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Author manuscript

*Perspect Psychol Sci.* Author manuscript; available in PMC 2022 November 04.

Published in final edited form as:

*Perspect Psychol Sci.* 2022 November ; 17(6): 1541–1555. doi:10.1177/17456916211059819.

## What do we know about aging and emotion regulation?

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### Abstract

Older adults report surprisingly positive affective experience. The idea that older adults are *better* at emotion regulation has emerged as an intuitively appealing explanation for why they report such high levels of affective well-being despite other age-related declines. In this paper, I review key theories and current evidence on age differences in the use and effectiveness of emotion regulation strategies from a range of studies, including laboratory-based and experience sampling. These studies do not yet provide consistent evidence for age *differences* in emotion regulation and thus do not clearly support the assertion that older adults are better at emotion regulation. However, current approaches may be limited in describing and testing possible age-related changes in emotion regulation. Future work will need to more directly investigate individual trajectories of stability and change in emotion regulation strategy use and effectiveness over time, while also considering the possible roles of context, physiological reactivity, neural changes, acceptance and personality.

### What do we know about aging and emotion regulation?

Older adults report very positive affective experience on average, sometimes more so than their younger counterparts (Mroczek & Kolarz, 1998; Charles & Carstensen, 2010). This robust finding is also surprising, given well-documented cognitive and physical declines and social losses that come with advancing age. Some refer to this as “the paradox of aging” (e.g., Mather, 2012). A key question is, why? What mechanisms might explain older adults’ generally positive affective experience?

A common explanation in the literature is that older adults are better at regulating their emotions, and this allows them to feel good even when facing negative experiences. The logic is: if older adults report feeling better than younger adults, then their regulatory behaviors *must* be helping them feel so good, and this would reflect “better” or “more adaptive” emotion regulation. In their seminal 2010 *Annual Review of Psychology* paper on social and emotional aging, Charles and Carstensen state (p. 397): “Older age is related to increases in the ability to regulate emotions.” A recent paper in *Science* asserted that “an increasing capacity for emotional regulation is a feature of human aging (Rosati et al., 2020, p. 475).” A widely-used Developmental Psychology textbook claims, without citation, (Feldman, 8th edition, 2017, p. 581), “It is also clear that...they [older adults] become more skilled at regulating their emotions.”

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The idea that older adults' positive emotional experience results from better emotion regulation is intuitively appealing, providing a counterpoint to negative age-related changes in other domains. It also comports with common-sense notions that age brings a better "perspective" on what is and is not important (Isaacowitz, 2005), as well as with lay ideas about older adults being wiser (though see Grossmann et al., 2019).

But what do we really know about how aging impacts emotion regulation? In this paper, I consider the idea that older adults are better at regulating their emotions than younger adults and evaluate the current evidence on adult age differences in emotion regulation. Results suggest few adult age differences in emotion regulation and limited support for the idea that older adults are "better." It may be, however, that current approaches are not able to document *individual* differences in emotion regulation that would permit a precise test of whether, how and why they vary by age. I then consider plausible mechanisms that may underlie age-related differences in self-reported positive affective experience.

## Older Adults Report More Positive Affective Experience

There is an extensive, robust literature suggesting that older adults self-report quite positive emotional lives; sometimes they even report being more emotionally positive than their younger counterparts (see review by Charles & Carstensen, 2010). Older adults report higher levels of positive affect and lower levels of negative affect than younger adults (Mroczek & Kolarz, 1998). A study of affective experience in everyday life in adults ages 18–94 found no age differences in the frequency or intensity of positive affect or in the intensity of negative affect, but older adults reported less frequent negative affect (Carstensen et al., 2000). Other studies found similar within-person age changes (Charles et al., 2001). A study of negative experience over 100 days found that older adults reported less negative affect variability than younger adults (Brose et al., 2015). Interestingly, another study using both cross-sectional and longitudinal data also found age-related declines in negative affect, but also in positive affect (Hudson et al., 2016). Age-related declines in negative affective experience are not found for all negative states: older adults report less frequent experiences of anger but not sadness (Kunzmann & Thomas, 2014).

The bulk of findings therefore suggest an age-related decline in at least some aspects of negative affective experience, that on balance makes older adults' experience more positive. These patterns have been replicated in some cross-cultural studies (i.e., Pethtel & Chen, 2010; Tsai & Sims, 2016; though see Grossmann et al., 2014 for stronger age effects in the US than Japan). Recent work suggests that older adults continue to report more positive emotional experience than younger adults during the COVID-19 pandemic, despite the greater risk to their health from the disease (Martire & Isaacowitz, 2021).

There is a related but distinct literature on aging and life satisfaction. "Psychological well-being" comprises both emotional and cognitive/evaluative components; the emotional self-reports described above reflect the emotional component (how they feel), whereas self-reported life satisfaction reflects the cognitive component (what they think about their life). Most life satisfaction studies report age stability (Diener & Suh, 1998) with some finding age-related increases (i.e., Gana et al., 2013; cf. Lawrie et al., 2020 on cultural differences);

this paper will focus primarily on the emotional component to make the clearest links to emotion regulation. Affective experience includes both valence and arousal/activation dimensions (Barrett & Russell, 1999); most research on emotion in aging has focused on positive-negative valence, but arousal will be considered when possible. While there is a lively debate about whether well-being judgments show a U-shape with midlife decline (Galambos et al., 2020), the phenomenon of interest for this paper is older adults' positive emotional well-being.

## Why Do Older Adults Report More Positive Affective Experience?

### Theoretical Views

Several theoretical frameworks try to explain why older adults report such positive affective experience. While each features its own distal mechanisms, they each suggest more proximal mechanisms involving possible age-related differences in emotion regulation strategies.

Socioemotional selectivity theory (SST; Carstensen et al., 1999; Carstensen, 2006) was originally developed to explain changes in social behavior with age but pivoted to also provide an account of changes in emotional experience. According to SST, time perspective shifts lead to shifts in emotion-relevant goals. When time is perceived as expansive, emotional well-being is less important than accomplishing future-oriented goals; however, when time is more limited as in late life, present-oriented goals such as feeling good are prioritized. If older adults' more limited time perspective leads them to prioritize present-oriented pro-hedonic emotional goals to feel good, it makes sense that they also feel better as a result of making choices in line with these goals. There is evidence for age-related increases in pro-hedonic goals, such that older adults more frequently report that they are trying to stay in a good mood or improve their mood, compared to younger age groups (Riediger et al., 2009).

An outgrowth of SST provided a concrete path by which emotional goals might be linked to more positive emotional experience. Several studies in the early 2000s found that older adults attended to and remembered relatively more positive than negative emotional stimuli – a pattern termed “age-related positivity effects” (Mather & Carstensen, 2005). For example, older adults remembered a similar proportion of positive emotional images as younger adults, but relatively fewer negative emotional images (Charles et al., 2003). Older adults were relatively faster to respond to a probe behind a positive image compared to one behind a negative one in a dot-probe task, suggesting an attentional bias away from negative (Mather & Carstensen, 2003). Eye tracking studies found that older adults fixated relatively more on positive stimuli and relatively less on some negative types (see Isaacowitz, 2012 for a summary). Age-related positivity effects were viewed as predicted by SST because they reflect older adults' emotional goals; prioritization of emotional goals leads to this potentially mood-enhancing positive pattern. While age-related positivity effects in attention and memory are somewhat consistently observed (Reed et al., 2014), links between positivity effects and actual emotional experience have been harder to document (Isaacowitz & Blanchard-Fields, 2012). Some studies refer to age differences in positive

affective experience as positivity effects, but this confuses the outcome (positive affective experience) with a potential process that might lead to that outcome (age-related positivity effects in attention and memory) and should be avoided.

There is debate about whether age-related positivity effects should be considered emotion regulation strategies (see also Barber et al., 2020 for a critical discussion of positivity effects). Age-related positivity effects in attention appear similar to the strategy of attentional deployment specified in Gross' (1998) process model of emotion regulation (see Isaacowitz, 2012). The process model proposes five families of strategies that individuals use to regulate their affective state: situation selection, situation modification, attentional deployment, cognitive change/reappraisal, and response modulation/suppression. Each general *strategy* is implemented with specific *tactics*, which vary by valence: engaging more with either positive or negative content, or neutralizing negative content (Livingstone & Isaacowitz, 2019). For example, the strategy of reappraisal may involve the tactic of detaching, to neutralize negative content, or putting a positive spin on the elicitor ("positive reappraisal"). Beyond showing more positive attentional deployment as indicated by findings of age-related positivity effects in attention, older adults may benefit more from positive reappraisal (Shiota & Levenson, 2009). In this way, age-related positivity effects might be considered an emotion regulation strategy. However, some argue that any links between positivity effects and affective experience are "a byproduct of goal-directed cognition" (Carstensen & De Liema, 2018, p. 9). While this can be debated, if the goal is to understand why older adults report such positive affective experience, it is ultimately an empirical question whether an observed behavior like positivity effects predict better emotional experience in older adults or not.

Another view is that age-related positivity effects are part of a general selectivity strategy (Sims & Carstensen, 2014; Sims, Hogan & Carstensen, 2015), combined with seeking out mood-enhancing situations in everyday life, that helps older adults to achieve positive affective experience. How (older) individuals accomplish their pro-hedonic goals through potentially emotion regulatory behavior can be investigated empirically.

The strength and vulnerability integration (SAVI) model (Charles, 2010) argues that changes in time perspective are one of numerous influences on age differences in emotion regulation. Some developmental changes, like changes in goals, might make older adults better at regulation and lead to more positive emotional experience, whereas other developmental changes, such as reduced physiological flexibility to arousal with age, might impair older adults' emotion regulation and lead to worsened emotional experience. If older adults can select situations that make them feel good, older adults will be happier; however, if unable to avoid distressing situations, older adults may actually be at an emotion regulation disadvantage.

The selection, optimization, and compensation in emotion regulation (SOC-ER) model posits that emotion regulation changes with age to reflect underlying resources that may also vary by age (Urry & Gross, 2010). Given age-related cognitive changes, strategies derived primarily from cognitive abilities (i.e., reappraisal) might be less favored than those that rely on resources that might increase with age, such as social support. If older adults feel

better, then SOC-ER tries to explain age changes that support better affective states with age. Each of these theories, then, implicates age-related differences in some aspects of emotion regulation, that may relate to age differences in affective experience.

## What Would Better Emotion Regulation with Age Look Like?

What would need to be shown to support the idea that older adults are better at emotion regulation than younger adults? One perspective is that “emotional *experience* is arguably the best measure of the effectiveness of emotion regulation in daily life” (Sims & Carstensen, 2014, p. 31). Concluding that older adults are better at emotion regulation just because of their positive affective experience may ultimately be circular.

What does it mean for some people to be “better” at emotion regulation than others? When making a behavioral effort to regulate an emotional state, there are two potentially separate components that might be relevant to older adults (Isaacowitz & Blanchard-Fields, 2012). The first component—*preference*—involves selecting a particular strategy to use. The second component involves whether the selected strategy successfully regulates the individual’s affective state, termed *effectiveness* or *adaptiveness*. Assuming a typical prohedonic emotion regulation goal to feel better, does the regulatory behavior help the individual feel good and/or better? Older adults may differ and/or be better in emotion regulation involving either preference and/or effectiveness (Fung et al., 2019).

For simplicity, I use “emotion regulation strategies” as an umbrella term for any measurable behavior or cognition used by an individual trying to modify their affective state. When relevant to particular studies, I will distinguish between general strategies (such as reappraisal) and more specific tactics within each strategy (such as positive reappraisal), but will use “emotion regulation strategies” to reference the wider range of (measurable) possible processes. There are three ways that older adults may be “better” at emotion regulation:

1. *Older adults shift their strategies from less effective to more effective ones.* Older adults may shift their use of emotion regulation behaviors away from less effective strategies more typically used by younger adults, in favor of those that are generally more effective. For example, if reappraisal is generally more effective than suppression, older adults might be better at emotion regulation by shifting to use relatively more reappraisal and less suppression, as compared to younger adults. In cross-sectional data, this would appear as an age difference with older adults using more effective strategies; in longitudinal data, individuals would drop less effective and add more effective strategies as they got older.
2. *Strategies are more effective at changing emotional experiences when implemented by older adults than other age groups.* It is also possible that age-related “better” emotion regulation results from the relative effectiveness of the strategies used. For example, older adults might benefit more from attentional deployment than younger adults when both use it, either when used naturally or when instructed to use it. This might be because older adults enact the strategy in a way that leads to greater affective benefit or because the strategy is best-suited

to older adults' resources. This may co-occur with changes in use (older adults use it more, *and* they benefit more from it), or not (both age groups use it to the same degree, but it works better for older adults).

3. *Older adults are better able to match strategies to what is effective in a particular situation.* Similar to the everyday problem-solving literature where older adults “tune” their problem-solving more closely to the nature of the problem than younger adults (Blanchard-Fields, 2007), a final possibility is that older adults might match strategies more closely to the demands of the particular context. Critically, this cannot be shown simply by studies of variability in emotion regulation strategy use, as trying a number of different strategies may simply reflect strategies not working and/or individuals not knowing what to do and trying everything possible. Instead, emotion regulation flexibility is only indicated by a particular type of variability in which strategies are matched to particular contexts (Aldao, 2013).

Importantly, all of these possibilities rest on there being some age differences – in mean levels or in relationships to other variables. Studies that fail to find significant age differences typically do not indicate age similarity; however, techniques such as equivalence tests and Bayesian analyses can provide support for potentially meaningful null age effects (see Isaacowitz, 2020; Lakens et al., 2020), though very few studies report equivalence tests. Thus, in reviewing the literature, significant age differences, lack of significant age differences, and occasionally equivalence-test based support for age similarity can all be considered.

### **What is the Actual Evidence on Age Differences in Emotion Regulation?**

What, then, is the evidence regarding whether older adults are better at emotion regulation than younger adults? One recent narrative review (Allen & Windsor, 2019) found mixed evidence for age differences in certain strategies and concludes (p. 11) “that development in adulthood is not characterised by predictable, normative shifts in preferences for the use of different ER [emotion regulation] strategies.” Rather than review every extant study in the literature, I try to give a selective but broad review of studies that can speak most closely to whether older adults are different and/or better in emotion regulation.

One early study found that older adults reported more control of their emotions than younger adults (Gross et al., 1997). Later work focused more on specific strategies that individuals of different ages use to manage emotions. One study of self-reported emotion regulation strategy use across different contexts (situations) found that older adults reported less maladaptive strategy use (defined as suppression, self-criticism, avoidance, and rumination), especially in moderate and high intensity situations (Schirda et al., 2016). This was assessed retrospectively at a single time-point, so might reflect both differences in what was actually done and what individuals of different ages believed should be done (Livingstone et al., 2020). It suggests that older adults may be better at emotion regulation by shifting away, or believing they shift away, from strategies that do not work.



## Laboratory-based Studies

**Early Lab Studies Suggesting Older Adults Are Better**—In one negative mood induction study (Larcom & Isaacowitz, 2009), older adults were more likely than younger adults to rapidly improve their mood (within several minutes): about half of the small sample of older adults rapidly regulated their mood (vs. roughly 1/3 of younger adults). There was a small age difference in the likelihood of effective regulation, but this does not tell us about underlying mechanisms: older adults say they feel better, but we do not know why or how.

Two relatively early lab studies are often cited to support the idea that older adults are better. In one, younger and older participants followed instructions to down-regulate their emotions (vs. maintain, no instructions or neutral) in response to disgusting films while also doing a secondary cognitive task (Scheibe & Blanchard-Fields, 2009). Older adults were less impaired at the cognitive task during regulation than were younger adults; this was interpreted as indicating that emotion regulation is less cognitively costly for older adults. This would be impressive, but is at best indirect evidence for “better” emotion regulation with age, because there were no parallel age differences in the apparent effectiveness of the regulation instructions.

The second heavily-cited study involved instructed emotion regulation in response to emotional videos (Shiota & Levenson, 2009). Importantly, this study did not manipulate the general strategy that participants were instructed to use, but rather the specific *tactic*. All participants were told to use the strategy of reappraisal, but some were told to use the tactic of detached reappraisal (taking an unemotional perspective), whereas others were told to use the tactic of positive reappraisal (putting a positive spin on it). Studies of instructed emotion regulation test only to the effectiveness of an emotion regulation effort (not preference for using it): effectiveness was assessed with participants’ self-reported mood and physiological reactivity after implementing the instructed tactic. Older adults felt relatively better when they used positive reappraisal, whereas younger adults felt relatively better when they used detached reappraisal. Interestingly, this pattern of results does not support the idea of older adults being generally better at emotion regulation; instead, it suggests that some strategies are more effective for older adults, whereas others are more effective for younger adults.

**Lab Studies on Positivity Effects**—The finding that a positive strategy is more effective for older adults was viewed as potential evidence for positivity effects extending to emotion regulation. However, several other studies have investigated age effects on reappraisal, using both behavioral and neural measures. Findings suggest that older adults are less “successful” in using and benefitting affectively from reappraisal (Opitz et al., 2012; Halfmann et al., in press), though not focusing specifically on positive reappraisal may have masked age advantages.

Positive reappraisal involves engaging more with positive content; each emotion regulation strategy similarly has a positively-focused tactic (choosing positive situations, changing a situation to be more positive, attending to positive content). Work on age-related positivity effects in visual fixation – one way to assess visual attention – could be taken as supporting the conclusion that older adults use the positive tactic of attentional deployment more (i.e.,

Isaacowitz et al., 2006), and also that using it is more effective for them in some cases (i.e., Isaacowitz et al., 2008). One study found on the aggregate level that older adults looked less at very negative skin cancer videos but also felt better than younger adults after watching those videos (Isaacowitz & Choi, 2012). However, within-person links did not emerge between looking less at negative videos and feeling better. Thus, age-related positivity effects in attentional deployment and age-related affective improvement may coexist but do not necessarily cause each other.

While the “emotion regulation account” of age-related positivity effects is the main alternative to an amygdala-based explanation that does not involve shifts in motivation (Mather, 2016), and there is debate about whether positivity effects should be considered possible tools of deliberate regulation, whether positivity effects are (or are not) a mechanism that allow older adults to feel good is ultimately an empirical rather than a conceptual question. However, age-related positivity effects in attention include only a small subset of potentially positively-oriented emotion regulation tactics.

**Lab Studies of Situation-Focused and Other Strategies**—To test the proposal that older adults use situational selectivity as a key emotion regulation strategy (Sims & Carstensen, 2014), my lab developed an “affective environment” in which participants could make selections among situations of different valence (and sometimes arousal). For example, participants could select among videos in which some were clearly negative in content, while others were more positive. While some individual situation selection studies found that older adults chose less negative content, a mini-meta-analysis of all our situation selection studies found no age effect on the valence of choices (Sands et al., 2018). Older adults may avoid high arousal situations, regardless of whether they are negative or positive (Sands et al., 2016), and rate high arousal stimuli as more aversive regardless of valence (Keil & Freund, 2009).

To systematically consider whether older adults use and benefit more from emotion regulation tactics that involve focusing on the positive across strategies, Livingstone & Isaacowitz (2019) conducted a lab study in which young, middle-aged, and older participants completed an emotion regulation choice task for each of the strategy groups specified in the process model. In each case, participants had three options that involved focusing more on positive content, neutralizing negative content, and focusing on negative content. For situation selection, situation modification, and attentional deployment, observed behavior was taken as an indicator of choice (e.g., choosing positive videos, fixating on positive). For reappraisal and response modulation, participants were trained in each tactic first and then were asked to select their most frequently-used one to implement first. Results suggested age similarity; Bayesian model comparisons suggested that models without age effects were much more likely across most strategies. Thus, these findings provide evidence for general similarity across adult age groups in preference for more positive tactics across emotion regulation strategies. Effectiveness was measured as change in affect before and after the particular emotional stimuli was presented. Analyses of effectiveness did not yield substantial differences among age groups either.



**Emotion Regulation Choice**—There is a small literature on emotion regulation choice: participants choose between 2 strategy options for a presented stimulus, usually distraction or reappraisal. In one study, older adults were more likely than younger adults to choose distraction rather than reappraisal (Scheibe et al., 2015). This is broadly consistent with the findings of studies of positivity effects in attention, where older adults use attentional deployment more and may sometimes benefit more from it (Isaacowitz, 2012), as well as other studies suggesting that reappraisal may be too cognitively taxing for older adults (e.g., Opitz et al., 2012). Thus, one line of studies would suggest that older adults use more attentional deployment strategies than younger adults; this would indicate better emotion regulation if these were systematically more effective. However, another study of emotion regulation choice did not find age differences in distraction choices for negative stimuli (Martins et al., 2016).

**Lab Study Conclusions**—The assertion that older adults are “better” at emotion regulation does not seem to be borne out by the lab studies available to date. While only one study provides direct support for age similarity - related to the relatively recent use of tools to conduct null effect equivalence testing for age similarity (i.e., Lakens et al., 2020) - many provide no evidence for age differences and some find older adults to be worse. A recent meta-analysis of lab-based studies of instructed emotion regulation came to a similar conclusion (though studies of instructed emotion regulation only concern effectiveness; Brady et al., 2018).

### **Problems with Lab Studies of Aging and Emotion Regulation**

A reasonable criticism of lab studies of emotion regulation is that they may not reflect what individuals actually do when regulating emotions in everyday life, and it is in everyday life that older adults really are better at regulating emotions. For example, Sims, Hogan and Carstensen (2015, p. 80) state: “Findings based on studies of daily life consistently associate older ages with relatively positive emotional experience, suggesting that older adults may regulate emotions more effectively than younger adults. Findings from laboratory studies are equivocal, however, with mixed evidence for age-related improvements in use of emotion regulatory strategies...we propose that findings may reflect a failure of laboratory-based experiments to capture the regulatory strategies that older people use in their everyday lives.” Therefore, I turn next to findings from experience sampling studies of everyday life.

### **Experience Sampling Studies**

Livingstone & Isaacowitz (2021) conducted an experience sampling study of adults age 20–79. At each query, participants reported whether they had attempted to regulate how they felt, and answered questions about particular strategies and subsequent tactics using branching logic. There were no age differences in the frequency of regulation, however some age differences did emerge in the use of strategies: whereas the positive strategies (positive situation selection, positive fixation, positive reappraisal, etc.) were the most frequently used across age groups, older adults used them slightly more than other age groups. Put another way, it was not that older adults used different strategies than other age groups; they just used the ones that were generally most popular a bit more than their younger counterparts - an age difference in degree but not in type. Effectiveness is challenging to examine in

experience sampling studies because it is inherently retrospective. Nonetheless, effectiveness can be assessed in experience sampling, for example, by asking about mood before and after a regulation attempt. In terms of effectiveness, age only moderated a few relationships, and the effect was negative, such that situation selection and attentional deployment were less related to mood for older than for younger adults. Older adults did report more positive mood on average, but it was unrelated to strategy use.

Other recent experience sampling-type studies have also not found evidence for robust age differences. For example, Eldesouky and English (2018) had participants report their emotion regulation strategy use at the end of each day for nine days. Older adults reported greater use of suppression, but there were no age differences in the other strategies (situation selection, modification, distraction, or reappraisal). Middle-aged and older adults were less variable in their use of strategies than younger adults. The authors conclude (p. 581): “Overall, our findings seem to run contrary to the common notion that later adulthood is characterized by the use of more typically adaptive strategies... The present research suggests, however, that they do not necessarily use more typically adaptive strategies or exhibit greater fluctuations in their daily regulation tactics. Thus, age-related improvements in well-being do not seem to be due to broad changes in the selection of emotion regulation strategies.”

One recent experience sampling study focused on desire regulation in everyday life (Burr et al., 2020). Younger and older adults reported on their affective experience, whether they had a desire they tried to regulate, and if they had successfully regulated it. Compared with younger adults, older adults reported more positive affective experience, and also more success in regulating desires, even though they also reported greater desire strength. Future work will need to look more mechanistically at what may be involved in desire regulation to see how it fits in with the emotion regulation work.

A recent daily diary study found a higher correlation between negative affect and strategy use for older than younger adults (Puente-Martinez et al., 2021) which the authors interpret as older adults better tailoring their strategy use to context. However, an experience sampling study assessed to what extent the use of reappraisal vs. suppression varied along with situational context, such as whether it was a social situation with close others or non-close others (Benson et al., 2019). This provides a concrete test of age differences in emotion regulation flexibility. Interestingly, results showed that individuals did flexibly match their strategies to situational components overall, but that older adults actually showed lessened covariation between suppression and relational content. This provides one piece of evidence suggesting that older adults may actually be less flexible, at least for this one strategy; no age difference was found for suppression.

### **Conclusions on the State of the Evidence**

Experience sampling studies of emotion regulation in everyday life, to date, do not support a strong view of age differences in emotion regulation behaviors. The main gulf in findings seems to be between single time-point self-report studies (Gross et al., 1997; Schirda et al., 2016) and both lab and experience sampling studies: Single time-point self-report studies more consistently suggest that older adults are “better” emotion regulators. Why might this

difference exist between single time-point self-report studies and other study types? One possibility is that the single time point self-reports draw on particularly accessible content (Robinson & Clore, 2002) that may amplify age differences, such as age-related beliefs about what emotion regulation strategies should be used (Livingstone et al., 2020), and about emotional control getting better with age (Gross et al., 1997). Older adults value low-arousal positive emotions more than younger adults (Scheibe et al., 2013); given that older adults seem to experience more low-arousal positive states, they may reason backward from their positive experience to infer that they must be regulating well to achieve them. Older adults might be doing the same as aging researchers: taking positive affective experience to indicate better emotion regulation. This is consistent with accessibility accounts that explain how participants answer questions in the absence of concrete memories about relevant experiences (Robinson & Clore, 2002). Thus, the methods that lead older adults to seem better may ultimately be more about beliefs – perhaps rooted in the positive affective outcomes themselves - and thus may be less informative about what older people actually do in their emotion regulation efforts.

The only support for the assertion of a general selectivity strategy (Sims et al., 2015) comes from the Eldesouky and English (2019) finding that older adults were less variable in their use of strategies, which indirectly might suggest greater selectivity in the use of strategies. One interesting exception to the general lack of age differences in strategies is that older adults prefer distraction over reappraisal in lab tasks with only those two options; this age difference does not emerge as clearly in experience sampling studies with a wider range of choices available. For example, in our experience sampling study, older adults used attentional deployment more often than reappraisal, but so did younger adults (Livingstone & Isaacowitz, 2021). One possibility is that presenting negative stimuli in the lab makes it challenging for older adults to use reappraisal, whereas in everyday life it may be easier for them to reappraise the elicitors they encounter. Lab studies may *amplify* rather than constrain any age differences.

Reflecting on this evidence, it is possible to return to the three potential ways enumerated above that older adults may be “better” at emotion regulation and assess the evidence for each: namely, do older adults shift to better strategies? Do they benefit more from strategies? Do they match their strategies better to situations? There is circumscribed support for the assertion that older adults shift to better strategies: Schirda et al. (2016) found that older adults reported fewer maladaptive strategies, and our experience sampling study found that older adults were slightly more likely to use the positive tactics that were the most typical across all age groups (Livingstone & Isaacowitz, 2021). While it is not clear which strategies are uniformly most effective, the lack of consistent age differences in strategies constrains this possibility.

The only evidence that older adults benefit more from strategies are the few studies of age-related positivity effects in attention that show both older adults using positive gaze patterns more and also benefiting from them more (though only for some older adults: Isaacowitz et al., 2009; Noh et al., 2011), and the finding that older adults benefited more from instructed positive reappraisal (though less for detached reappraisal: Shiota & Levenson, 2009).

Some evidence that older adults are better at matching strategies to situations comes from Schirda et al. (2016), but it is from self-reported variability over slightly different (arousal) contexts rather than lab manipulation of contexts or experience sampling reports of various contexts. Simple variability does not necessarily indicate flexibility, which would need to be demonstrated by actual better matching of behavior to specific contexts (according to Aldao, 2013). While Puente-Martinez et al. (2021) interpret their findings as reflecting better tuning to the emotional demands of the situation with age, without investigating the match of specific strategies to specific situations, it is not possible to rule out that older adults actually needed to use more strategies to manage more challenging emotional situations. The one study that has directly investigated flexibility found either no age differences or *less* flexibility among older adults (Benson et al., 2019). Thus, better matching of strategy to situation with age is still an open question.

The small age differences in emotion regulation strategies observed do not yet seem sufficient to explain age differences in emotional outcomes nor to conclude that older adults are “better” at emotion regulation. Findings of experience sampling studies do not seem to vary systematically from lab studies, disputing the assertion that lab studies constrain age differences that will emerge in more everyday circumstances.

### **What Else Could Underlie Older Adults’ Positive Affective Experience?**

The evidence reviewed above suggests that age differences in affective experience, with older adults reporting high levels of positive and low levels of negative affect, are unlikely to be rooted in age differences in emotion regulation as studied to date. In other words, older adults’ positive affective experience does not likely result from them being better, more effective, or even substantially different at how they regulate their emotions, as traditionally defined and measured. Age differences that have been found thus far tend to be of degree (more vs. less use or effectiveness of similar strategies) rather than of type (use or effectiveness of different strategies altogether); these may play some role in contributing to age differences in affective experience, but in a relatively circumscribed fashion, especially given that the few differences found are not consistently in a direction of older adults being “better” or using more adaptive strategies.

It remains possible that older adults are still different, or maybe even better, at emotion regulation, but studies to date have not yet been able to discern this. Despite the range of emotion regulation studies that have been conducted comparing age groups in the lab and in everyday life, one limitation of past work is that age differences are tested on the level of particular strategies (or in their aggregated variability), but not in terms of individual differences in strategy preferences. Without a way to assess individual differences in strategy configuration, it is difficult to know whether aging leads to changes across the strategies. At the very least, individual differences across strategies need to be investigated over time to see what sorts of within-person shifts are actually observed.

What else needs to be considered in future research? The extended process model (Gross, 2015) suggests the importance of monitoring strategy success, which may be one locus of possible age differences. The typical focus on down-regulation of negative emotions may

obscure interesting age differences in regulating positive emotions. Older adults may shift their criteria for saying that they are happy to give more credit than they previously would have to their own regulatory efforts (i.e., calling regulatory efforts successful that they would not have previously considered so). Experience may teach older adults which strategies are the most effective for them specifically, in particular contexts, but might only be observable in tests of specific strategy X context interactions. Yet another possibility is that older adults follow an “arousal-avoidance” strategy (Sands et al., 2017). Next, I consider some other plausible pathways.

### **The Role of Context**

Perhaps older adults simply select contexts that are better suited to their emotion regulation behaviors or are easier to regulate. One study followed younger and older adults over 100 days; each day, they reported on context, stressors, and negative affect (Brose et al., 2015). Older adults reported fewer and less impactful stressors and also less negative affect. When participants were matched across age groups on stressor level, having fewer stressors was related to less variability in negative affect, though affect variability was more related to age than stressor level. Data from two other diary studies also found reduced stressor diversity in older adults (Koffer et al., 2016). In contrast, a study of aging and activity diversity found a mixed age pattern: while older adults reported less diversity of social partners, they reported greater activity diversity in the afternoons within and across days (Weber et al., 2020). Finally, a study in which adults of different ages generated their own emotional episodes of varying intensity found generally similar episodes regardless of age (Schirda et al., 2016). Thus, while it is possible that reduced contextual variability and greater stability may contribute to older adults’ well-being, these mixed results suggest a more complex story. It remains plausible that, as Eldesouky and English note (2018, p. 582), “the emotional advantages in old age may more likely be found in how strategies are deployed in specific daily contexts” but future research will need to test that directly. Future work may clarify the nature of any age-related difference in contexts and how that may relate to the range of emotion regulation strategies deployed across those contexts.

### **Reduced Reactivity and Physiological Changes**

Reactivity is typically defined as an affective response to some elicitor, whereas regulation involves some attempt to modify or influence the affective response (see, for example, Davis et al., 2014). In a study of affective variability and reactivity across age groups, older adults self-reported less reactivity to stressors (Brose et al., 2015). This suggests that reduced reactivity could serve as one pathway to older adults’ reduced negative affective experience; less reactivity to elicitors could lead to greater emotional stability, and thus less demand to regulate. If older adults are less physiologically reactive to negative emotional elicitors (e.g., Kunzmann et al., 2005), they would have less need to regulate to feel good, so they could end up feeling better with no changes in emotion regulation behavior. However, other studies suggest the link between aging and physiological reactivity is more complex. Older adults can show comparable or more robust physiological responses to negative stimuli when they are relevant to them (such as sadness-inducing: Kunzmann & Grühn, 2005). One study of negative social interactions found that older adults were less physiologically reactive to unpleasant situations, but this was also related to different goals and appraisals

(Luong & Charles, 2014). A general physiological blunting is unlikely to be the primary explanation for age differences in affective experience, reinforcing the potential importance of regulation.

Mendes (2010) proposed a maturational dualism account, in which aging increases dissociation between peripheral responses and subjective experience. Lohani et al. (2018) found *greater* concordance between subjective ratings and physiology for older than younger adults during sadness experience - the opposite of maturational dualism. However, one study found that older adults associated fewer physical states with their emotional experiences and also reported fewer physical states in their daily emotional experiences. As the authors conclude: "If older adults experience fewer peripheral sensations during emotions, then this may make unpleasant and highly activated emotions both less frequent and easier to regulate when they do occur." (Maccormack et al., 2021, p. 240). This illustrates how age-related changes in reactivity and regulation may be reciprocally intertwined, as reduced visceral aspects of responses might change the nature of regulation attempts when they occur. In future research, emotion regulation strategies could be tethered to situations that elicit lower vs. higher initial responses to assess whether the strategies deployed vary with levels of initial reactivity and whether that varies by age.

### Neural Changes

The Aging Brain Model (Cacioppo et al., 2011) argues that older adults' amygdala responds less to negative stimuli, leading to less negative (and more positive) affective experience as a happy side effect of these brain changes. This amygdala explanation has been contrasted with an "emotion regulation" explanation (Mather, 2016). While the aging brain model does not seem consistent with available evidence (see Mather, 2016 for a discussion), some recent work suggests that older adults, especially those with lower executive function, show impairment in neural pathways supporting bottom-up processing of arousing stimuli (Glinka et al., 2020). There is also evidence for a role of the prefrontal cortex in producing age-specific responses to negative (vs. positive stimuli) that might reflect emotion regulation: for example, Ford et al. (2014) found that older adults showed greater prefrontal activation during retrieval of negative memories, which might reflect attempts to dampen down negative emotional responses to them.

Another plausible mechanism involves *implicit* emotion regulation. According to Etkin et al., (2015, p. 694) "Implicit regulation is characterized by the absence of an explicit instruction, is evoked automatically by the stimulus itself, runs to completion without conscious monitoring, and can happen without insight and awareness." In contrast to model-based regulation, which involves attempts to impose internal models on the environment (such as reappraising the environment), implicit emotion regulation is thought to involve model-free regulation based on prediction error feedback (and thus directed from the environment). For example, Etkin et al. (2015) argue that activity in the ventral anterior cingulate cortex and ventromedial prefrontal cortex drives individuals into what they term "good-for-me" states without necessarily invoking conscious awareness.

One possibility is that older adults' neural processes lead them more frequently to these "good-for-me" states even in the absence of deliberate attempts to regulate. To make an



empirical case that this type of implicit emotion regulation could underlie older adults' positive affective experience, some connection to that experience would need to be shown. It does not need to be intentionally regulatory: if older adults' brains are tuned to engage most with situations that optimize their well-being goals, that might lead to positive emotional outcomes without intentional regulation. However, there should still be some externally observable behavioral traces of these changes (such as in situational choices).

A recent fMRI study found less self-reported reactivity to positive stimuli with age, as well as an age-related reduction in down-regulation of negative stimuli as measured by affect change (Schweizer et al., 2019). Neural data also suggested *decreased* engagement of regions thought to be involved in regulation. This speaks against a simple neural reactivity explanation for age differences in affective experience, as it suggests brain changes should make it harder rather than easier for older adults to down-regulate negative states and maintain positive ones. Thus, it may be especially impressive that older adults report positive affective experience if neural changes are not helping them be more reactive to positive stimuli or to facilitate the diminishment of negative states. There is also recent interest in the study of motivational processes involving value and reward in the brain, especially with regard to the role of the dopamine system and processes involving the ventromedial prefrontal cortex (see Gutchess & Samanez-Larkin, 2019).

It is possible that subgroups of older adults show more vs. less of this implicit emotion regulation-supporting brain activity. If these same older adults showed the most positive affective experience, this could then be a plausible pathway even without intentional regulation. Without such direct evidence, though, it remains just a possibility. Put another way, what is the minimum prerequisite of links to affective experience to make a claim about emotion regulation?

Future work may determine whether individuals who show similar patterns of brain activity also show similar configurations of strategy use, thus providing an explicit brain-behavior link. Similarly, longitudinal strategy studies could be used in tandem with repeated brain imaging to test whether, for example, individuals whose strategies become more positive over time also show particular brain changes in the same timeframe.

### **Acceptance and Mindfulness**

Another potential mechanism by which older adults may be considered “better” at regulating their emotions involves mindfulness and the use of acceptance – usually defined as letting the reaction happen and not trying to regulate it. While some may dispute whether deciding not to regulate is a form of regulation, it makes sense to consider it as such given links to positive emotional outcomes (see Wojnarowska et al., 2020 for a discussion), even if it is not explicitly included in the process model. It also involves the interface of possible age-related changes in reactivity and regulation, as it represents a regulatory approach that may explicitly modify reactivity.

Older adults report higher levels of emotional acceptance (Shallcross et al., 2013), at least in some situations (moderate-intensity, sadness or anxiety-evoking: Schirda et al., 2016). One study found older adults were higher in both trait and state acceptance (Wolfe &

Isaacowitz, in press). However, an experience sampling study found no age differences in the frequency of self-reported use of acceptance in everyday life (Livingstone & Isaacowitz, 2020). While choosing not to regulate a negative emotional state might lead to worse affect in the short term, it may be an adaptive strategy to increase well-being over the longer term. For example, acceptance at baseline predicted reduced anger and anxiety later in the study (Shallcross et al., 2013). Thus, older adults may be “better” at emotion regulation by accepting short-term discomfort for longer term well-being (though this might speak against SST’s present-oriented focus). A recent experience sampling study of state mindfulness found that the mindfulness facet of nonjudgmental acceptance predicted more momentary positive and less momentary negative affect, as well as less reactivity to hassles especially among relatively older participants (Mahlo & Windsor, 2021). The complex interface of possible reduced reactivity and enhanced acceptance with age warrants further study: it may be that older adults are better at using acceptance to modulate their responses, or they may have lessened responses and thus infer that they must be accepting them.

If acceptance is considered a possible emotion regulation strategy, future research could determine if acceptance actually increases with age by replacing more active strategies as they become used less frequently with time. For example, if reappraisal use declines over time, perhaps as a function of declines in the cognitive (or neural) mechanisms that support it (see Urry & Gross, 2010; but also Mather, 2016), it could be replaced with either distraction (Mather, 2016), or with acceptance.

### **The Role of Personality**

Personality likely predicts individual differences in emotion regulation strategy use. However, recent work has also suggested small but robust changes in aspects of personality with age. Rather than being random, as might be expected from the accumulation of life experiences, these changes seem to be toward “maturation” – more conscientiousness, agreeableness, and emotional stability (see Roberts et al., 2006; Damian et al., 2019). Such small changes might cause subtle shifts in strategy usage, or reduced reactivity. For example, more emotional stability and agreeableness might support the small shift toward the use of more positive strategies found in experience sampling (Livingstone & Isaacowitz, 2021). Alternately, emotional stability may lead to less reactivity and therefore less need to regulate, resulting in more positive affective experience without any shift in emotion regulation (see Brose et., 2015; Rueschkamp et al. 2020).

Future work could test whether changes in emotion regulation behavior parallel personality changes or not. For example, if older individuals use more positive strategies over time, they could be related to corresponding shifts in personality maturation.

### **General Conclusions**

Older adults say they are happy on average, in some cases even happier than their younger counterparts; this is impressive given everything else that we know about aging. Despite conceptual models making intuitively appealing general predictions about how age may influence affective processing and the regulation of affective experience—suggesting that older adults may be better at regulating their emotions—the empirical literature to date does

not support any strong conclusions about age differences in emotion regulation. Both lab and experience sampling studies point to few consistent age differences in emotion regulation and sometimes provide greater support for age similarity. Emotion regulation, as studied to date, does not appear to provide a clear causal mechanism underlying older adults' generally positive affective experience.

One implication of this for emotion regulation research in general is the need to identify profiles of individual differences in emotion regulation strategy use in a way that will facilitate understanding of its origins, consequences, and development. For example, does emotion regulation strategy use reflect habits? Wood and Neal (2007) argue that goals direct habits by encouraging repetitive behavior that leads to habit formation and by increasing exposure to contexts that activate habits. Another implication is the need to develop paradigms to study strategies beyond the process model. Existing models and paradigms may constrain attempts to fully test the mechanistic role of emotion regulation in emotional outcomes. More holistic approaches may also enable a consideration of emergent dynamics in a way not possible when considering only individual strategies.

The conclusion to whether older adults are better at emotion regulation must therefore be "we don't know yet." Future work will need to more precisely assess stability vs. change in emotion regulation over time. While it may be disappointing to not yet support the idea that older adults are "better" at emotion regulation, the robust finding of older adults' positive affective experience remains to be well-explained. This is a mystery for future researchers still to unravel.

## Acknowledgments

Work on this article was supported by NIA grant AG048731 and a grant from the Velux Stiftung to the author. The author wishes to acknowledge Eliza Bliss-Moreau, Alexandra Freund, Helene Fung, Angela Gutches, Yuen Wan Ho, Kimberly Livingstone and Shevaun Neupert for feedback on earlier versions of this manuscript.

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