Available online at www.sciencedirect.com

ScienceDirect

Current Opinion in Psychology

Attachment security priming: a systematic review

Omri Gillath[1] and Gery Karantzas[2]

Attachment security priming has been used to shed light on the cognitive processes related to attachment internal working models as well as the cognitive substrates of people's attachment-related affect and behavior. Security primes activate a sense of attachment security by making mental representations in one's memory more accessible and salient. In the current paper, we report on a qualitative synthesis of 20 studies published in the last two years to determine the effects of security priming. We found that supraliminally administered security priming (especially via guided imagery or visualization) is associated with beneficial effects across a diverse set of domains. The effects were especially strong among anxiously attached individuals.

Addresses
[1] University of Kansas, USA
[2] Deakin University, Melbourne, Australia

Corresponding author: Gillath, Omri (ogillath@ku.edu)

Current Opinion in Psychology 2019, **25**:86–95

This review comes from a themed issue on **Attachment in adulthood**

Edited by **Jeffry A Simpson** and **Gery Karantzas**

https://doi.org/10.1016/j.copsyc.2018.03.001

2352-250X/© 2018 Elsevier Ltd. All rights reserved.

Attachment security priming has been used to understand various aspects of the cognitive processes related to attachment internal working models as well as the cognitive substrates of people's attachment-related affect and behavior [1,2]. Security priming entails exposing individuals to stimuli designed to activate a sense of love, comfort, and safety [3••,4]. Security priming is a social cognitive procedure where mental representations in one's memory are triggered [2,3••]. Then, by way of 'spreading activation' [5,6], semantic and affective nodes are triggered thus creating a sense of security similar to that induced by the presence of supportive others who provide love, comfort, and security (termed *attachment figures*). Following exposure to security primes, researchers can examine the outcomes and the extent to which these outcomes are moderated by attachment style (i.e. level of attachment anxiety or avoidance).

Different methods have been used to prime attachment security [7,8]. These methods involve: first, exposing people (subliminally or supraliminally) to security-related words (e.g. love, hug, affection, support) or the names of security-providing attachment figures via different tasks (e.g. a crossword puzzle); second, exposing people to pictures representing attachment security (such as a mother hugging a child); and third, asking participants to recall memories of being loved and supported by attachment figures, or asking people to imagine such scenarios or relationships. These priming procedures have been shown to influence such diverse variables as mood and attitudes toward novel stimuli [9], reactions to out-group members [10], death anxiety and political views [11], aggression [8], compassion and altruism [12,13], and depression [14••].

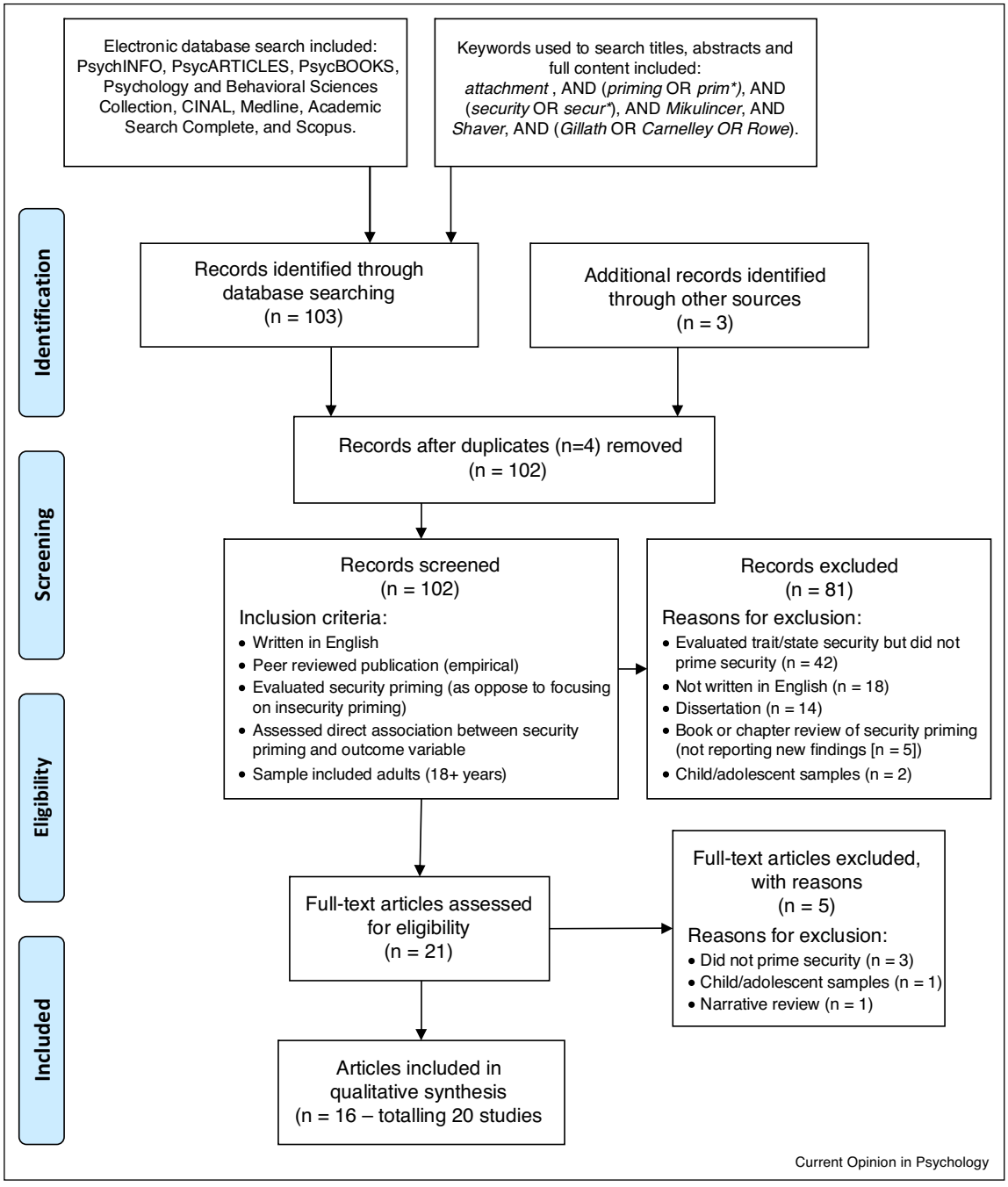
Most of these studies have been cross-sectional in design, with little by way of longitudinal studies on the effects of attachment security. What little research has been conducted on this front has found that repeated security priming (spanning one week to several weeks) appears to result in facilitative effects over time such as: increases in positive relationship appraisals, positive mood and emotional wellbeing, positive appraisals of the self, greater compassion toward others, and reductions in attachment-related anxiety [7,15,14••].

The last few years have seen an influx of studies on the effects of security priming [1]. At the same time, criticism regarding priming studies (not specifically security priming), has raised doubts about the robustness of priming effects (e.g. [16,17•,18]). Despite this criticism and the recent influx of research, it is surprising that there has been no systematic review into security priming. Therefore, we report on a qualitative synthesis of the research into security priming focusing on recent research conducted over the last two years.

Method

In line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; see Figure 1) the review methodology involved four steps — identification, screening, eligibility and inclusion. As part of the identification step, a series of electronic databases were used to conduct literature searches, and a variety of keywords were used separately and in combination to identify articles (see Figure 1). Specific author names known to conduct work in security priming were also included in the search. Additional records were identified by examining the reference lists of articles recovered through the databases search to capture any relevant studies that may have been missed using the search strategy listed above.

Figure 1



A flow diagram detailing the application of PRISMA to the qualitative synthesis of published security priming studies conducted between January 2016 and January 2018.

Given the focus of COIP on research published in the last two years, the search was limited to peer-reviewed publications between January 2016 and January 2018.

Results

The identification of articles through the searching of electronic databases using the search terms outlined (see Figure 1) revealed a total of 106 articles. Examination of these records through abstract and full-text review against the inclusion criteria resulted in a total of 16 papers for qualitative synthesis. Of these 16 papers, three papers detailed multiple studies assessing the effects of security priming (see Table 1). Therefore, a total of 20 studies were evaluated as part of the qualitative synthesis. The

Table 1

Summary of security priming study characteristics and outcomes (2016–2018)

Author	Location	Sample size	*M* Age	Administration	Prime type	Comparison group	Outcome	Outcome type	Main effect for Prime	Interaction with attachment style
Boag, & Carnelley (2016) (Study 1) [19]	United Kingdom	124 30 men 94 women	24 years	Community (online research community) online	Supraliminal (guided imagery/ visualization)	Neutral prime condition (acquaintance)	Empathy Prejudice	Self-report	Y ↑ empathy ↓ prejudice (compared to neutral prime)	None tested
Boag & Carnelley (2016) (Study 2) [19]	United Kingdom	88 15 men 73 women	23.9 years	Community (online research community) online	Supraliminal (guided imagery/ visualization)	Att ax prime condition Att av prime condition	Perspective taking Empathic concern Distress Prejudice Social Dominance Orientation (SDO)	Self-report	Partial ↑ perspective taking ↑ empathic concern ↓ distress ↓ prejudice ↓ SDO	None tested
Bryant & Chan (2017) [20]	Australia	75 56 men 19 women	19 years	University sample (laboratory)	Supraliminal	Positive mood prime condition	Intrusion of negative images Distress	Self-report	Y ↓ intrusive thoughts of images ↓ in distress	Y ↓ distress (Att ax) ↑ affective stimuli (Att av)
Carnelley, Otway, & Rowe (2016) (Study 1) [21]	United Kingdom	144 17 men 127 women	20.1 years	University sample (laboratory)	Supraliminal (guided imagery/ visualization)	Attachment avoidance prime condition Attachment anxiety prime condition Neutral prime condition	Anxious and depressed mood		Y ↓ anxious and depressed mood	N (interactions tested)
Carnelley, Otway, & Rowe (2016) (Study 2) [21]	United Kingdom	81 11 men 70 women	20.32 years	University sample (laboratory — initial assessment and priming; online repeated priming and assessments)	Supraliminal (guided imagery/ visualization) Initial priming in lab, subsequent repeated priming via text messaging	Neutral prime condition	Anxious mood Depressed mood	Self-report	Partial ↓ anxious mood 0 depressed mood	Not reported
Davis, Soref, Villalobos, & Mikulincer (2016) (Study 3) [22]	Israel	90 40 men 50 women	34.08 years	Community sample (Migdam.com — participant recruitment site) (online)	Supraliminal (guided imagery/ visualization)	Neutral prime condition (non-attachment acquaintance)	Disclosure of: – hostile thoughts & behaviors toward Israeli-Arabs – criminal behavior – socially undesirable traits	Self-report	Partial ↑ Disclosure of hostile thoughts & behaviors toward Israeli-Arabs 0 disclosure of criminal behavior & socially undesirable traits	Not tested

Table 1 (*Continued*)

Author	Location	Sample size	*M* Age	Administration	Prime type	Comparison group	Outcome	Outcome type	Main effect for Prime	Interaction with attachment style
Deng *et al.* (2016) [23]	China	114 69 men 45 women (57 high optimistic explanatory style; 57 high pessimistic explanatory style)	20.26 years	University sample (unclear if study conduct in laboratory or online)	Supraliminal (reading a story — third party)	Control condition	Optimistic/ pessimistic attributions internal/external achievement attributions	Self-report	Partial ↓Optimistic attributions and ↓ internal attributions of success (in HOES individuals) ↑ Optimistic attributions and ↑ internal attributions of success (in HPES individuals)	Not tested
Dutton, Lane, Koren, & Bartholomew (2016) [24]	Canada & United States	278 95 men 183 women	27.5 years	Community (online) & university sample (laboratory & online)	Unclear (images of a mother/child or romantic couples embracing) Exposure time to images not reported	Control condition Distraction condition	Anger Anxiety	Self-report	Y ↓ Anger ↓ Anxiety	Y ↓ Anger (Att ax)
Gillath, Karantzas, & Selcuk (2017) (Study 3) [25••]	United States	80 32 men 48 women	21 years	University sample non-laboratory (pen and paper)	Supraliminal (guided imagery/ visualization)	Neutral prime condition	Network management skills (initiation, maintenance, dissolution of network ties)	Self-report	Y ↑ initiating ties ↓ dissolving ties	Y ↓ dissolution of ties (Att Ax; Att av)
Hutton, Ellett, & Berry (2017) [26]	United Kingdom	60 12 men 48 women	21 years	University sample (laboratory)	Supraliminal (guided imagery/ visualization)	Neutral prime condition Positive affect prime condition	Paranoid thinking	Self-report	N	Y ↑ paranoid thinking (Att ax)
Jarvinen & Paulus (2017) (Study 1) [27]	United States	1204 Sex composition reported	32.16 years	Community (Mturk) (online)	Supraliminal (guided imagery/ visualization)	Attachment avoidance prime condition Attachment anxiety prime condition Control condition	Cognitive openness	Self-report	Partial ↑ Cognitive openness to counterarguments about God 0 Cognitive openness to counter arguments about abortion and spending	N Interactions tested
Li *et al.* (2016) (Study 2) [28]	China	51 25 men 26 women	19.9 years	University sample (laboratory)	Supraliminal (guided imagery/ visualization)	Neutral prime condition (acquaintance)	Response inhibition (ego depletion)	Reaction Time Error Rate	Y ↑ Response inhibition	N Interactions tested

Table 1 (*Continued*)

Author	Location	Sample size	*M* Age	Administration	Prime type	Comparison group	Outcome	Outcome type	Main effect for Prime	Interaction with attachment style
Liao, Wang, Zhang, Zhou, & Liu (2017) [29]	China	105 35 men 70 women (51 classified as dependent depressive symptoms; 54 classified as self-critical depressive symptoms)	20.43 years	University sample (laboratory)	Supraliminal (guided imagery/ visualization)	None (pre-post priming assessment)	Positive affect	Self-report	Y ↑ Positive affect for both individuals with dependency depression symptoms and individuals with self-critical depression symptoms	Not tested
Pan, Zhang, Liu, Ran, & Teng (2017) (Study 3) [30]	China	78 23 men 55 women	21.27 years	University sample (laboratory)	Supraliminal (guided imagery/ visualization)	Neutral prime condition (acquaintance)	Perception of pain in others	Self-report	N	Y ↓ perceived pain intensity (Att Anx x Att Av)
Rowe, Shepstone, Carnelley, Cavanagh, & Millings (2016) [31]	United Kingdom	117 33 men 84 women	22.3 years	Community & university (laboratory)	Supraliminal (guided imagery/ visualization)	Neutral prime condition	Willingness to undertake further mindfulness training	Self-report	Y ↑ training willingness	Not tested
Sakaluk & Gillath (2016) (Study 1) [32]	United States	282 147 men 135 women	27.41 years	Community (Mturk) online administration	Supraliminal (Guided imagery/ visualization)	Attachment avoidance prime condition Attachment anxiety prime condition Control condition (acquaintance)	Attitudes toward condom use	Self-report	Y (in line with predictions) ↓ condom use (as did an attachment anxiety prime)	Not tested
Sakaluk & Gillath (2016) (Study 2) [32]	United States	149 82 Men 67 Women	26.56 years	Community (Mturk) online administration	Supraliminal (guided imagery/ visualization)	Attachment avoidance prime condition Attachment anxiety prime condition Control condition (acquaintance)	Attitudes toward condom use Perceptions of partner as a sexual health threat	Self-report	Y (in line with predictions) ↓ condom use (as did an attachment anxiety prime) ↓ perceptions of partner as a sexual health threat	Not tested
Sakaluk & Gillath (2016) (Study 3) [32]	United States	228 105 men 123 women	19.43 years	Community (Mturk) online administration	Supraliminal (guided imagery/ visualization)	Attachment avoidance prime condition Attachment anxiety prime condition Control condition (acquaintance)	Attitudes toward condom use Number of condoms taken	Self-report Behavioral	Partial (in line with predictions) ↓ condom use (as did an attachment anxiety prime) 0 — difference for security prime compared to insecurity primes	Not tested

Table 1 (*Continued*)

Author	Location	Sample size	*M* Age	Administration	Prime type	Comparison group	Outcome	Outcome type	Main effect for Prime	Interaction with attachment style
Tang, Chen, Hu, & Liu (2017) [33]	China	42 19 men 23 women	21.16 years	University sample (laboratory)	Supraliminal (exposure to name of romantic partner for 2000 ms)	Neutral prime condition (coupled with either positive or negative valence by way of facial images)	Brain activation & Response Time in the processing of emotional facial stimuli	Reaction Time Brain activation (fMRI)	Partial ↓ response time to positive facial stimuli 0 response time to negative facial stimuli ↑ LH brain activation regions associated with romantic love	Yes ↑ left hemispheric brain activation (Att ax)
Troyer & Greitemeyer (2018) (Study 2) [34]	Austria	531 86 men 445 women	23.3 years	University sample (unclear context of administration)	Supraliminal (Guided imagery/ visualization) Gillath & Hart 2010	Insecurity prime condition Neutral prime condition (aquaintance)	Emotion regulation empathic responding	Self-report	Partial Emotion regulation: ↑ cognitive reappraisal ↓ suppression ↓ rumination ↓ negative affectivity 0 empathic responding	None tested

Note. Att ax: attachment anxiety; Atta av: attachment avoidance.

details of these 20 studies are presented in Table 1. In Table 2, a narrative summary is detailed to alert the reader to the trends as they relate to study features, designs (including priming methods), and sample characteristics.

Security priming findings

Significant associations were reported between security priming and outcome variables in 95% of studies. Of the studies reporting multiple outcome variables, partial support was found for the effects of security priming with the

Table 2

A summary of the design and characteristics of the 20 studies included in the systematic review

Recruitment and study characteristics	Sample characteristics	Outcomes	Security priming method
• The majority of the studies were conducted in three countries, the United Kingdom (n = 6), United States (n = 5), and China (n = 5). One study was conducted in both the United States and Canada, while the remaining studies were conducted in Australia (n = 1), Austria (n = 1), and Israel (n = 1) • 7 studies were conducted exclusively online (security priming was also conducted online, see Table 1) • 2 studies reported a mixed methods design involving laboratory and online procedures [21,24] – Of these two studies, Carnelley and colleagues repeatedly primed participants via mobile phone messaging • 8 studies were conducted within the laboratory (see Table 1) • 1 study was conducted outside the laboratory using a pen-and-paper rather than online administration [25••] • Two studies did not provide adequate details to determine research methodology (e.g. whether conducted within the laboratory or in the field, pen-and-paper or online administration [23,34])	• Sample size across all 20 studies totalled 3921 participants • There was great variability in sample size across studies ranging from 42 to 1204 participants *see Table 1) • 11 studies involved samples of university students, while seven studies recruited participants from the wider community – All studies involving community samples exclusively were recruited through crowdsourcing sites (e.g. MTurk, Midgam, Hanover College, OnlinePsychResearch, and W-Lab). – 2 studies involved mixed samples that were recruited from both the university and the wider community. • The mean age of participants across studies ranged from 19 years to 34.8 years (see Table 1)	• Studies demonstrated large variability in terms of outcomes, and eight studies documented results for multiple outcome variables (see Table 1) • The most commonly reported outcome variable related to aspects of affect and emotional wellbeing (n = 6; i.e. depression, anxiety, anger, distress and positive affect, see Table 1) • 3 studies investigated prejudice and hostile attitudes toward outgroup members [19] [study 1 and 2]; [22], while 3 studies reported on empathy/perspective taking ([19], Studies 1 and 2) [34] and attitudes toward condom use ([26], Studies 1–3) respectively • 2 studies reported on regulatory processes (i.e. response inhibition and emotion regulation) [28,34] • 8 outcome variables were reported on by a single study: – Network management skills [21] – Cognitive intrusion of negative images [28] – Paranoid thinking [26], – Willingness to undertake future mindfulness training [31] – Optimistic and pessimistic attributional styles (for those high in either high optimistic explanatory style [HOES] or high pessimistic explanatory style [HPES]) [23] – Disclosure of criminal behavior and undesirable traits [22] – Perception of another's pain [30] – Left hemispheric brain activation [33] • 18/20 studies assessed outcomes by way of self-report, though 1study also included a behavioral measure (number of condoms taken ([32], Study 3) • 2 studies assessed reaction times to the presentation of stimuli [28,33], and one study assessed brain activation by way of fMRI [33]	• 19/20 studies used a supraliminal priming method • One study did not clearly report the details of the prime administered • 80% of studies used either visualization or guided imagery task as the prime, in which participants were asked to spend a few minutes visualizing an interaction with a close other involving the receipt of love, comfort, and security • 1 study — participants read a security-enhancing story [23] • 2 studies used words and images to invoke security priming. One study exposed participants to the names of their romantic partners [32] • 1 study — participants viewed security enhancing images (e.g. mother and child or romantic partners embracing) [33] • Across all but one study (which conducted a pre-post analysis [29]) the effects of security priming were tested against other priming conditions or control condition – 9 studies included a control or neutral priming condition (see Table 1) – 5 studies included attachment anxiety and avoidance priming conditions as well as a control/neutral prime (see Table 1) – 1 study only included an attachment anxiety and attachment avoidance conditions [19] – 1 study included a positive mood and neutral priming condition [26] – 1 study included an insecure and neutral priming condition [34] – 1 study only included a positive mood/affect condition [20] (see Table 1)

prime yielding significant associations (in the expected direction) for all eight studies (see Table 1). In all studies pertaining to affect and emotional wellbeing, security priming was found to reduce the experience of negative affect (though one study found a reduction in depression but not anxiety [21]) and increase in the experience of positive affect [29]. Security priming was also significantly associated with reductions in prejudice and hostile attitudes toward outgroup members (including social dominance orientation, $n = 3$), attitudes toward condom use ($n = 3$), and regulatory processes ($n = 2$) (see Table 1). For the two studies pertaining to regulatory processes, one found that security priming increased response inhibition on a Stroop task [28] while a study into emotion regulation found security priming led to reductions in suppression, rumination and negative affectivity [34]. The three studies that focused on empathy and perspective taking revealed mixed results. In one study, security priming yielded no association with empathic responding [34], whereas in two of the three studies, security priming enhanced empathy-related process (empathy, empathic concern, perspective taking [19]; Studies 1 and 2).

In addition to these findings, security priming was also found to be directly associated with network management skills (specifically increase in social tie initiation and reduction in tie dissolution, [3••]). Additionaly, security priming reduced cognitive intrusion of negative images [20], reaction times to positive facial stimuli [33], optimistic and internal attributions (for HOES individuals [23]). Furthermore, enhancing attachment security was associated with increases in cognitive openness to counterarguments against the existence of God (but not counterarguments on abortion or spending [27]), willingness for future mindfulness training [31], left-hemispheric brain activation (specifically brain regions associated with romantic love), and optimistic and internal attributions of success (in HPES individuals [23]).

In some studies, mediating and moderating variables were included to test explanatory mechanisms for the link between security priming and certain outcome variables. For instance, for studies on the association between security priming and attitudes toward condom use, security priming was associated with perceiving one's partner as less of a sexual health threat, which in turn, was negatively associated with attitudes toward condom use [32] Also, in a study on empathy, security priming was associated with increased cognitive reappraisal, reduced suppression, and rumination, which in turn, were associated with cognitive empathy [34].

Regarding testing the interaction between security priming and attachment style, ten studies did not test for this moderated association, and one study did not provide enough details to determine whether the interaction was tested. Of the nine studies that tested for this interaction, six found that attachment style moderated the effects of security priming, with one study noting that this interaction was in the opposite direction to expectations (i.e. security priming increased paranoid thinking in individuals with high attachment anxiety [26]). Of the five studies that found moderated associations in the expected directions, all five found attachment anxiety to moderate the effects of the security prime, with those high on attachment anxiety experiencing greater benefits of exposure to the prime than those low on attachment anxiety. Two studies found the effects of priming to be moderated by attachment avoidance — security priming was associated with reductions in the dissolution of network ties for those high on attachment avoidance [25••], whereas exposure to priming led individuals low on attachment avoidance to experience greater positive affect when exposed to positive images compared to those high on attachment avoidance [20]. One study that required participants to view images of others experiencing pain found a three-way interaction between security prime, attachment anxiety, and avoidance [30]. Specifically, security priming was associated with heightened reports of pain intensity among individuals high on both attachment avoidance and anxiety.

Discussion

The findings of this systematic review (limited to research published in the last two years) demonstrates that supraliminally administered security priming appears to be associated with beneficial effects across a diverse set of domains. Moreover, as a collective set of studies, the findings speak to the effectiveness of a specific kind of security priming — guided imagery or visualization of a security enhancing interaction.

Regarding outcome variables, despite the wide array, 85% of the studies included at least one criterion that could be clustered across five categories of outcome variables. These were: affect and emotional wellbeing, prejudice and hostile attitudes, empathy-related processes, attitudes toward condom use, and regulatory processes. Aside from empathy-related processes, the findings for the effects of security priming demonstrated considerable consistency. Security priming was found to be associated with the experience of less negative and more positive affect, a finding in line with much past research (for reviews see [3••,35]), as well as reduced hostility and prejudice, and enhanced regulatory processes.

Given that priming should activate felt security similar to that experienced in the actual presence of a supportive attachment figure, one would expect a reduction in feelings of distress and anxiety and the promotion of positive emotions. To this end, priming security may not only help to assuage distress and other forms of negative affect but contribute to what Mikulincer and Shaver [35] refer to as the 'broadening and building cycle' of attachment

security. Moreover, it appears that priming security may not only enhance positive affect, resiliencey, coping flexibility, and skills and capabilities, but also activates brain regions associated with love and human bonding [1]. Some of these left hemispheric regions have also been found to be associated with regulatory processes such as emotion regulation. Thus, these regions may also be in play when security is primed in contexts of response inhibition and the regulation of affect. Two studies within this review indeed demonstrated that these regulatory processes are associated with security priming [28,34]. This further supports the idea that security priming can act as a cognitive resource that assists in regulatory processes [1].

The findings that priming security is associated with reductions in hostility and prejudice are in line with past findings regarding the increased tolerance and prosocial behaviors afforded to outgroup members as a function of security priming (e.g. [10]). It may be that security priming reduces particular worries or concerns that individuals may have about outgroup members, and as a result, they are less likely to see others as a threat to their wellbeing or sense of felt security.

While the findings discussed above support the effectiveness of security priming, it is important to highlight that the systematic review identified one study where security priming did not result in significant effects, and there were seven studies that found only partial support for the effects of security priming. In fact, the findings about empathy-related processes were the least consistent; however, these inconsistencies appeared to be explained by mediators reflective of processes involved in cognitive empathy. The role of mediators is something that may need to be explored further in security priming research to not only develop a better understanding as to the explanatory mechanisms that underlie security priming but to assist in reconciling unexpected or inconsistent associations. However, as noted by critics of research into priming in general, drawing on explanatory variables with little by way of a priori theory or rationale only 'muddies the waters' with respect to understanding the conditions under which priming works [16,17•]. However, this is less of a problem within the context of security priming, where there are particular moderator variables that should theoretically explain variation in priming effects.

One possible explanatory variable identified in this systematic review is a person's chronic attachment style, especially attachment anxiety. It may be that priming has beneficial effects specifically for those whose chronic attachment style involves hypervigilance to threat (and to signs of love being offered or taken away), and the chronic use of distress intensifying cognitions, behaviors and emotion regulation strategies. From this perspective, supraliminal priming may be effective in down-regulating the hyperactivating strategies of anxiously attached individuals.

For those high on attachment avoidance, security priming that is supraliminal in nature may not be as effective due to their use of defense mechanisms. Thus, avoidant individuals may find it more difficult to recall security enhancing interactions with close others, or provide less detailed recollections of such experiences. Research into the secure-base script suggests that individuals high on attachment avoidance have difficulties generating narratives that include the positive behavioral and emotional content reflective of a coherent secure base script (see Waters and Roisman, this issue, [36]). Thus, it may be that individuals high on attachment avoidance are more resistant to the beneficial effects of security priming, or that only subliminal priming may be able to bypass the cognitive-affective defenses of these individuals.

What is clear from this systematic review is that studies published in the last two years suggest that priming attachment security yields positive effects across a diverse set of outcomes and that this line of inquiry is very much worth pursuing. It is however important to note that our review only included published studies. Thus we are unable to comment on the number of unpublished studies into security priming that may have yielded null findings or inconsistent findings. Future research could extend on the qualitative synthesis reported in the present study by systematically reviewing the effects of security priming across both published and unpublished studies as well as include studies that proceeded the last two years. Furthermore, to significantly extend our understanding of security priming, future research using multilevel and multi-method approaches is needed to determine the short-term and long-term effects of attachment security and to develop further insights into the underlying mechanisms and processes that underpin attachment security.

Conflict of interest statement

Nothing declared.

References and recommended reading

Papers of particular interest, published within the period of review, have been highlighted as:

- • of special interest
- •• of outstanding interest

1. Canterberry M, Gillath O: **Neural evidence for a multifaceted model of attachment security**. *Int J Psychophysiol* 2013, **88**:232-240.

2. Weingarten E, Chen Q, McAdams M, Yi J, Hepler J, Albarracín D: **From primed concepts to action: a meta-analysis of the behavioral effects of incidentally presented words**. *Psychol Bull* 2016, **142**:472.

3. •• Gillath O, Karantzas GC, Fraley RC: *Adult Attachment: A Concise Introduction to Theory and Research*. Academic Press; 2016.

The chapter about priming gives a comprehensive review of the attachment literature about priming beyond the two recent years that is the focus of the current paper.

4. Gillath O, Karantzas G: **Attachment security and prosociality: dynamics, underlying mechanisms, and implications**. In *Handbook of Personal Security.* Edited by Carroll PJ, Arkin RM, Wichman AL. Psychology Press; 2015:159-172.

5. Collins AM, Loftus EF: **A spreading-activation theory of semantic processing**. *Psychol Rev* 1975, **82**:407.

6. Förster J, Liberman N: **Knowledge activation**. In *Social Psychology: Handbook of Basic Principles*, vol 2. Edited by Kruglanski AW, Higgins ET . Guilford Press; 2007:201-231.

7. Gillath O, Selcuk E, Shaver PR: **Moving toward a secure attachment style: can repeated security priming help?** *Soc Per Psychol Compass* 2008, **2**:1651-1666.

8. Mikulincer M, Shaver PR: **Boosting attachment security to promote mental health, prosocial values, and inter-group tolerance**. *Psychol Inq* 2007, **18**:139-156.

9. Mikulincer M, Hirschberger G, Nachmias O, Gillath O: **The affective component of the secure base schema: affective priming with representations of attachment security**. *J Pers Soc Psychol* 2001, **81**:305.

10. Mikulincer M, Shaver PR: **Attachment theory and intergroup bias: evidence that priming the secure base schema attenuates negative reactions to out-groups**. *J Pers Soc Psychol* 2001, **81**:97.

11. Gillath O, Hart J: **The effects of psychological security and insecurity on political attitudes and leadership preferences**. *Eur J Soc Psychol* 2010, **40**:122-134.

12. Gillath O, Shaver PR, Mikulincer M: **An attachment-theoretical approach to compassion and altruism**. In *Compassion: Conceptualisations, Research and Use in Psychotherapy.* Edited by Gilbert P. Routledge; 2005:121-147.

13. Mikulincer M, Shaver PR, Gillath O, Nitzberg RA: **Attachment, caregiving, and altruism: boosting attachment security increases compassion and helping**. *J Pers Soc Psychol* 2005, **89**:817.

14. •• McGuire A, Gillath O, Jackson Y, Ingram R: **Attachment security priming as a potential intervention for depressive symptoms**. *J Soc Clin Psychol* 2018, **37**:44-68.
This recent paper provides a great example of the effects of priming in and outside the lab, on real-world problems like depression symptoms.

15. Carnelley KB, Rowe AC: **Repeated priming of attachment security influences later views of self and relationships**. *Pers Relatsh* 2007, **14**:307-320.

16. Donnellan MB, Lucas RE, Cesario J: **On the association between loneliness and bathing habits: nine replications of Bargh and Shalev (2012) Study 1**. *Emotion* 2015, **15**:109.

17. • Harris CR, Coburn N, Rohrer D, Pashler H: **Two failures to replicate high-performance-goal priming effects**. *PLoS ONE* 2013, **8**:e72467.
This paper provides a context to some of the issues that were raised about priming effects and the failure to replicate.

18. Payne BK, Brown-Iannuzzi JL, Loersch C: **Replicable effects of primes on human behavior**. *J Exp Psychol: Gen* 2016, **145**:1269.

19. Boag EM, Carnelley KB: **Attachment and prejudice: the mediating role of empathy**. *Br J Soc Psychol* 2016, **55**:337-356.

20. Bryant RA, Chan I: **Activating attachment representations during memory retrieval modulates intrusive traumatic memories**. *Conscious Cogn* 2017, **55**:197-204.

21. Carnelley KB, Otway LJ, Rowe AC: **The effects of attachment priming on depressed and anxious mood**. *Clin Psychol Sci* 2016, **4**:433-450.

22. Davis D, Soref A, Villalobos JG, Mikulincer M: **Priming states of mind can affect disclosure of threatening self-information: effects of self-affirmation, mortality salience, and attachment orientations**. *Law Hum Behav* 2016, **40**:351.

23. Deng Y, Yan M, Chen H, Sun X, Zhang P, Zeng X, Liu X, Lye Y: **Attachment security balances perspectives: effects of security priming on highly optimistic and pessimistic explanatory styles**. *Front Psychol* 2016, **7**:1269.

24. Dutton DG, Lane RA, Koren T, Bartholomew K: **Secure base priming diminishes conflict-based anger and anxiety**. *PLOS ONE* 2016, **11**:e0162374.

25. •• Gillath O, Karantzas GC, Selcuk E: **A net of friends: investigating friendship by integrating attachment theory and social network analysis**. *Pers Soc Psychol Bull* 2017, **43**:1546-1565.
This is another recent example of priming and its effects on broader factors, in this case, social networks.

26. Hutton J, Ellett L, Berry K: **Adult attachment and paranoia: an experimental investigation**. *Cogn Behav Ther* 2017, **10**.

27. Jarvinen MJ, Paulus TB: **Attachment and cognitive openness: emotional underpinnings of intellectual humility**. *J Posit Psychol* 2017, **12**:74-86.

28. Li J, Galley M, Brockett C, Spithourakis GP, Gao J, Dolan B: *A Persona-based Neural Conversation Model*. 2016arXiv:1603.06155.

29. Liao R, Wang S, Zhang P, Zhou Y, Liu X: **Effect of priming with attachment security on positive affect among individuals with depression**. *Soc Behav Pers* 2017, **45**:331-338.

30. Pan Y, Zhang D, Liu Y, Ran G, Teng Z: **The effects of attachment style and security priming on the perception of others' pain**. *J Soc Pers Relat* 2017, **34**:184-208.

31. Rowe AC, Shepstone L, Carnelley KB, Cavanagh K, Millings A: **Attachment security and self-compassion priming increase the likelihood that first-time engagers in mindfulness meditation will continue with mindfulness training**. *Mindfulness* 2016, **7**:642-650.

32. Sakaluk JK, Gillath O: **The causal effects of relational security and insecurity on condom use attitudes and acquisition behavior**. *Arch Sex Behav* 2016, **45**:339-352.

33. Tang Q, Chen X, Hu J, Liu Y: **Priming the secure attachment schema affects the emotional face processing bias in attachment anxiety: an fMRI research**. *Front Psychol* 2017, **8**:624-632 http://dx.doi.org/10.3389/fpsyg.2017.00624.

34. Troyer D, Greitemeyer T: **The impact of attachment orientations on empathy in adults: considering the mediating role of emotion regulation strategies and negative affectivity**. *Pers Individ Dif* 2018, **122**:198-205.

35. Mikulincer M, Shaver PR: *Attachment in Adulthood: Structure, Dynamics, and Change*. edn 2. 2017. New York.

36. Waters TEA, Roisman GI: **The secure base script concept: an overview**. *Curr Opin Psychol* 2019, **24**:1-6.