Adjusting for publication bias in the presence of heterogeneity. *Statistics in Medicine, 22*(13), 2113–2126. <https://doi.org/10.1002/sim.1461>

Thériault, R. (2022). *rempsyc: Convenience Functions for Psychology.* <https://rempsyc.remi-theriault.com>

Thrash, T. M., Maruskin, L. A., Cassidy, S. E., Fryer, J. W., & Ryan, R. M. (2010). Mediating between the muse and the masses: Inspiration and the actualization of creative ideas. *Journal of Personality and Social Psychology, 98*(3), 469–487. <https://doi.org/10.1037/a0017907>

Tidikis, V., Ash, I. K., & Collier, A. F. (2017). The Interaction of Emotional Valence and Arousal on Attentional Breadth and Creative Task Performance. *Creativity Research Journal, 29*(3), 313–330. <https://doi.org/10.1080/10400419.2017.1360068>

To, M. L., Fisher, C. D., Ashkanasy, N. M., Zhou, J., & Jones, J. H. (2021). *Feeling differently, creating together: Affect heterogeneity and creativity in project teams.* <https://doi.org/10.1002/job.2535>

Topolinski, S., & Deutsch, R. (2012). Phasic affective modulation of creativity. *Experimental*

- Psychology*, 59(5), 302–310. <https://doi.org/10.1027/1618-3169/a000159>
- Torrance, E. P. (1966). *Torrance tests of creative thinking: Directions manual and scoring*. Personnel Press.
- Trope, Y., & Liberman, N. (2010). Construal-level theory of psychological distance. *Psychological Review*, 117(2), 440–463. <https://doi.org/10.1037/a0018963>
- Trope, Y., & Liberman, N. (2012). Construal level theory. In P. A. M. Van Lange, A. W. Kruglanski, & E. T. Higgins (Eds.), *Handbook of theories of social psychology*, Vol. 1. (pp. 118–134). Sage Publications Ltd. <https://doi.org/10.4135/9781446249215.n7>
- Truelove-Hill, M., Erickson, B. A., Anderson, J., Kossoyan, M., & Kounios, J. (2018). A Growth-Curve Analysis of the Effects of Future-Thought Priming on Insight and Analytical Problem-Solving. *Frontiers in Psychology*, 9(July), 1–9. <https://doi.org/10.3389/fpsyg.2018.01311>
- Tsai, M. H., & Chou, W. L. (2016). Attentional orienting and executive control are affected by different types of meditation practice. *Consciousness and Cognition*, 46, 110–126. <https://doi.org/10.1016/J.CONCOG.2016.09.020>
- Tulving, E., & Pearlstone, Z. (1966). *Availability Versus Accessibility of Information in Memory for Words I*. 5, 381–391.
- Vallacher, R. R., & Wegner, D. M. (1987). What do people think they're doing? Action identification and human behavior. *Psychological Review*, 94(1), 3–15. <https://doi.org/10.1037/0033-295X.94.1.3>
- van Aert, R. C. M., Wicherts, J. M., & van Assen, M. A. L. M. (2016). Conducting Meta-Analyses Based on p Values: Reservations and Recommendations for Applying p-Uniform and p-Curve. *Perspectives on Psychological Science*, 11(5), 713–729. <https://doi.org/10.1177/1745691616650874>
- Van Geert, P. (1998). A Dynamic Systems Model of Basic Developmental Mechanisms:

Piaget, Vygotsky, and Beyond. *Psychological Review*, 105(4), 634–677.

<https://doi.org/10.1037/0033-295X.105.4.634-677>

Van Leeuwen, W., & Baas, M. (2017). Creativity Under Attack: How People's Role in Competitive Conflict Shapes Their Creative Idea Generation. *Creativity Research Journal*, 29(4), 354–369. <https://doi.org/10.1080/10400419.2017.1376492>

van Vianen, A. E. M., Klehe, U.-C., Koen, J., & Dries, N. (2012). Career adapt-abilities scale — Netherlands form: Psychometric properties and relationships to ability, personality, and regulatory focus. *Journal of Vocational Behavior*, 80(3), 716–724.

<https://doi.org/10.1016/j.jvb.2012.01.002>

Vaughn, L. A., Baumann, J., & Klemann, C. (2008). Openness to Experience and regulatory focus: Evidence of motivation from fit. *Journal of Research in Personality*, 42(4), 886–894. <https://doi.org/10.1016/j.jrp.2007.11.008>

Vezzali, L., Gocłowska, M. A., Crisp, R. J., & Stathi, S. (2016). On the relationship between cultural diversity and creativity in education: The moderating role of communal versus divisional mindset. *Thinking Skills and Creativity*, 21, 152–157.

<https://doi.org/10.1016/J.TSC.2016.07.001>

Viechtbauer, W. (2010). Conducting Meta-Analyses in R with the metafor Package. *Journal of Statistical Software*, 36(3). <https://doi.org/10.18637/jss.v036.i03>

Wakslak, C. J., & Trope, Y. (2009). Cognitive consequences of affirming the self: The relationship between self-affirmation and object construal. *Journal of Experimental Social Psychology*, 45(4), 927–932. <https://doi.org/10.1016/J.JESP.2009.05.002>

Wakslak, C. J., Trope, Y., Liberman, N., & Alony, R. (2006). Seeing the forest when entry is unlikely: probability and the mental representation of events. *Journal of Experimental Psychology. General*, 135(4), 641–653. <https://doi.org/10.1037/0096-3445.135.4.641>

Wan, W. W. N., & Chiu, C. Y. (2002). Effects of novel conceptual combination on creativity.

- Journal of Creative Behavior*, 36(4), 227–240. <https://doi.org/10.1002/j.2162-6057.2002.tb01066.x>
- Wang, J., Wang, L., Liu, R. De, & Dong, H. Z. (2017). How expected evaluation influences creativity: Regulatory focus as moderator. *Motivation and Emotion*, 41(2), 147–157. <https://doi.org/10.1007/s11031-016-9598-y>
- Ward, T. B., Finke, R. A., & Smith, S. M. (1995). Creativity and the mind: discovering the genius within. In *Choice Reviews Online*. Plenum Publishing Corporation. <https://doi.org/10.5860/choice.33-6600>
- Ward, T. B., Patterson, M. J., & Sifonis, C. M. (2004). The Role of Specificity and Abstraction in Creative Idea Generation. *Creativity Research Journal*, 16(1), 1–9. https://doi.org/10.1207/s15326934crj1601_1
- Webster, D. M., & Kruglanski, A. W. (1994). Individual Differences in Need for Cognitive Closure. *Journal of Personality and Social Psychology*, 67(6), 1049–1062.
- Wei, T., & Simko, V. (2021). *R package “corrplot”: Visualization of a Correlation Matrix*. <https://github.com/taiyun/corrplot>
- Weingarten, E., Chen, Q., McAdams, M., Yi, J., Hepler, J., & Albarracín, D. (2016). From primed concepts to action: A meta-analysis of the behavioral effects of incidentally presented words. *Psychological Bulletin*, 142(5), 472–497. <https://doi.org/10.1037/bul0000030>
- Wen, F., Zuo, B., Xie, Z., & Gao, J. (2019). Boosting creativity, but only for low creative connectivity: The moderating effect of priming stereotypically inconsistent information on creativity. *Frontiers in Psychology*, 10(FEB), 1–8. <https://doi.org/10.3389/fpsyg.2019.00273>
- Wickham, H. (2016). *ggplot2*. Springer International Publishing. <https://doi.org/10.1007/978-3-319-24277-4>

- Wickham, H., Averick, M., Bryan, J., Chang, W., McGowan, L. D., François, R., Golemund, G., Hayes, A., Henry, L., Hester, J., Kuhn, M., Pedersen, T. L., Miller, E., Bache, S. M., Müller, K., Ooms, J., Robinson, D., Seidel, D. P., Spinu, V., ... Yutani, H. (2019). Welcome to the {tidyverse}. *Journal of Open Source Software*, *4*(43), 1686.
<https://doi.org/10.21105/joss.01686>
- Wickham, H., François, R., Henry, L., Müller, K., & Vaughan, D. (2023). *dplyr: A Grammar of Data Manipulation*. <https://cran.r-project.org/package=dplyr>
- Wiekens, C. J., & Stapel, D. A. (2008). I versus We: The Effects of Self-Construal Level on Diversity. *Social Cognition*, *26*(3), 368–377. <https://doi.org/10.1521/soco.2008.26.3.368>
- Wigboldus, D. H. J., Spears, R., & Semin, G. R. (2005). When do we communicate stereotypes? Influence of the social context on the linguistic expectancy bias. *Group Processes and Intergroup Relations*, *8*(3 SPEC. ISS.), 215–230.
<https://doi.org/10.1177/1368430205053939>
- Winter, K., Scholl, A., & Sassenberg, K. (n.d.). *Counterfactual priming*. Unpublished study.
- Wolfradt, U., & Pretz, J. E. (2001). Individual differences in creativity: personality, story writing, and hobbies. *European Journal of Personality*, *15*(4), 297–310.
<https://doi.org/10.1002/per.409>
- Woo, S. E., Chernyshenko, O. S., Longley, A., Zhang, Z.-X., Chiu, C.-Y., & Stark, S. E. (2014). Openness to Experience: Its Lower Level Structure, Measurement, and Cross-Cultural Equivalence. *Journal of Personality Assessment*, *96*(1), 29–45.
<https://doi.org/10.1080/00223891.2013.806328>
- Wu, X., Gu, X., & Zhang, H. (2019). The Facilitative Effects of Ambiguous Figures on Creative Solution. *Journal of Creative Behavior*, *53*(1), 44–51.
<https://doi.org/10.1002/jocb.161>
- Wu, X., Guo, T., Tang, T., Shi, B., & Luo, J. (2017). Role of Creativity in the Effectiveness

- of Cognitive Reappraisal. *Frontiers in Psychology*, 8, 1598.
<https://doi.org/10.3389/fpsyg.2017.01598>
- Ye, S., Ngan, R. Y. L., & Hui, A. N. N. (2013). The State, Not the Trait, of Nostalgia Increases Creativity. *Creativity Research Journal*, 25(3), 317–323.
<https://doi.org/10.1080/10400419.2013.813797>
- Yen, C. L., Chao, S. H., & Lin, C. Y. (2011). Field Testing of Regulatory Focus Theory. *Journal of Applied Social Psychology*, 41(6), 1565–1581. <https://doi.org/10.1111/j.1559-1816.2011.00766.x>
- Zabelina, D. L., & Robinson, M. D. (2010). Child’s Play: Facilitating the Originality of Creative Output by a Priming Manipulation. *Psychology of Aesthetics, Creativity, and the Arts*, 4(1), 57–65. <https://doi.org/10.1037/a0015644>
- Zhang, W., Sjoerds, Z., & Hommel, B. (2020). Metacontrol of human creativity: The neurocognitive mechanisms of convergent and divergent thinking. *NeuroImage*, 210, 116572. <https://doi.org/10.1016/j.neuroimage.2020.116572>
- Zhbanova, K. S., & Rule, A. C. (2014). Construal level theory applied to sixth graders’ creativity in craft constructions with integrated proximal or distal academic content. *Thinking Skills and Creativity*, 13, 141–152. <https://doi.org/10.1016/j.tsc.2014.04.002>
- Zhou, J., & Hoever, I. J. (2014). Research on Workplace Creativity: A Review and Redirection. *Annual Review of Organizational Psychology and Organizational Behavior*, 1(1), 333–359. <https://doi.org/10.1146/annurev-orgpsych-031413-091226>
- Zhou, J., Wang, X. M., Song, L. J., & Wu, J. (2017). Is it new? Personal and contextual influences on perceptions of novelty and creativity. *Journal of Applied Psychology*, 102(2), 180–202. <https://doi.org/10.1037/apl0000166>
- Zhou, Z., Hu, L., Sun, C., Li, M., Guo, F., & Zhao, Q. (2019). The effect of Zhongyong thinking on remote association thinking: An EEG study. *Frontiers in Psychology*,

10(FEB), 1–9. <https://doi.org/10.3389/fpsyg.2019.00207>

Zitek, E. M., & Vincent, L. C. (2014). Deserve and Diverge: Feeling Entitled Makes People More Creative. *Journal of Experimental Social Psychology*.

<https://doi.org/10.1016/j.jesp.2014.10.006>

Zitek, E. M., & Vincent, L. C. (2015). Deserve and diverge: Feeling entitled makes people more creative. *Journal of Experimental Social Psychology*, 56, 242–248.

<https://doi.org/10.1016/j.jesp.2014.10.006>

Zuo, B., Wen, F., Wang, M., & Wang, Y. (2019). The mediating role of cognitive flexibility in the influence of counter-stereotypes on creativity. *Frontiers in Psychology*, 10(FEB),

1–11. <https://doi.org/10.3389/fpsyg.2019.00105>

Appendix A. List of comparisons classified into each priming mechanism category

Table A1

Comparisons Coded as Unconstrained Thought

subcategory	reference
bottom-up processing	Park, Lim, & Oh (2018), Experiment 1 – sorting vs. collage
bottom-up processing	Park, Lim, & Oh (2018), Experiment 3 – sorting vs. collage
bottom-up processing	Haase (2020) – open-problem vs. closed-problem
bottom-up processing	Fan (2018) – open-ended vs. well-defined
bottom-up processing	Liu (2016) – Experiment 1 – broad vs. narrow
bottom-up processing	Chiu (2014), Experiment 2 – avoid common writing tendencies vs. no restrictions
bottom-up processing	Chiu (2014), Experiment 3 – avoid common writing tendencies vs. no restrictions
bottom-up processing	Moreau & Gundersen Engeset (2016), Pretest 1 – well-defined problem-solving vs. ill-defined problem-solving
bottom-up processing	Moreau & Gundersen Engeset (2016), Study 1 – well-defined problem-solving vs. ill-defined problem-solving
bottom-up processing	Moreau & Gundersen Engeset (2016), Study 2 – present (instructions) vs. absent (instructions)
bottom-up processing	Moreau & Gundersen Engeset (2016), Study 2 – present (outcome) vs. absent (outcome)
bottom-up processing	Chiu, Hsu, Lin, Chen, & Liu (2017), Study 1 – avoid common writing tendencies vs. no restrictions
broad attention	Baas, Nevicka, Ten Velden (2014), Study 4 – observation vs. act with awareness
broad attention	Colzato, Ozturk & Hommel (2012) – open-monitoring vs. focused-attention
broad attention	Colzato, Ozturk & Hommel (2012) – open-monitoring vs. baseline
broad attention	Colzato, Ozturk & Hommel (2012) – focused-attention vs. baseline
broad attention	Colzato, Szapora, Lippelt, & Hommel (2017) – open-monitoring vs. focused-attention
broad attention	Ostafin, Kassman (2012), Study 2 – mindfulness vs. natural history

Note. There were more effect sizes than comparisons, because some studies measured more than one indicator per comparison.

Table A2*Comparisons Coded as Abstraction*

subcategory	reference
visual global processing	Friedman, Fishbach, Förster, & Werth (2003), Experiment 1 – broad vs. narrow
visual global processing	Friedman, Fishbach, Förster, & Werth (2003), Experiment 2 – broad vs. narrow
visual global processing	De Dreu, Nijstad, & Baas (2011), Experiment 1 – global vs. Local
visual global processing	Klauer & Singmann (2015), Study 2 – global letters vs. local letters
visual global processing	Klauer & Singmann (2015), Study 2 – global letters vs. global and local letters
visual global processing	Klauer & Singmann (2015), Study 2 – local letters vs. global and local letters
temporal distance	Chiu (2012), Study 1 – 50-year vs. 5-year
temporal distance	Chiu (2012), Study 1 – 50-year vs. present-day
temporal distance	Chiu (2012), Study 1 – 5-year vs. present-day
temporal distance	Chiu (2012), Study 2 – 50-year vs. 5-year
temporal distance	Chiu (2012), Study 2 – 50-year vs. present-day
temporal distance	Chiu (2012), Study 2 – 5-year vs. present-day
temporal distance	Ye, Ngan, & Hui (2013) – nostalgia vs. schedule
temporal distance	De Dreu, Nijstad, & Baas (2011), Experiment 2 – distal future vs. Proximal future
temporal distance	Truelove-Hill, Erickson, Anderson, Kossoyan, & Kounios (2018) – far-future vs. near-future
temporal distance	Koh & Leung (2019), Experiment 1 – 50 years in the future vs. in the present day
temporal distance	Koh & Leung (2019), Experiment 1 – 51 years in the future vs. none
temporal distance	Koh & Leung (2019), Experiment 2 – 50 years in the future vs. in the present day
temporal distance	Koh & Leung (2019), Experiment 2 – 50 years in the future vs. none
temporal distance	Forster, Friedman, & Liberman (2004), Study 5 – distant vs. near
temporal distance	Forster, Friedman, & Liberman (2004), Study 5 – distant vs. nothing
spatial distance	Liberman, Polack, Hameiri, & Blumenfeld (2012) – distal vs. proximal
spatial distance	Zhbanova & Rule (2014), Study 2 – distal vs. proximal
social distance	Gaither, Fan, & Kinzler (2020), Experiment 2 – multiple self identities vs. multiple other identities

Table A2*Comparisons Coded as Abstraction*

social distance	Ritter, Kuhn, Muller, Baaren, Brass, & Dijksterhuis (2014), Experiment 1 – high vs. low
abstraction of semantic categories	Chiu (2015), Experiment 2 – overinclusive vs. regular
abstraction of semantic categories	Chiu (2015), Experiment 3 – overinclusive long-distance vs. overinclusive short-distance
abstraction of semantic categories	Chiu (2015), Experiment 3 – overinclusive long-distance vs. regular
abstraction of semantic categories	Chiu (2015), Experiment 3 – overinclusive short-distance vs. regular

Note. There were more effect sizes than comparisons, because some studies measured more than one indicator per comparison.

Table A3*Comparisons Coded as Uniqueness*

subcategory	reference
nonconformity	Gino & Wiltermuth (2014), Experiment 2 – present vs. absent
nonconformity	Gino & Wiltermuth (2014), Experiment 3 – high vs. low
nonconformity	Förster, Friedman, Butterbach, & Sassenberg (2005), Experiment 2 – punk vs. Engineer
individualism	Zitek & Vincent (2014), Experiment 1 – entitlement vs. equity
individualism	Zitek & Vincent (2014), Experiment 2 – entitlement vs. equity
individualism	Zitek & Vincent (2014), Experiment 3a – entitlement vs. neutral
individualism	Kim, Vincent, & Goncalo (2013), Experiment 2 – independent vs. interdependent
individualism	Kim, Vincent, & Goncalo (2013), Experiment 2 – rejection vs. inclusion
individualism	Kim, Vincent, & Goncalo (2013), Experiment 3 – independent vs. interdependent
individualism	Stajkovic, Locke, & Blair (2006), Pilot Study – achievement words vs. neutral words
individualism	Stajkovic, Locke, & Blair (2006), Main Study – achievement words vs. neutral words
individualism	Zitek & Vincent (2014), Experiment 3b – entitlement vs. neutral
individualism	Cheng & Hong (2017), Study 3 – kiasu images vs. matched imaged
individualism	Lu, Brockner, Vardi, & Weitz (2017), Study 4 – high autonomy vs. low autonomy
individualism	Lu, Brockner, Vardi, & Weitz (2017), Study 4 – high autonomy vs. neutral
individualism	Lu, Brockner, Vardi, & Weitz (2017), Study 4 – low autonomy vs. neutral
individualism	Mehta & Zhu (2016), Experiment 1 – scarcity vs. abundance
individualism	Mehta & Zhu (2016), Experiment 1 – abundance vs. control
individualism	Mehta & Zhu (2016), Experiment 2 – scarcity vs. abundance
individualism	Mehta & Zhu (2016), Experiment 2 – abundance vs. control
individualism	Mehta & Zhu (2016), Experiment 3 – scarcity vs. abundance
individualism	Mehta & Zhu (2016), Experiment 4 – scarcity vs. abundance
individualism	Mehta & Zhu (2016), Experiment 5 – scarcity vs. abundance
individualism	Porath & Erez (2009), Study 3 – competitive vs. cooperative
individualism	Bittner, Bruena, & Rietzschel (2016) – cooperation vs. competition
individualism	Shao, Nijstad, & Tauber (2018), Study 1 – independent vs. interdependent
individualism	Sligte, De Dreu, & Nijstad (2011), Experiment 1 – high power vs. low power
individualism	Sligte, De Dreu, & Nijstad (2011), Experiment 3 – high power vs. low power
individualism	Huang (2020), Study 1 – high power vs. low power

Table A3*Comparisons Coded as Uniqueness*

individualism	Minas (2015), Study 1 – achievement vs. neutral
individualism	Landkammer & Sassenberg (2016), Study 4 – cooperation vs. interpersonal competition
individualism	Landkammer & Sassenberg (2016), Study 4 – interpersonal competition vs. intergroup competition

Note. There were more effect sizes than comparisons, because some studies measured more than one indicator per comparison.

Table A4*Comparisons Coded as Open-mindedness*

subcategory	reference
promotion focus	Baas, De Dreu, & Nijstad (2011), Study 1 - promotion vs. prevention
promotion focus	Baas, De Dreu, & Nijstad (2011), Study 2 - promotion vs. prevention
promotion focus	Baas, De Dreu, & Nijstad (2011), Study 3 - promotion vs. prevention
promotion focus	Friedman & Förster (2001), Experiment 1 - promotion vs. prevention
promotion focus	Friedman & Förster (2001), Experiment 2 - promotion vs. prevention
promotion focus	Rook & van Knippenberg (2011) - promotion vs. prevention
promotion focus	Rook (2014) - appetition vs. aversion
promotion focus	Liu, Wang, Ren, & Liu (2017), Study 1 - promotion vs. prevention
promotion focus	Liu, Wang, Ren, & Liu (2017), Study 2 - promotion vs. prevention
promotion focus	Bittner, Bruena, & Rietzschel (2016) - promotion vs. prevention
promotion focus	Memmert, Huttermann, & Orliczek (2013) - promotion vs. prevention
promotion focus	Hao, Qiao, Cheng, Lu, Tang, Runco (2020), Study 3 - promotion vs. prevention
promotion focus	Van Leeuwen & Baas (2017) - attacker vs. defender
promotion focus	Van Leeuwen & Baas (2017) - attacker vs. neutral task
promotion focus	Van Leeuwen & Baas (2017) - defender vs. neutral task
promotion focus	Yen, Chao, & Lin (2011), Study 3 - promotion vs. prevention
promotion focus	Jin, Wang, & Dong (2016), Experiment 2 - promotion vs. prevention
promotion focus	Wang, Wang, Liu, & Dong (2017), Study 2 - promotion vs. prevention
promotion focus	Sacramento, Fay, & West (2013), Study 1, part 2 - promotion vs. prevention
knowledge expansion	Sassenberg, Moskowitz, Fetterman, & Kessler (2017), Experiment 3 - creative vs. preciseness
knowledge expansion	Higgins & Chaires (1980), Experiment 2 - and vs. of
knowledge expansion	Sassenberg, Moskowitz, Fetterman, & Kessler (2017), Experiment 2a - creativity vs. preciseness
knowledge expansion	Sassenberg, Moskowitz, Fetterman, & Kessler (2017), Experiment 2a - creativity vs. no priming
knowledge expansion	Sassenberg, Moskowitz, Fetterman, & Kessler (2017), Experiment 2b - creativity vs. preciseness
knowledge expansion	Sassenberg, Moskowitz, Fetterman, & Kessler (2017), Experiment 2b - creativity vs. no priming

Table A4
Comparisons Coded as Open-mindedness

subcategory	reference
knowledge expansion	Gillebaart, Forster, Rotteveel, & Jehle (2013), Study 1 - novelty vs. familiarity
knowledge expansion	Miron-Spektor & Argote (2008) - efficiency vs. creativity
knowledge expansion	Maddux & Galinsky (2009), Study 3 - travelling abroad vs. hometown
knowledge expansion	Maddux & Galinsky (2009), Study 3 - travelling abroad vs. supermarket
knowledge expansion	Mehta & Zhu (2016), Experiment 5 - nontraditional use vs. time of purchase decision
knowledge expansion	Tan, Wang, Guo, Zeng, Zhou, & Cao (2019), Study 1 - American vs. Chinese
knowledge expansion	Tan, Wang, Guo, Zeng, Zhou, & Cao (2019), Study 1 - American vs. none
knowledge expansion	Liu (2016) - Experiment 3 - generate atypical vs. generate typical
knowledge expansion	Liu (2016) - Experiment 3 - generate atypical vs. judge typicality
knowledge expansion	Maddux, Adam, & Galinsky (2010), Experiment 2 - learning a new sport vs. visiting a supermarket
knowledge expansion	Greving & Epstude (unpublished), Study 2 - improvisation vs. conventional
knowledge expansion	Sassenberg (unpublished), Experiment 1 - creativity vs. preciseness
knowledge expansion	Sassenberg (unpublished), Experiment 1 - creativity vs. no priming
knowledge expansion	Sassenberg (unpublished), Experiment 2 - creativity vs. no priming
knowledge expansion	Sassenberg (unpublished), Experiment 3 - creativity vs. no priming
knowledge expansion	Sassenberg (unpublished), Experiment 4 - creativity vs. no priming
knowledge expansion	Sassenberg (unpublished), Experiment 4 - creativity as intervention vs. no priming
knowledge expansion	Sassenberg (unpublished), Experiment 6 - creativity vs. preciseness
knowledge expansion	Sassenberg (unpublished), Experiment 6 - creativity vs. no priming

Table A4*Comparisons Coded as Open-mindedness*

subcategory	reference
knowledge restructuring	Cheng & Leung (2013), Study 2 - difference vs. similarly
knowledge restructuring	Gaither, Remedios, Sanchez, & Sommers (2015), Study 2 - multiple identities vs. average day
knowledge restructuring	Gaither, Remedios, Sanchez, & Sommers (2015), Study 3 - multiple identities vs. multiracial identity
knowledge restructuring	Gaither, Remedios, Sanchez, & Sommers (2015), Study 3 - multiple identities vs. average day
knowledge restructuring	Gaither, Remedios, Sanchez, & Sommers (2015), Study 3 - multiracial identity vs. average day
knowledge restructuring	Wan & Chiu (2002), Experiment 1 - incompatible vs. compatible
knowledge restructuring	Wan & Chiu (2002), Experiment 2 - incompatible vs. compatible
knowledge restructuring	Gocłowska, Crisp, & Labuschagne (2013), Experiment 1 - female mechanic vs. male mechanic
knowledge restructuring	Gocłowska, Crisp, & Labuschagne (2013), Experiment 2 - counter-stereotypic vs. stereotypic
knowledge restructuring	Miron-Spektor & Argote (2008) - paradoxical vs. efficiency
knowledge restructuring	Miron-Spektor & Argote (2008) - paradoxical vs. creativity
knowledge restructuring	Wen, Zuo, Xie, & Gao (2019), Study 2 - inconsistent vs. consistent
knowledge restructuring	De Dreu, Nijstad, & Baas (2011), Experiment 3 - flexibility vs. focus
knowledge restructuring	Leung, Liou, Miron-Spektor, Koh, Chan, Eisenberg, & Schneider (2018), Study 1 - paradoxical vs. non paradoxical (creativity + efficiency)
knowledge restructuring	Leung, Liou, Miron-Spektor, Koh, Chan, Eisenberg, & Schneider (2018), Study 1 - paradoxical vs. creativity
knowledge restructuring	Leung, Liou, Miron-Spektor, Koh, Chan, Eisenberg, & Schneider (2018), Study 1 - paradoxical vs. efficiency
knowledge restructuring	Maddux & Galinsky (2009), Study 3 - living abroad vs. travelling abroad
knowledge restructuring	Maddux & Galinsky (2009), Study 3 - living abroad vs. hometown
knowledge restructuring	Maddux & Galinsky (2009), Study 3 - living abroad vs. supermarket

Table A4
Comparisons Coded as Open-mindedness

subcategory	reference
knowledge restructuring	Maddux & Galinsky (2009), Study 5 - adapting culture vs. observing culture
knowledge restructuring	Maddux & Galinsky (2009), Study 5 - adapting culture vs. learning sport
knowledge restructuring	Maddux & Galinsky (2009), Study 5 - adapting culture vs. no priming
knowledge restructuring	Markman, Lindberg, Kray, & Galinsky (2007), Study 3 - subtractive vs. none
knowledge restructuring	Markman, Lindberg, Kray, & Galinsky (2007), Study 3 - additive vs. none
knowledge restructuring	Markman, Lindberg, Kray, & Galinsky (2007), Study 4 - subtractive vs. none
knowledge restructuring	Markman, Lindberg, Kray, & Galinsky (2007), Study 4 - additive vs. none
knowledge restructuring	Zuo, Wen, Wang, & Wang (2019), Experiment 1 - counter-stereotypical vs. stereotypical
knowledge restructuring	Wu, Gu, & Zhang (2016), Experiment 1 - ambiguous vs. non-ambiguous
knowledge restructuring	Wu, Gu, & Zhang (2016), Experiment 2 - ambiguous vs. non-ambiguous
knowledge restructuring	Winter, Scholl, & Sassenberg (unpublished), Study S1 - with subtractive counterfactual questions vs. without subtractive counterfactual questions
knowledge restructuring	Cho, Tadmor, & Morris (2018), Study 2 - polyculturalism vs. colorblindness
knowledge restructuring	Cho, Tadmor, & Morris (2018), Study 2 - polyculturalism vs. control
knowledge restructuring	Cho, Tadmor, & Morris (2018), Study 2 - multiculturalism vs. colorblindness
knowledge restructuring	Cho, Tadmor, & Morris (2018), Study 2 - multiculturalism vs. control
knowledge restructuring	Cho, Tadmor, & Morris (2018), Study 3 - polyculturalism vs. colorblindness
knowledge restructuring	Cho, Tadmor, & Morris (2018), Study 3 - polyculturalism vs. control
knowledge restructuring	Cho, Tadmor, & Morris (2018), Study 3 - multiculturalism vs. colorblindness
knowledge restructuring	Cho, Tadmor, & Morris (2018), Study 3 - multiculturalism vs. control

Table A4*Comparisons Coded as Open-mindedness*

subcategory	reference
knowledge restructuring	Gaither, Fan, & Kinzler (2020), Experiment 1 - multiple identities vs. multiple traits
knowledge restructuring	Gaither, Fan, & Kinzler (2020), Experiment 2 - multiple self-identities vs. multiple traits
knowledge restructuring	Gaither, Fan, & Kinzler (2020), Experiment 2 - multiple traits vs. multiple other identities
knowledge restructuring	Gaither, Fan, & Kinzler (2020), Experiment 3 - multiple identities vs. multiple preferences
knowledge restructuring	Krause (2015), Study 1 - perspective taking vs. thinking about another person
knowledge restructuring	Krause (2015), Study 2 - perspective taking vs. thinking about another person
knowledge restructuring	Tadmor, Chao, Hong, & Polzer (2013), Experiment 1 - essentialist vs. non-essentialist
knowledge restructuring	Tadmor, Chao, Hong, & Polzer (2013), Experiment 1 - non-essentialist vs. properties of water
knowledge restructuring	Tadmor, Chao, Hong, & Polzer (2013), Experiment 2a - essentialist vs. non-essentialist
knowledge restructuring	Tadmor, Chao, Hong, & Polzer (2013), Experiment 2b - essentialist vs. non-essentialist
knowledge restructuring	Tan, Wang, Guo, Zeng, Zhou, & Cao (2019), Study 1 - American vs. American and Chinese
knowledge restructuring	Tan, Wang, Guo, Zeng, Zhou, & Cao (2019), Study 1 - Chinese vs. American and Chinese
knowledge restructuring	Tan, Wang, Guo, Zeng, Zhou, & Cao (2019), Study 1 - American and Chinese vs. none
knowledge restructuring	Rosenbaum, Aronson, & Panman (1964) - yes vs. no
knowledge restructuring	Maddux, Adam, & Galinsky (2010), Experiment 2 - functional learning in a foreign culture vs. visiting a supermarket
knowledge restructuring	Maddux, Adam, & Galinsky (2010), Experiment 2 - functional learning in own culture vs. visiting a supermarket
knowledge restructuring	Maddux, Adam, & Galinsky (2010), Experiment 3 - functional vs. non-functional
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 1 - express sarcasm vs. receive sincerity
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 1 - receive sarcasm vs. express sincerity

Table A4*Comparisons Coded as Open-mindedness*

subcategory	reference
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 1 - receive sarcasm vs. receive sincerity
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 2 - express sarcasm vs. express sincerity
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 2 - express sarcasm vs. receive sincerity
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 2 - express sarcasm vs. last conversation
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 2 - receive sarcasm vs. express sincerity
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 2 - receive sarcasm vs. receive sincerity
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 2 - receive sarcasm vs. last conversation
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 3 - express sarcasm vs. express sincerity
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 3 - express sarcasm vs. receive sincerity
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 3 - express sarcasm vs. last conversation
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 3 - receive sarcasm vs. express sincerity
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 3 - receive sarcasm vs. receive sincerity
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 3 - receive sarcasm vs. last conversation
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 4 - express sarcasm vs. express sincerity
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 4 - express sarcasm vs. receive sincerity
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 4 - receive sarcasm vs. express sincerity
knowledge restructuring	Huang, Gino, & Galinsky (2015) - Experiment 4 - receive sarcasm vs. receive sincerity
knowledge restructuring	Koh & Leung (2019), Experiment 3 - high vs. low
knowledge restructuring	Gocłowska & Crisp (2013) - female mechanic vs. male mechanic

Table A4*Comparisons Coded as Open-mindedness*

subcategory	reference
knowledge restructuring	Ritter, Damian, Simonton, van Baaren, Strick, Derks, & Dijksterhuis (2012), Experiment 1 - active unexpected vs. active normal
knowledge restructuring	Ritter, Damian, Simonton, van Baaren, Strick, Derks, & Dijksterhuis (2012), Experiment 1 - active normal vs. vicarious unexpected
knowledge restructuring	Ritter, Damian, Simonton, van Baaren, Strick, Derks, & Dijksterhuis (2012), Experiment 2 - active schema-violation vs. active normal
knowledge restructuring	Ritter, Damian, Simonton, van Baaren, Strick, Derks, & Dijksterhuis (2012), Experiment 2 - active schema-violation vs. vicarious normal
knowledge restructuring	Ritter, Damian, Simonton, van Baaren, Strick, Derks, & Dijksterhuis (2012), Experiment 2 - active normal vs. vicarious schema-violation
knowledge restructuring	Ritter, Damian, Simonton, van Baaren, Strick, Derks, & Dijksterhuis (2012), Experiment 2 - vicarious schema-violation vs. vicarious normal
knowledge restructuring	Chua (2013), Study 2 - conflict vs. harmony
knowledge restructuring	Chua (2013), Study 2 - different vs. same
knowledge restructuring	Chua (2013), Study 3 - conflict vs. harmony
knowledge restructuring	Chua (2013), Study 3 - conflict vs. neutral
knowledge restructuring	Chua (2013), Study 3 - different vs. same
knowledge restructuring	Ritter, Kuhn, Muller, Baaren, Brass, & Dijksterhuis (2014), Experiment 1 - violation vs. normal
knowledge restructuring	Ritter, Kuhn, Muller, Baaren, Brass, & Dijksterhuis (2014), Experiment 2 - violation vs. normal
knowledge restructuring	Miron-Spektor, Gino, & Argote (2011), Study 1 - paradoxical vs. creativity
knowledge restructuring	Miron-Spektor, Gino, & Argote (2011), Study 1 - paradoxical vs. efficiency
knowledge restructuring	Miron-Spektor, Gino, & Argote (2011), Study 2 - paradoxical vs. neutral
knowledge restructuring	Miron-Spektor, Gino, & Argote (2011), Study 3 - paradoxical vs. neutral
knowledge restructuring	Miron-Spektor, Gino, & Argote (2011), Study 4 - paradoxical vs. neutral
knowledge restructuring	Sligte, De Dreu, & Nijstad (2011), Experiment 1 - stable vs. unstable

Table A4
Comparisons Coded as Open-mindedness

subcategory	reference
knowledge restructuring	Leung & Chiu (2010), Study 1 - fusion culture vs. both cultures
knowledge restructuring	Leung & Chiu (2010), Study 1 - fusion culture vs. only Chinese
knowledge restructuring	Leung & Chiu (2010), Study 1 - fusion culture vs. only American
knowledge restructuring	Leung & Chiu (2010), Study 1 - fusion culture vs. no presentation
knowledge restructuring	Leung & Chiu (2010), Study 1 - both cultures vs. only Chinese
knowledge restructuring	Leung & Chiu (2010), Study 1 - both cultures vs. only American
knowledge restructuring	Leung & Chiu (2010), Study 1 - both cultures vs. no presentation
knowledge restructuring	Kray, Galinsky, & Wong (2006), Experiment 3 - counterfactual vs. noncounterfactual
knowledge restructuring	Kray, Galinsky, & Wong (2006), Experiment 4 - counterfactual vs. noncounterfactual
knowledge restructuring	Kray, Galinsky, & Wong (2006), Experiment 5 - counterfactual vs. noncounterfactual
knowledge restructuring	Lu, Hafenbrack, Eastwick, Wang, Maddux, & Galinsky (2017), Study 2 - intercultural vs. intracultural
knowledge restructuring	Olszewska & Sobkow (unpublished), sample A - ambiguous vs. one percept
knowledge restructuring	Olszewska & Sobkow (unpublished), sample B - ambiguous vs. one percept
knowledge restructuring	Landkammer & Sassenberg (2016), Study 4 - co-opetition vs. cooperation
knowledge restructuring	Landkammer & Sassenberg (2016), Study 4 - co-opetition vs. interpersonal competition
knowledge restructuring	Landkammer & Sassenberg (2016), Study 4 - co-opetition vs. intergroup competition

Note. There were more effect sizes than comparisons, because some studies measured more than one indicator per comparison.

Appendix B. Coding Protocol Category Coding

UNCONSTRAINED THOUGHT		
relaxing top-down control, activating bottom-up processing, and allowing for broad awareness		
CODE	OPERATIONAL	CONCEPTUAL
1	<ul style="list-style-type: none"> - observing stimuli without specified goals or instructions (vs. thinking along certain rules or under constraints) - observing external stimuli without specified goals or instructions (vs. processing the stimuli through past experiences, memory and predictions) - engaging in open-ended tasks without a goal (vs. engaging in a task with a certain goal in mind or to achieve a certain end result) output constraints - doing a task in one's chosen way (vs. adhering to certain rules or following certain steps when performing a task) process constraints - generating new content without a predetermined plan (vs. reproducing old content) 	bottom-up processing
2	<ul style="list-style-type: none"> - attending to a broad range of stimuli (vs. focusing only on certain stimuli) - observing any sensation or thought without focusing on a concept in the mind or a fixed item: open-monitoring meditation) (vs. focusing on a particular item, thought, or object: focused attention meditation) (Colzato, Ozturk, & Hommel, 2012) 	broad attention
99	The category is not applicable	NA

IMPORTANT: The distinction between bottom-up processing and UNIQUENESS is that here, top-down and rule-driven thinking refers to the strictness of task criteria, which are supposed to induce more analytical thinking. In UNIQUENESS, following (or not) the rules refers to the societal rules, norms, and standards. So the rules in UNIQUENESS are more abstract and societal-level, while the rules here are more concrete and cognitive-level or task-level. In cognitive control, breaking the rules simply means that someone makes an error. In uniqueness, breaking the rules is framed as a nonconformist act of resistance against the norms. Also, note that doing a "task without rules" is not among the criteria for UNIQUENESS.

ABSTRACTION		
priming broad, inclusive, and abstract semantic categories and mental representations or activating abstract, high-level construal thinking		
CODE	OPERATIONAL	CONCEPTUAL
1	<ul style="list-style-type: none"> - identifying big (vs. small) letters in Navon task and similar tasks - focusing on a big (vs. small) area of the map - completing a gestalt (vs. identifying missing details on a picture) 	visual global processing
2	<ul style="list-style-type: none"> - imagining one's life a year from now (vs. tomorrow) - imagining making a choice a month from now (vs. tomorrow) - making predictions about events that will occur in the distant (vs. near) future 	temporal distance
3	<ul style="list-style-type: none"> - imagining going on a trip to a distant (vs. nearby) location - believing one is talking to or making judgments about others who are in a distant (vs. nearby) location 	spatial distance

4	<ul style="list-style-type: none"> - making a choice for another person (vs. for oneself) - making judgments about a dissimilar individual, someone who celebrates a birthday on a different day (vs. a similar individual, someone who celebrates a birthday on the same day). - making judgments about outgroup (vs. ingroup) members 	social distance
5	<ul style="list-style-type: none"> - believing there is a low (vs. high) likelihood that one will complete a task later in the study - making judgments about an event that has a low (vs. high) probability of occurring 	hypotheticality
6	<ul style="list-style-type: none"> - superordinate categories, prototypes or traits (vs. subordinate exemplars) - traits (vs. behaviours) - broad (vs. narrow) categorization 	abstraction of semantic categories
7	<ul style="list-style-type: none"> - generating why (vs. how) something happens - generating why (vs. how) to achieve a goal 	abstraction of goals
99	The category is not applicable	NA

IMPORTANT: **Social distance** emphasizes the distance from a specific individual, while **UNIQUENESS** emphasizes being different from the social group or the crowd. Also, social distance needs to be from the self, here, and now, while UNIQUENESS doesn't need to satisfy these criteria.

UNIQUENESS		
presenting the possibility that being different from other people, deviating from the conventional norms, and acting as an independent self can be valuable		
CODE	OPERATIONAL	CONCEPTUAL
1	<ul style="list-style-type: none"> - diverging from (vs. following) the social norms and conventions - breaking (vs. following) the rules - ignoring (vs. continuing) the tradition 	nonconformity
2	<p>Priming manipulations (Oyserman, Coon, & Kimmelmeier, 2002):</p> <ul style="list-style-type: none"> - elaborating on what makes yourself different (vs. similar) from other people, - circling singular (vs. plural) first-person pronouns <p>Components of individualism-collectivism scales (Oyserman, Coon, & Kimmelmeier, 2002):</p> <ul style="list-style-type: none"> - Independent: freedom, self-sufficiency, and control over one's life (vs. related: considering close others an integral part of the self) - Goals: striving for one's own goals, desires, and achievements (vs. belong: wanting to belong and enjoy being part of groups) - Compete: personal competition and winning (vs. duty: the duties and sacrifices being a group member entails) - Unique: focus on one's unique, idiosyncratic qualities (vs. harmony: concern for group harmony and that groups get along) - Private: thoughts and actions private from others (vs. advice: turning to close others for decision help) - Self-know: knowing oneself, having a strong identity (vs. context: self changes according to context or situation) - Direct communication: clearly articulating one's wants and needs (vs. hierarchy: focus on hierarchy and status issues; group: a preference for group work) 	individualism

99	The category is not applicable	NA
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IMPORTANT: For individualism, the operational criterion in the brackets (for collectivism) does not always reflect the exact opposite of the criterion outside of brackets (for individualism). This is because the components of individualism and collectivism were extracted from multiple scales not as opposites, but as separate constructs.

OPEN-MINDEDNESS		
encouraging interest, exploration, and reaching out for new information or offering new information and new perspectives directly		
CODE	OPERATIONAL	CONCEPTUAL
1	<ul style="list-style-type: none"> - looking for opportunities (vs. avoiding threats) - attaining aspirations in life (vs. living up to the responsibilities to which one is committed) - fulfilling hopes and dreams (vs. fulfilling obligations to which one is dedicated) - creating a strategy to meet a promotion goal, e.g., being a good friend (vs. creating a strategy to meet a prevention goal, e.g., not being a poor friend) - cheese waiting at the end of the maze (vs. owl hovering above the maze) 	promotion focus
2	<ul style="list-style-type: none"> - imagining pleasant (vs. unpleasant) novel events, introducing a task as new (vs. familiar) - perceiving (being exposed to), interacting with, or generating new or interesting information or knowledge (vs. typical, stereotypical, uninteresting or familiar information or knowledge) 	knowledge expansion
3	<ul style="list-style-type: none"> - perceiving (being exposed to), interacting with, or generating a new perspective, more than one perspective or more than one option (vs. an old perspective, a single perspective or a single option) - perceiving (being exposed to), interacting with, or generating variety, diversity, or differences (vs. homogeneity, uniformity, similarity, black and white perception) 	knowledge restructuring
99	The category is not applicable	NA

Appendix C. Coding Protocol Priming Tasks and Creativity Tasks

PRIMING					
	CODE	CATEGORIES	DEFINITION	EXAMPLES	PURPOSE
PRIMING TYPE	1	conceptual priming	Participants' mental representations are activated.	scrambled sentences, lexical decision task	exploratory moderator
	2	mindset priming	Participants actively engage or are exposed to a situation in which someone is engaged in a goal-directed type of thought that primes a procedure or way of thinking about a situation (Bargh & Chartrand, 2014).	participants compare two pairs of illustrated pictures by listing up to 10 differences (vs. similarities) for each pair.	
	99	NA	Missing data or the priming technique is impossible to classify based on the description in the article.	-	
AWARENESS LEVEL	1	supraliminal	Participants are aware of the primed stimulus.	scrambled sentences	exploratory moderator
	2	subliminal	The manipulation is specifically designed in a way that participants are not aware of the primed stimulus.	Participants were exposed for 20 milliseconds to names of people they had previously described as security-enhancing attachment figures. Participants completed a 20-trial computerised lexical decision task. This task was designed to prime a specific mental representation subliminally while the participant was focusing consciously on reading a string of letters and deciding whether or not it constituted a word.	
	99	NA	Missing data or the awareness level is impossible to classify based on the description in the article. Participants might be not aware of the primed stimuli or procedure, but this is not clear, not tested, or not reported.	-	

PRIMING PARADIGM	1	simple presentation	<p>Participants are presented with a stimulus or a set of stimuli but are not required to react or respond. Participants watch the stimuli without any specific instruction.</p> <p>→ When participants read a portion of text (a paragraph, a description, an article), then we code it as "reading".</p> <p>→ When:</p> <ul style="list-style-type: none"> - stimuli are embedded in another task (e.g., lexical decision task) - participants process stimuli in some specified way (e.g., evaluate them) - participants are instructed to respond to the stimuli in some way <p>We do NOT classify it as a simple presentation. Rather, we code it as "other" (when the task is not among our codes) or "mixed" (when it's a mix of tasks from our codes).</p>	<p>Each condition was presented to the subjects as a slide show, which included 160 images and was played with a music background of the corresponding culture for 20min. After that were 10min music video and 15min TV video.</p>	descriptives
	2	simple observation	<p>Participants witness, listen to, watch, or observe a certain situation or an event happening in the here and now without any specific instruction.</p> <p>When a certain situation is arranged using a combination of different stimuli (e.g., a virtual reality environment), then "simple observation".</p>	<p>A confederate of the experimenter took his time reading the consent form and purposefully delayed signing it. After a few minutes another confederate said (vs. did not say anything) to the 'slow confederate', "come on. . .what's taking so long? What are you, stupid? Can't you read? This thing is a no-brainer. . .just do it and let's get on with this. Can't you tell you're holding the entire group up?"</p>	
	3	visual search task	Participants search for visual elements.	searching for the number "3" in a matrix of numbers	
	4	Navon task	Participants detect smaller or bigger letters and press an appropriate key.	-	
	5	reading task	Participants read a narrative, article, or description.	description about why a product is both creative and efficient	

6	lexical decision task	Participants respond whether the <i>primed</i> stimulus is a word or a non-word. When the primed stimulus is <i>not</i> a word for which participants make a word vs. nonword decision, but rather, it is flashed subliminally before the word vs. nonword trial, then, we classify it as "mixed" (lexical decision task + simple presentation). In other words, when the primed word is primed <i>through</i> the lexical decision task - "lexical decision task". When the primed word is primed <i>during</i> the lexical decision task - "mixed".	-
7	word or sentence completion task	Participants complete words with missing letters or sentences with missing words.	-
8	scrambled sentences	Participants create sentences from a set of provided words, among which are the primes.	-
9	findings words in a word search	Participants look for words in a matrix of letters.	-
10	circling words task	Participants circle words that belong to a certain category.	-
11	written recall	Participants recall a specified event and write about it.	writing about the situations in which you were creative
12	written reflection	Participants write their thoughts or reflection on a given topic.	describing your culture to a friend
13	imagination task	Participants imagine a hypothetical situation or scenario and only think about it or write about it. The situation or scenario is neither a specific past experience of the participant (then it's "written recall"), nor an element of the present experiences of the participant (then it's "written reflection"). Rather, the imagined scenario is neither present in the here and now nor in the past. It needs to be <i>hypothetical</i> .	writing about a day in the life of this photographed person
14	maze task	Participants need to find a way out of a drawn or displayed maze.	-
15	generation task	Participants generate content. Rather than describing their thoughts, arguments, reflection, recalled event, or an imagined event in the form of continuous text, participants generate a set or list of single responses. In other words, they give instances or examples of something.	generating associations to words
16	motor task	The main purpose of the task is to move participants' body in a certain way. Writing tasks also involve moving participants' hands, but their main purpose is not movement.	adopting an open position

17	game task	Participants play a game: they engage with certain stimuli or objects to achieve a certain outcome. By taking action, they can affect the game environment or game stimuli in a predictable way, and thus, they can reach the desired outcome.	playing Minecraft, building with LEGO
18	guided attention task	Participants focus their attention on stimuli, areas, objects, or sensations specified by the instruction or instructor.	open awareness meditation
19	task approach	Participants solve the priming task with different instructions or a different approach. We code it as task approach only when the instructions or approach are presented to the participants before the creativity task, but the actual task for which approach is manipulated is after the creativity task or does not take place at all. Otherwise, we also need to think of a code for the task itself to which the approach is manipulated. Then, it's most likely "mixed" or in some cases "other".	realistic vs. unrealistic performance expectations, rewards vs. no rewards This would be the task approach: participants were told that they would join their group after completing some tasks vs. they were not selected to be in a group. This would NOT be the task approach (it would be "other", because we don't have math and logic problems in our codes): participants had vs. didn't have a possibility to cheat while doing math and logic problems.
20	mixed	The manipulation encompasses two or more of the research paradigms listed above or different conditions of the manipulation encompass different research paradigms.	-
21	other	The manipulation is not listed above or it's a mix of different paradigms, and at least one of these paradigms is <i>not</i> listed in the remaining codes.	-

	22	written mix	Different conditions of a manipulation ask participants to do a mix of the following: - Written recall - Written reflection - Imagination task	In one condition, participants imagine their lives 50 years from now, and in another condition, participants describe their current day.	
	99	NA	Missing data or manipulation is impossible to classify based on the description in the article.	-	
PRIME MODALITY	1	visual	The prime stimuli used in a task are visual.	pictures	exploratory moderator
	2	linguistic	The prime stimuli used in a task are linguistic.	text, words	
	3	mixed	The task uses a combination of different primes or another modality than linguistic or visual. The combinations could be visual and linguistic, but it could also involve other modalities or it could be multimodal.	movies, pictures with descriptions, meditation	
	99	NA	Missing data or prime modality is impossible to classify based on the description in the article.	-	

Table C1

Recoded categories of the priming paradigm

Code	Coded category	Recoded category
1	simple presentation	observing
2	simple observation	observing
3	visual search task	interacting
4	Navon task	interacting
5	reading task	observing
6	lexical decision task	interacting
7	word or sentence completion task	interacting
8	scrambled sentences	interacting
9	findings words in a word search	interacting
10	circling words task	interacting
11	written recall	generating
12	written reflection	generating
13	imagination task	generating
14	maze task	performing
15	generation task	generating
16	motor task	performing
17	game task	performing
18	guided attention task	performing
19	task approach	performing
20	mixed	-

21	other	-
22	Written mix	generating
99	NA	-

CREATIVITY TASK					
	CODE	CATEGORIES	DEFINITION	EXAMPLES	PURPOSE
TYPE	1	unusual uses task	Participants come up with alternative, unusual, or other than the typical ones uses of objects.	unusual uses of a bottle	descriptives
	2	product development	Participants develop a new product, so an object whose main purpose is to make it useful or attractive for other people who might buy it (e.g., a toy). If the object is created for aesthetic pleasure or other purpose, then we classify it as "figure drawing task" or "other artistic task".	Their goal was to come up with creative ideas for an easy, efficient, lightweight, and aesthetic mechanism that dog owners and dog walkers could use to clean up dog excrement while walking their dogs	
	3	other divergent thinking task	Participants generate ideas on a given topic, provide solutions, or brainstorm, which is not unusual uses or product development. Importantly, participants are asked to engage in divergent thinking, so to generate multiple responses. If participants are asked to generate a single response or a best response, then we classify as "other".	new names for animals, titles for a picture, consequences of a given scenario, how to improve teaching at university	
	4	alien drawing task	Participants draw an imaginary creature from a different planet.	-	
	5	figure drawing task	Participants make a drawing other than in alien drawing task.	drawing pictures using the circles as a basic element	
	6	other artistic tasks	Participants create an artistic product which is not alien drawing task or figure drawing task. The purpose is to create some aesthetic or artistic value.	collage building, poem writing, writing task, making a poster However, building from LEGO bricks would not be classified here, unless it's clearly specified that the construction should have some artistic value (e.g., "build a sculpture").	
	7	endings task	Participants generate names for a new product and are presented with example names of this product. Creativity scores depend on whether participants used the endings provided in the examples.	pasta task	

	8	remote associates test	Participants find a common associate or a common prefix for the three given words.	RAT, cRAT (compound RAT)	
	9	insight tasks	Participants solve an insight puzzle which has a single, predefined solution or a set of predefined correct solutions, e.g., words that can be completed in two ways or anagrams that can be solved in two ways.	candle problem, prisoner problem, antique coins problem, moving circles to form a triangle, radiation problem, snowy pictures test, gestalt completion task, anagrams, word completion task	
	10	other	None of the tasks listed above or a combination of the tasks listed above.	-	
	99	NA	Missing data or the type of creativity task is impossible to classify based on the description in the article.	-	
MODALITY	1	verbal task	Participants provide verbal answers to a problem. When the problem itself is presented visually, as in the candle task, we classify it as "multimodal task". When the problem is accompanied by a picture, but the picture is only an addition to the verbal description of a problem, we code it as "verbal".	- unusual uses task - They were told they would be presented with an image of a random product and asked to generate "as many unusual uses for the common object as possible".	exploratory moderator
	2	figural task	Participants draw the solution. When participants make a drawing on a letter or a Chinese pictogram, we still classify it as figural.	alien drawing task, designing a poster, making a collage	

	3	multimodal task	<p>The task involves more than one modality.</p> <ul style="list-style-type: none"> - When the creativity task is presented with a visual stimulus (picture of a candle, or a triangle made out of circles) and participants are asked to provide a verbal response, we classify it as multimodal. - When participants provide neither verbal nor drawn solution, but rather, they need to create something 3-dimensional, we classify it as multimodal. 	<ul style="list-style-type: none"> - In this task, the participants had to imagine and draw an alien creature that they met on another planet on a piece of paper. They had to label the creature's major parts, and to write a short paragraph on the back of the same sheet to describe or explain its properties. - This test involves a series of 10 fragmented pictures of mundane objects that participants have to "close" by answering what the picture displays. Participants could key in their answer or click on a button to see the next gestalt if they were unable to close it. - Participants saw a cartoon picture of a dog sitting on a sofa. Their task was to find the most creative title for it. - Children were asked to make up a brief story to accompany a fairly open-ended set of pictures in a book with no words. After looking through the illustrations once, subjects went through the book a second time saying "one thing" about each page. 	
	99	NA	Missing data or the modality of the creativity task is impossible to classify based on the description in the article.	-	
PRIMED GOAL	1/0	fluency: yes/no	as many ideas as possible, many ideas, multiple ideas	Give all the uses you have seen or can imagine.	exploratory/theoretical moderator
	1/0	quality: yes/no	as good ideas as possible, do your best, focus on quality, describe in as much detail as possible We do NOT code as quality goal when: - participants imagine that they are interviewing with a top marketing firm, and in order to test their aptitude for business, they have been given a short test (endings task) - participants are asked to generate interesting ideas	Think of and list as many interesting uses of a tin can as possible.	
	1/0	originality: yes/no	new, original, unusual, atypical, creative ideas, alternative	<ul style="list-style-type: none"> - Refrain from listing typical uses. - Come up with alternative uses. 	

1/0	no self-criticism: yes/no	write everything that comes to your mind, there are no right or wrong responses	Write down as many ideas as you can think of regardless of how you or others evaluate these ideas.
1/0	diversity: yes/no	as many diverse, different, varied ideas	List various problems a certain situation might create.
1/0	usefulness: yes/no	feasible, justifiable, valuable, appropriate, possible ideas	Create a grammatically correct and logical story utilizing these words.
1/0	other: yes/no	<p>The goals included in the creativity task instruction are not listed above.</p> <p>For this goal:</p> <ul style="list-style-type: none"> - we had 14 agreements that the goal was present - we had 29 disagreements <p>So I think it's best if we drop this goal from analysis.</p> <p>However, if we want to show what other goals might be involved in the creativity task instruction (e.g., maybe they create unnecessary noise or confusion for participants), we can analyze all of the goals in which at least one person coded as "other", and see what we can find there.</p>	Develop inexpensive prototypes for a decorative object.

Table C2

Recoded categories of the creativity task type

Code	Coded category	Recoded category
1	unusual uses task	Divergent thinking
2	product development	Creative product
3	other divergent thinking task	Divergent thinking
4	alien drawing task	Creative product
5	figure drawing task	Creative product
6	other artistic tasks	Creative product
7	endings task	Divergent thinking
8	remote associates test	RAT
9	insight tasks	insight
10	other	-
99	NA	-

CREATIVITY INDICATORS		
CODE	VARIABLE	EXAMPLES
1	fluency	<p>the number of:</p> <ul style="list-style-type: none"> - ideas - drawings - responses - etc.
2	flexibility	<ul style="list-style-type: none"> - the number of uses that were different from one another - the number of categories - the number of times when participants switched the idea category - the number of categories or groups created by participants in the social categorization task (the social categorization task asked children to sort or organize a set of 16 photographs into as many groups as possible. The individuals featured differed systematically by gender (eight males, eight females), by race (eight Black, eight White), by age (eight children, eight adults), by facial expression (eight neutral affect, eight smiling), as well as less systematically (e.g. by facial hair and by shirt color). After each sort, children were asked if they had any other ideas. The task concluded when children either came up with a maximum of ten responses or said they had no other ideas.)
3	originality	<p>In general, if the name of the indicator given by author suggests one indicator (e.g., originality), but the scale anchors suggest another indicator (e.g., 1 = not at all creative, 5 = very creative), we code based on how the scale anchors were labelled (in this case, "composite").</p> <ul style="list-style-type: none"> - likert scale rating - novelty - uniqueness - deviance - paradigm breaking - infrequency - ideas generated by less than some percentage of participants - dissimilarity to earth creatures in alien drawing task (even when it's coded using using Ward's (1994) original coding scheme, when it consists of several dimensions and when it's called "composite score of creativity per drawing") - similarity to earth creatures (reversed) - the extent to which the product deviates from the reference models - how the use deviates from the standard use - the number of endings that differed from the example in pasta task
4	composite	<ul style="list-style-type: none"> - likert scale rating - creativity - creative strength: checklist of specified criteria - consensual assessment technique rating - point system: points are given and subtracted depending on evaluations of fluency, flexibility, originality - sum of the scores given by judges - sum out of different specified dimensions
5	RAT	<p>number or percentage of correct responses in RAT or cRAT Tasks classified as "RAT" should automatically get a "RAT" indicator.</p>

6	insight	<p>number or percentage of correct solutions or solution time</p> <p>Tasks classified as "insight" should automatically get an "insight" indicator: candle problem, prisoner problem, antique coins problem, moving circles to form a triangle, radiation problem, snowy pictures test, gestalt completion task, anagrams, word completion task</p>
7	other	<p>The indicator does not fit into any of the listed above, and thus, we exclude the indicator from the analysis:</p> <ul style="list-style-type: none"> - children completed a category comparison task. Participants interacted with a puppet (Feppy) and were presented with two pictures across four domains – animals, artifacts, gender and race – and were asked to determine if the two pictures were members of the same category. For example, in the animal trial, participants saw a dog and a cat, and were asked: “Feppy and his friends say these are the same kind of animal. Are they maybe right?” This same format question was asked of each of the other categories: an example of the artifacts trial, participants saw a fork and a spoon, an example of the gender trial, participants saw a male and a female child and an example of the race trial, participants saw a White and a Black child. Responses in which children rejected a more flexible categorization (e.g. said that boys and girls cannot be considered the same kind of person) were scored as a “0”, and responses in which children accepted a more flexible categorization (e.g. said that boys and girls could potentially be considered the same kind of person) were scored as a “1”. - highly creative ideas: the number of highly creative ideas (score more than 3 points)

Appendix D: Forrest plots

Figure D1

Forest Plot Containing Effect Sizes and 95% Confidence Intervals for the Effect of Priming

Unconstrained Thought on Creativity

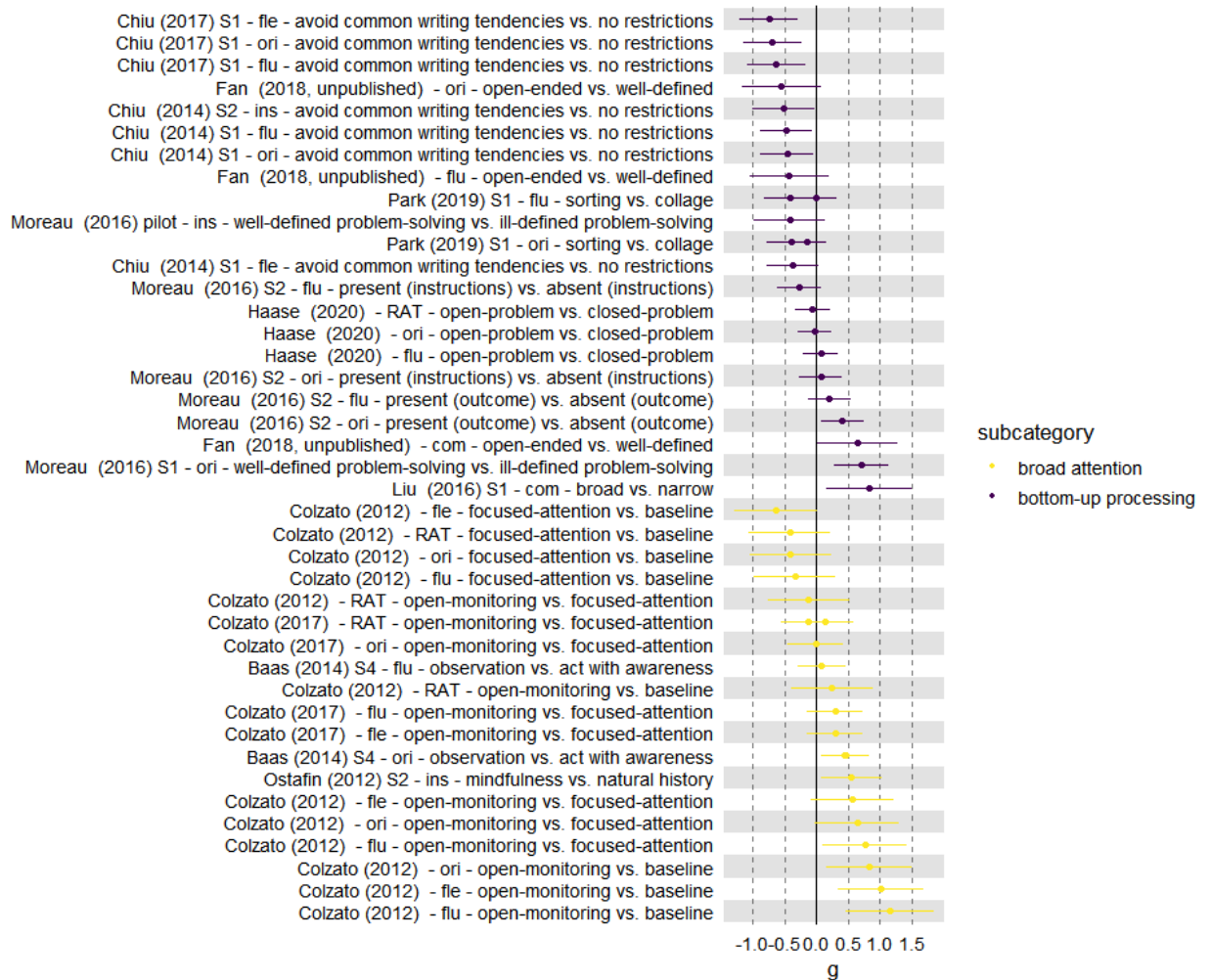


Figure D2

Forest Plot Containing Effect Sizes and 95% Confidence Intervals for the Effect of Priming

Abstraction on Creativity

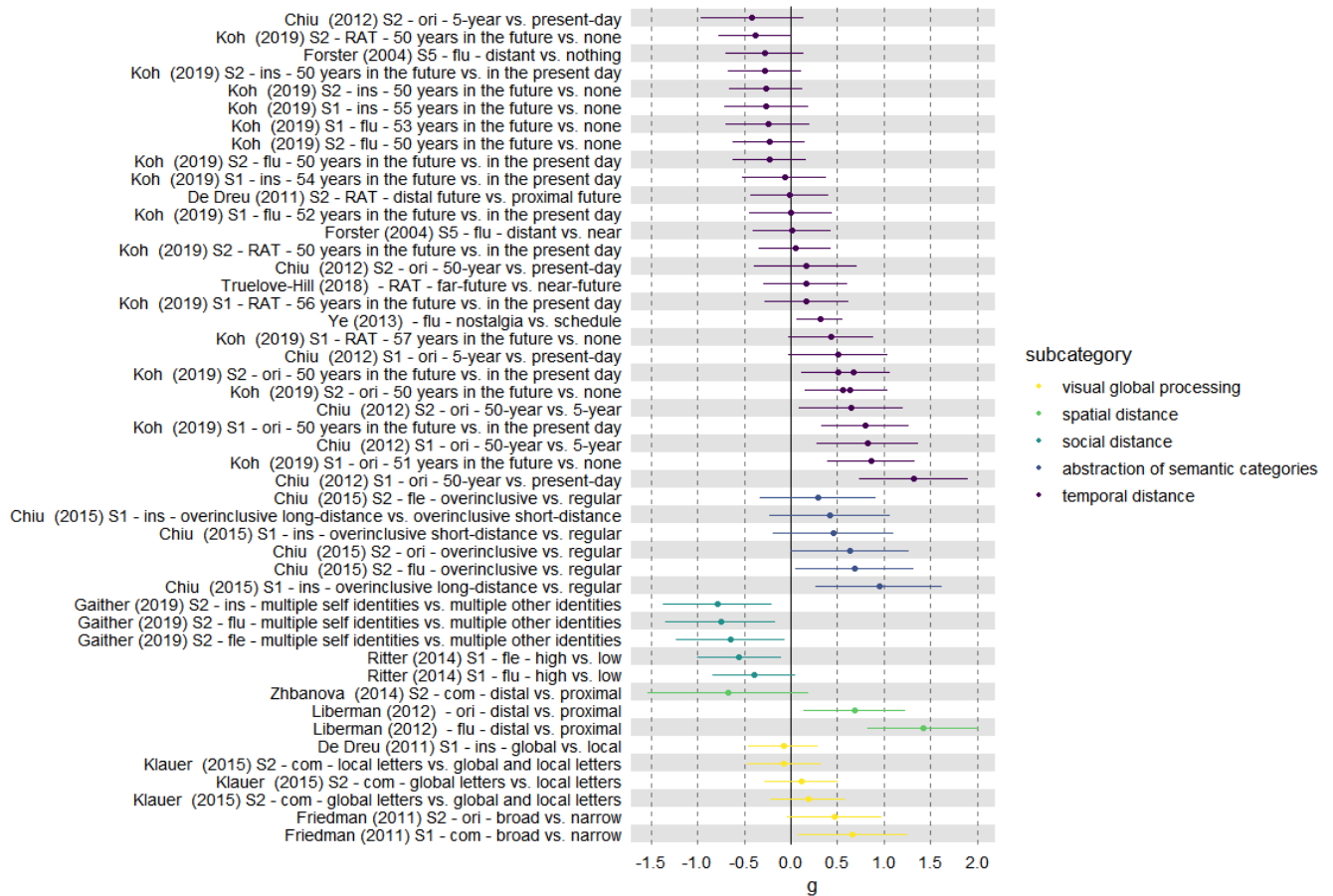


Figure D3

Forest Plot Containing Effect Sizes and 95% Confidence Intervals for the Effect of Priming

Uniqueness on Creativity

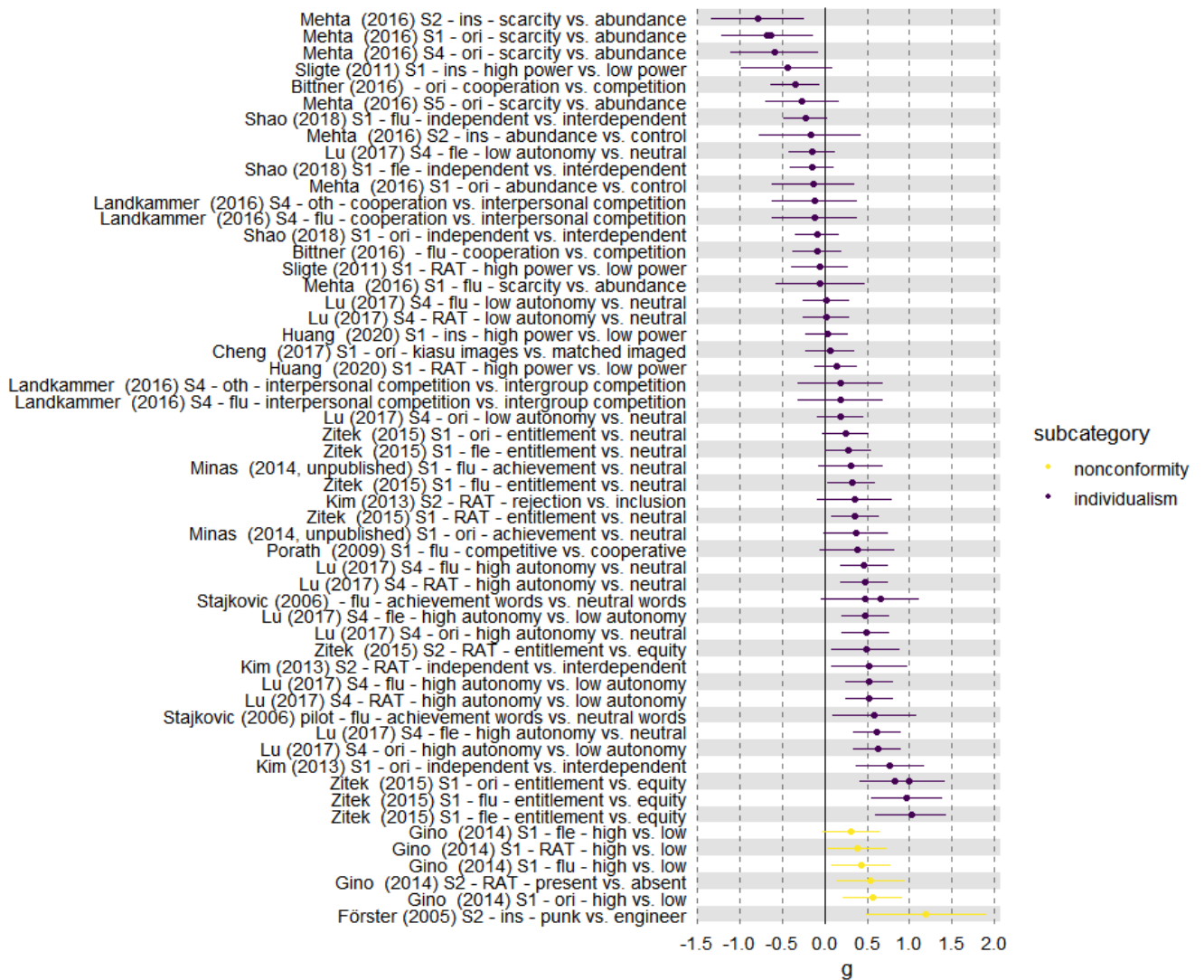


Figure D4

Forest Plot Containing Effect Sizes and 95% Confidence Intervals for the Effect of Priming

Open-Mindedness on Creativity

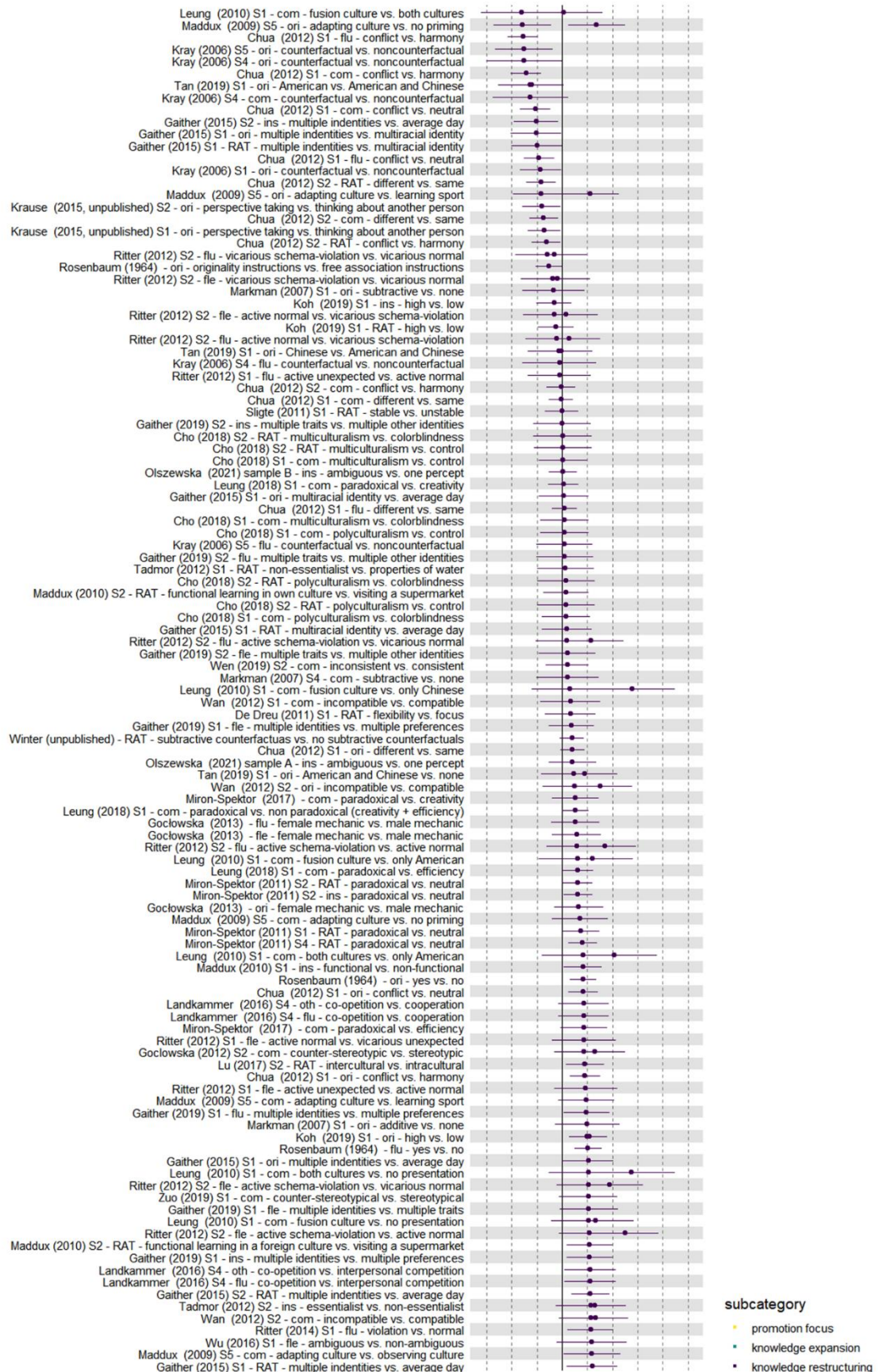
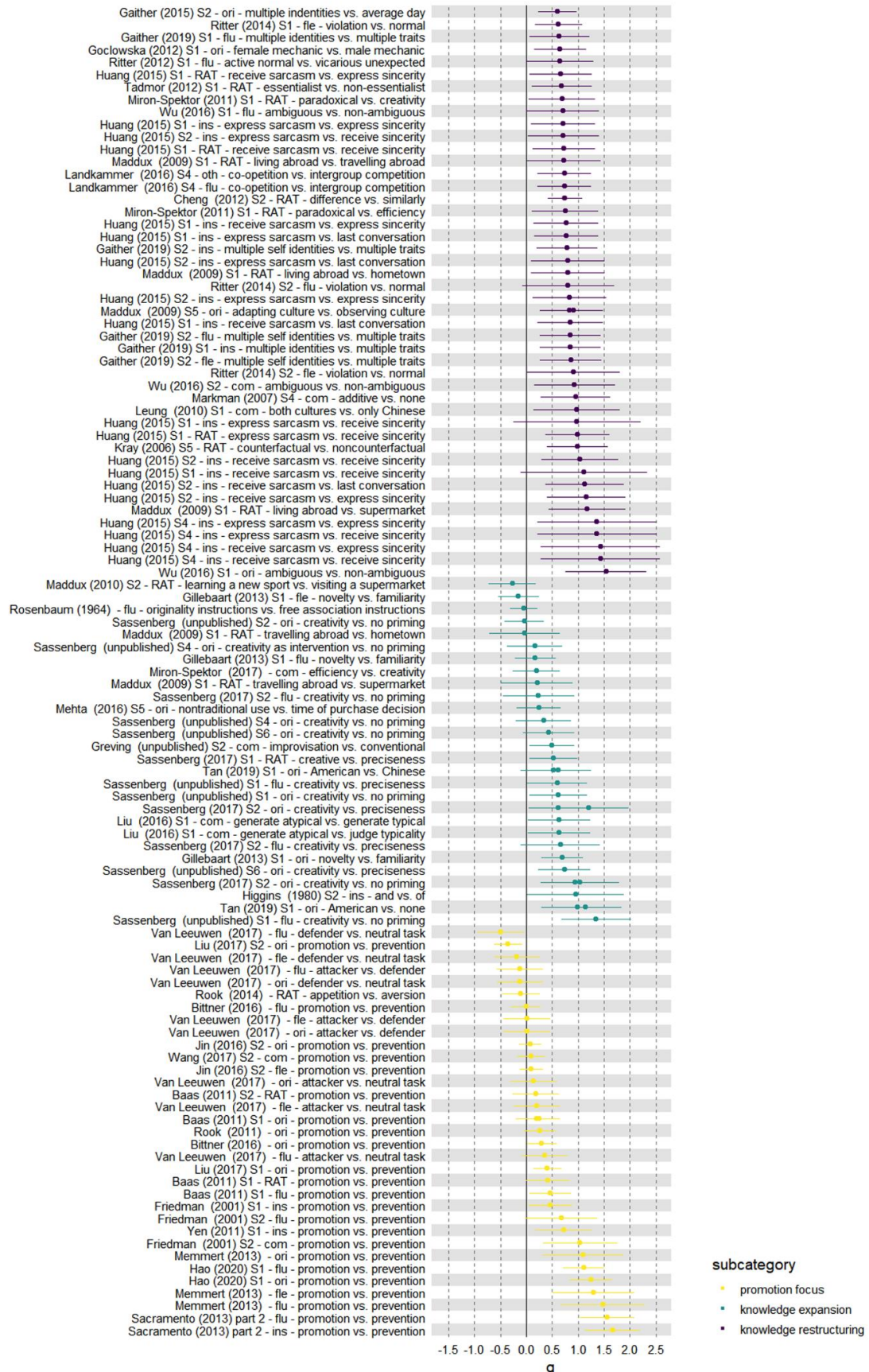


Figure D4 (continued)

Forest Plot Containing Effect Sizes and 95% Confidence Intervals for the Effect of Priming Open-Mindedness on Creativity



Appendix E: Funnel Plots per Category

Figure E1a

Funnel Plot Showing the Hedges' g Effect Size on the x-Axis, and the Standard Error of Hedges' g Effect Size on the y-Axis (unconstrained thought)

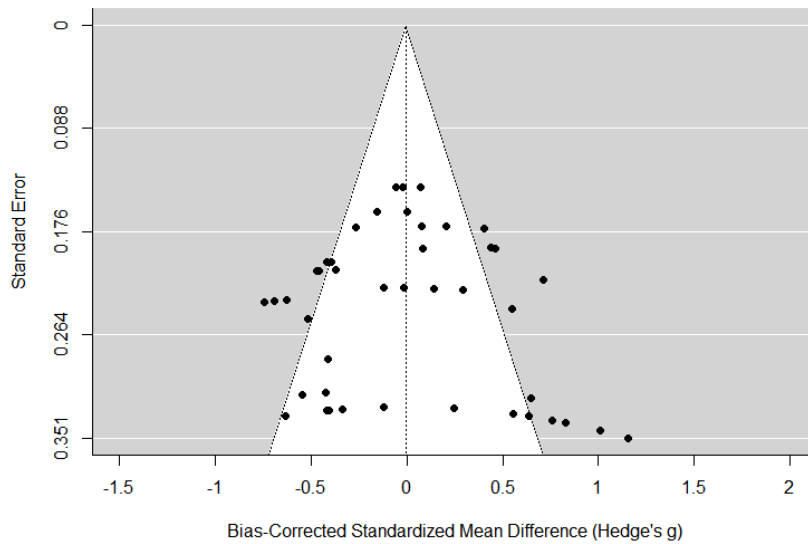


Figure E1b

Contour Enhanced Funnel Plot with Effects Belonging to the Same Study Represented in the Same Color (unconstrained thought)

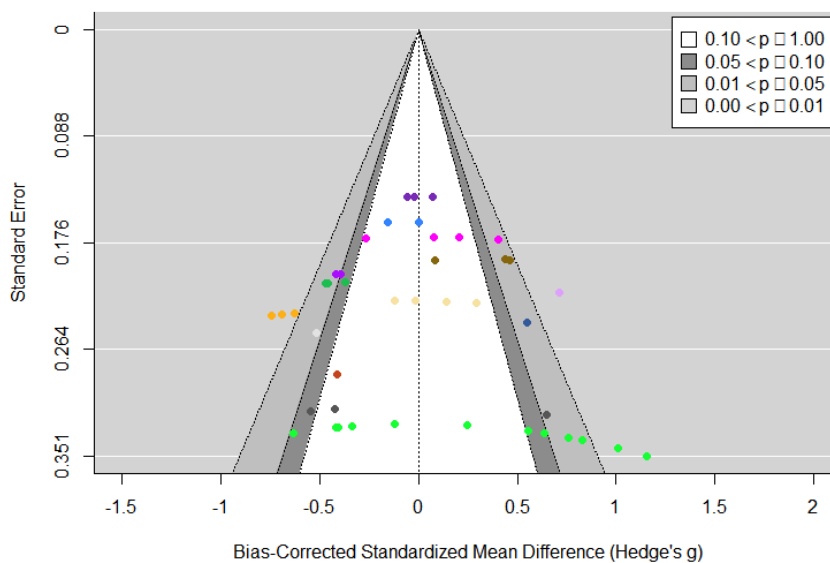


Figure E2a

Funnel Plot Showing the Hedges' g Effect Size on the x-Axis, and the Standard Error of Hedges' g Effect Size on the y-Axis (abstraction)

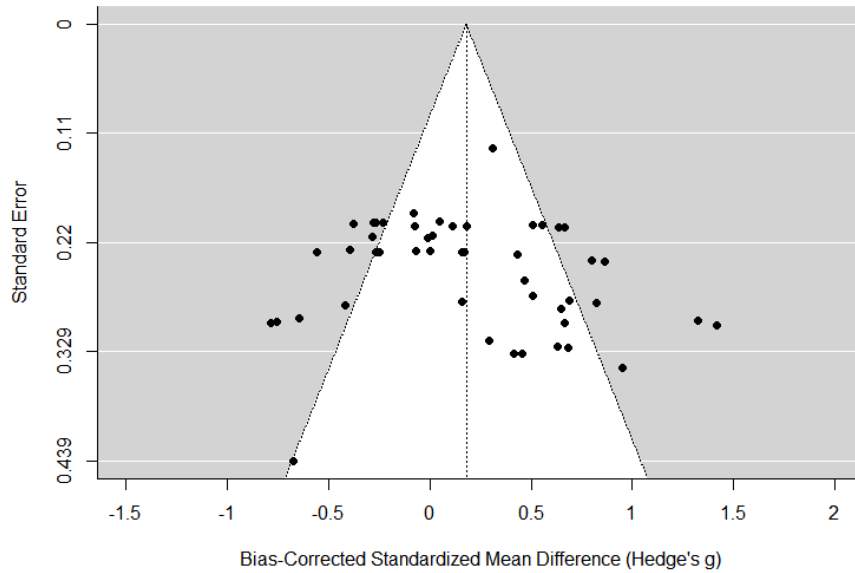


Figure E2b

Contour Enhanced Funnel Plot with Effects Belonging to the Same Study Represented in the Same Color (abstraction)

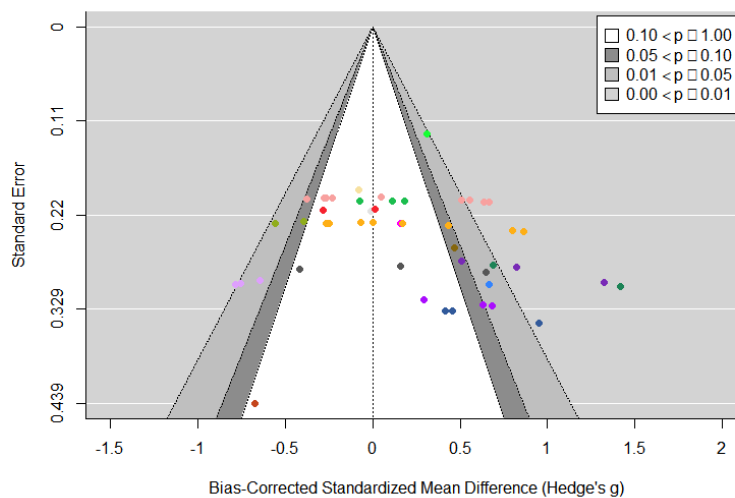


Figure E3a

Funnel Plot Showing the Hedges' g Effect Size on the x-Axis, and the Standard Error of Hedges' g Effect Size on the y-Axis (uniqueness)

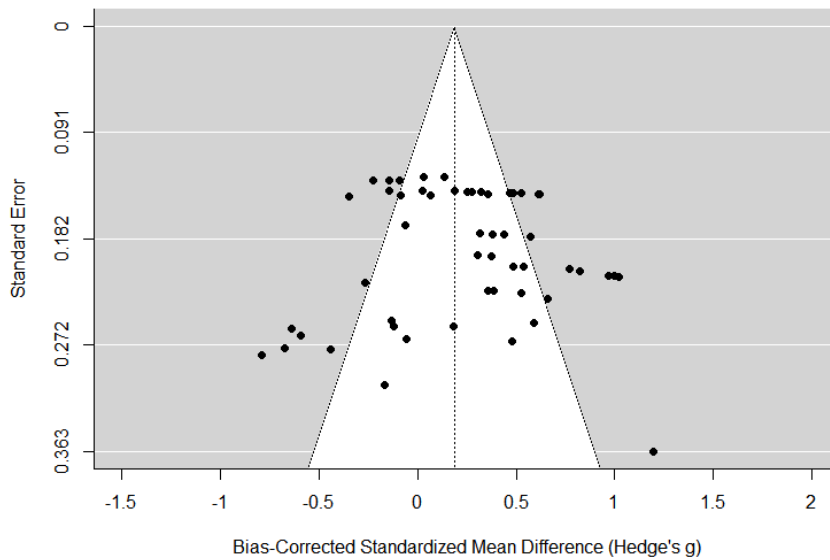


Figure E3b

Contour Enhanced Funnel Plot with Effects Belonging to the Same Study Represented in the Same Color (uniqueness)

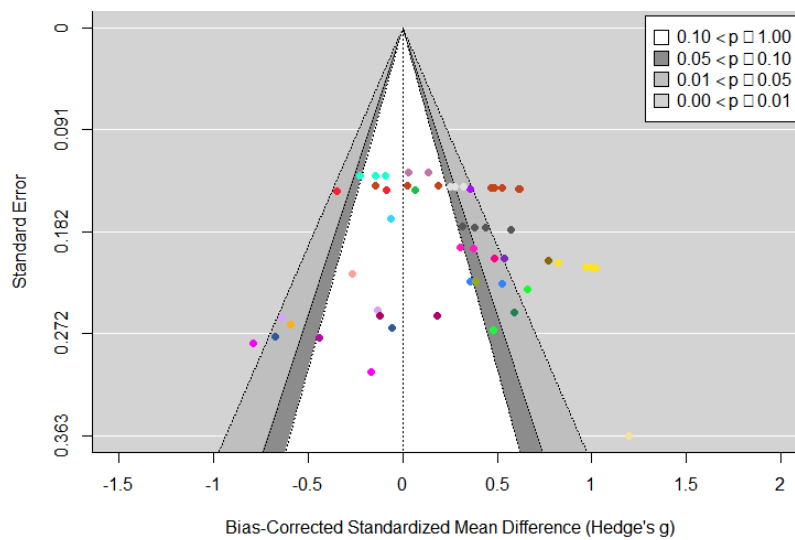


Figure E4b

Funnel Plot Showing the Hedges' g Effect Size on the x-Axis, and the Standard Error of Hedges' g Effect Size on the y-Axis (open-mindedness)

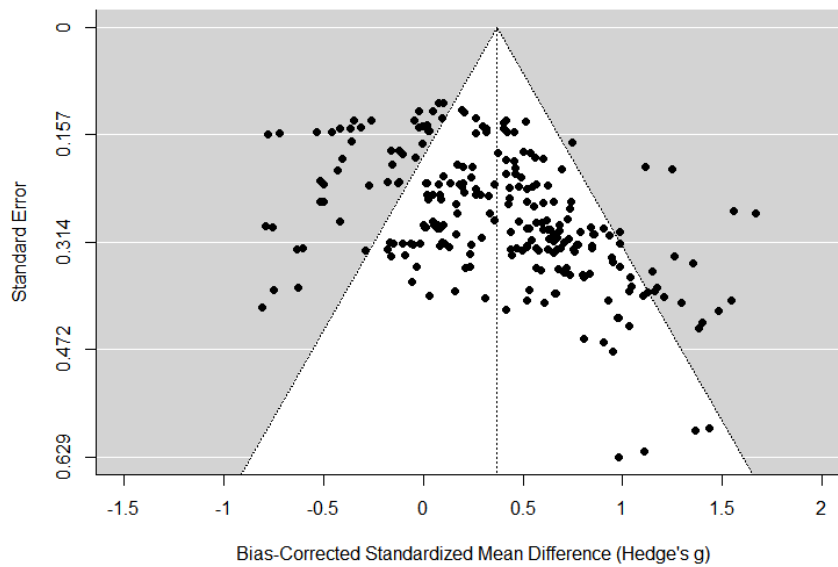


Figure E4b

Contour Enhanced Funnel Plot with Effects Belonging to the Same Study Represented in the Same Color (open-mindedness)

