



ELSEVIER



Positive affect and behavior change

Michelle N Shiota¹, Esther K Papies², Stephanie D Preston³ and Disa A Sauter⁴

Affect and emotion have potent motivational properties that can be leveraged to promote desirable behavior change. Although interventions often employ fear appeals in an effort to motivate change, both theory and a growing body of empirical evidence suggest that positive affect and emotions can promote change by serving as proximal rewards for desired behaviors. This article reviews examples of such efforts in the domains of healthy diet and exercise, prosocial behavior, and pro-environmental behavior, documenting the strong potential offered by behavioral interventions using this approach. The extent to which positive affect experience prospectively drives behavior change (as distinct from rewarding the desired behavior) is less clear. However, a variety of possible indirect pathways involving incidental effects of positive affect and specific positive emotions deserve rigorous future study.

Addresses

¹ Department of Psychology, Arizona State University, P.O. Box 871104, Tempe, AZ 85287-1104, USA

² Institute of Neuroscience and Psychology, University of Glasgow, 62 Hillhead Street, Glasgow, G12 8QB, Scotland, United Kingdom

³ Department of Psychology, University of Michigan, 530 Church St., Ann Arbor, MI 48109-1043, USA

⁴ Department of Psychology, University of Amsterdam, Nieuwe Achtergracht 129B, 1001 NK Amsterdam, The Netherlands

Corresponding author: Shiota, Michelle N (iani.shiota@asu.edu)

Current Opinion in Behavioral Sciences 2021, 39:222–228

This review comes from a themed issue on **Emotion, motivation, personality and social sciences** *positive affect*

Edited by Gilles Pourtois, Disa Sauter, Blair Saunders and Henk van Steenbergen

<https://doi.org/10.1016/j.cobeha.2021.04.022>

2352-1546/© 2021 Elsevier Ltd. All rights reserved.

Interventions to promote healthy, prosocial, and pro-environmental behaviors face a common problem: the undesirable behavior is rewarding in the moment, convenient and/or easy, and increases the likelihood of long-term negative outcomes; whereas the desired behavior is expected to be relatively unpleasant, costly and/or effortful in the short term, with rewards that are reaped in the distal future or by others. Information about the long-

term negative consequences of undesirable behaviors is generally insufficient to produce lasting change. Motivation is also needed, along with congruent social norms, a belief that the outcome is controllable, and skills for implementing the change [1–3]. Intervention efforts often use fear appeals — warnings about the dire consequences of failure to change — as the primary motivational element. However, evidence suggests that these only work when people can regulate the resulting distress, and have high self-efficacy to enact the necessary change [4*,5].

As another approach, researchers increasingly call for employing positive affect and emotions in behavior change efforts [5,6,7**,8**]. The overarching aim in this work is to bring a sense of reward to the desired behavior *in the moment*, strategically leveraging the motivational, cognitive, and behavioral advantages of reward orientation to facilitate change. This review offers examples of recent efforts to use positive affect and emotion to promote healthy diet and physical exercise, prosocial behavior, and pro-environmental behavior. These domains are strong exemplars of the central problem of behavior change, and are critically important at the current time, with real-world consequences that affect millions of people and require novel solutions. Throughout this article *positive affect* is used to denote any subjectively pleasant affective state, including positive mood; *positive emotion* denotes a theorized brief, multi-component emotional response to a particular eliciting event; and *reward* refers to a desirable outcome received by the individual as a consequence of exhibiting some behavior (for more on these distinctions see Shiota, Sauter, and Desmet, this issue). We analyze common mechanisms by which most positive affect-based interventions appear to work, and conclude with recommendations for additional mechanisms to explore, as well as advice for future efforts using positive affect and emotion to promote behavior change.

Promoting healthy dietary choices and physical exercise

A growing body of evidence indicates that positive emotion-based interventions aimed at promoting healthy dietary choices and increasing physical exercise can be effective. Techniques highlighted in the examples below harness positive affect by emphasizing the immediate pleasure of a healthy product or activity, and by increasing the salience of rewards beyond individual physical health, thereby bringing longer-term rewards of behavior change into the present moment.

Traditionally, healthy dietary options have been encouraged through labels that describe their health-promoting qualities (e.g. low salt or fat). Although such labels direct attention to desirable long-term outcomes (i.e. good physical health), their effectiveness is limited [9]. In contrast, labels that describe immediate hedonic aspects of products, such as appetizing flavors and texture profiles, increase the appeal of healthy choices [10[•],11,12[•],13]. Similar findings have been reported for physical activity interventions, wherein activating expectations of immediate enjoyment (e.g. feeling good during and right after exercise) appear more effective than directing attention toward distal outcomes such as weight loss [14,15[•]]. To succeed, positive intervention techniques must help consumers vividly simulate the proximal pleasures of healthy choices, thereby generating anticipation of positive affect in the moment and pointing appetitive motivation toward healthy options [10[•],16].

Interventions that prime the salience of long-term benefits can also motivate people, provided that those distal benefits are already highly valued [17^{••},18[•]]. For example, in one field experiment, reminders of a future slim figure reduced unhealthy snack intake, but only for participants with active weight-control goals [19]. Individuals with such ‘want-to’ dietary goals show higher implicit liking of and implicit positive associations with healthy foods, and less positive associations with unhealthy foods; an effect not seen for ‘have-to’ goals that emphasize obligation and external pressure [20^{••}]. In some cases, linking the desired behavior to a goal or value beyond individual health can heighten motivation, especially if the rewards associated with *that* goal are proximally salient. Among committed couples, for example, reframing a health behavior change as doing what’s best for the couple and/or partner may be quite motivating [21]. Although social influence attempts such as harassing, bargaining, and guilting generally fail to have the desired effect on partners, positive social control techniques such as displaying positive affect as a reward for the desired behavior, and communicating that the target behavior is valued, have been linked to improvements in partner health behaviors including healthy diet and exercise [22[•]]. In these ways, pleasant feedback and encouragement from the partner become an immediate reward for healthy choices.

Prosocial behavior

A long-standing question in research on prosocial and altruistic behavior is whether people who *feel* good are also more likely to *do* good. One hypothesis is that happiness encourages behaving in more prosocial ways [23^{••}]. An alternative hypothesis is that people in a pleasant mood are highly motivated to maintain that cheerful state, rather than undermining it by engaging with another’s distress or need. Altruistic/prosocial action commonly involves a cost to the self for helping others — including costs of time and effort. Moreover, prosocial action often

depends on some degree of empathy, especially when the target of that action is in distress [24[•],25], and a growing body of evidence suggests that empathy requires effort [26]. Thus, positive affect and emotion might produce complacency, undermining rather than promoting prosociality [27]. Recent decades have yielded a wealth of evidence on this topic across a variety of outcome measures, such as donating, volunteering, political participation, and taking the time to assist a person in need. The resulting picture is somewhat complex, and requires careful analysis.

The bulk of the evidence, including correlational, experience sampling, daily diary, and experimental studies, supports the first hypothesis — that positive affect generally does promote prosociality [23^{••}]. By what mechanisms might this occur? Much research highlights the value of anticipated and received proximal affective rewards for altruistic and prosocial behavior. The links between positive affect and prosocial behavior are bidirectional [28]; findings from a recent meta-analysis show that engaging in prosocial behavior increases subsequent positive affect and well-being in the helper [29^{••}]. Thus, helping others is rewarding to the helper, completing a feedback loop that increases the likelihood of engaging in prosocial behavior in the future [30,31]. Social contact and approval are particularly potent rewards in this regard, activating neural circuitry similar to that for material rewards [32,33]. Although material rewards to children for helping behavior can backfire by reducing intrinsic motivation, social reinforcements such as displays of positive emotion, praise, and encouragement do foster downstream prosociality [34[•]]. For example, in an experiment with 197 adolescents, those who received positive social feedback (thumbs up) ostensibly from their peers after donating tokens in a public goods game increased donations compared to when the thumbs up came from keeping tokens or without feedback [35].

Some research relevant to this mechanism has focused on specific positive emotion states, rather than positive affect. For example, moral elevation — an affective response to witnessing another’s prosociality — has been found to increase subsequent helping [36]. Consistent with social learning theory, feelings of elevation reflect the recognition that altruism is rewarded rather than exploited by others in the current social context [37]. Feelings of love are associated with increased prosocial behavior as well, not only towards members of one’s own group but also towards out-group members [38]. Gratitude also facilitates prosocial behavior in multiple ways. According to Algoe’s ‘Find, Remind, Bind’ theory, gratitude serves adaptive functions related to initiating, developing, and maintaining lasting interdependent relationships with responsive interaction partners [39]. Much experimental research finds that gratitude motivates a beneficiary’s subsequent prosocial behavior toward the

benefactor, as well as ‘paying it forward’ to third parties [40,41]. Moreover, receiving an expression of gratitude increases the benefactor’s commitment to further support the beneficiary [42], and third-party observers to gratitude expression are subsequently more helpful and affiliative toward both the beneficiary and benefactor [43*], consistent with viewing gratitude as a form of social reward.

Importantly, the evidence also suggests mechanisms by which positive affect may sometimes *inhibit* prosociality, and these are important to consider when developing a new intervention. Consistent with more pessimistic predictions, correlational research has linked higher trait positive emotionality with lower performance on a test of empathic accuracy [27]. As a state, positive affect generally promotes a rosy, optimistic attitude toward the current focus of attention [44]. When one’s own behavior is that focus, a certain tolerance for morally questionable acts can result. In both cross-sectional and experimental studies, participants experiencing more positive affect rated unethical behaviors as more acceptable, and actually engaged in more unethical behavior (e.g. lying to obtain a reward, taking more than was earned) given an easy opportunity [45,46]. In each case, the effect of current pleasant affect may nudge one toward the immediate reward of unethical behavior, especially if foregoing these opportunities is unlikely to be detected and praised by others. More research is needed on the conditions in and mechanisms by which positive affect encourages prosocial behavior, rather than the reverse.

Pro-environment consumer behavior

Climate change is accelerating, and resolute action is needed across nations and partisan lines to address this mounting crisis. As with health and prosocial behavior, individuals’ consumer behavior at the moment of choice is typically focused on options that are convenient and that provide known, immediate benefits to the self — despite distal and more abstract negative consequences [47]. A recent meta-analysis suggests however that, as with health behavior, people make more pro-environmental purchases and other choices when they have a positive attitude toward pro-environmental behavior, believe it is consistent with their values, morals, and norms, care about the environment, and feel control over the situation [48].

Bringing rewards into the moment can play an important role in facilitating pro-environmental consumer behavior. As with health and prosocial behavior, individuals with strong pro-environmental values may be motivated by the anticipation of positive affect resulting from the behavior itself. A recent meta-analysis revealed that pro-environmental behavior is promoted by positive feelings from (ordered by magnitude) happiness from hedonic rewards, personal meaning, and the ‘warm glow’ of knowing that

one has performed a socially valued act [49**]. In one study, men who anticipated feeling more positive and less negative about owning an electric car reported a stronger intention to adopt an electric vehicle [50]. In another, positive anticipated emotions predicted behavioral intentions to address climate change for more engaged (but not less-engaged) people [51**]. Pro-environmental behavior is also facilitated by both pride in past environmental achievements [52] and anticipated pride in future pro-environmental acts [53]. In one experience sampling study, students who performed a pro-environmental act reported concurrent pride that then predicted future pro-environmental acts, at least among those who believed these values were normative [54].

Extrinsic rewards may promote pro-environmental behavior as well, provided that they are deployed strategically to support new habit formation rather than undermining intrinsic motivation. A meta-analysis found that financial incentives for pro-environmental behavior had a small to medium effect not only while active ($d = .36$), but even after incentives were removed ($d = .41$) [55]. Rewards given on variable schedules were most effective, consistent with a well-replicated finding that unpredictable rewards are most likely to lead to the formation of new habits [56**]. Another trick for bringing rewards into the moment is *gamification*, or making the desired behavior fun. For example, in one randomized controlled trial with nearly 2000 households, those playing a new ‘Cool Choices’ competitive game, in which they earned points for energy-saving actions, reduced electricity consumption even six months later (as verified by electricity bills), and the effect was strongest among previous high-energy-use consumers [57].

As with health behavior and prosocial behavior, linking pro-environmental behavior to positive emotion mechanisms of interdependent relationships can promote behavior change as well. For example, the heightened status motivation associated with pride may promote the selection of and willingness to pay more for ‘green’ products, as long as the product is visible to others who will be impressed [58,59*]. Viewing nature as vulnerable should also facilitate pro-environmental behavior by activating feelings of tenderness and the caregiving motivations that evolved to nurture helpless neonates [30]. For example, feelings of empathy for and connection with nature can promote pro-environmental attitudes and behavior [60*]. People induced to empathize with a bird or tree recommend higher allocations for environmental protection [61], and people induced to perspective-take with harmed animals, without feeling distress, reported higher biospheric and lower egoistic concern [62]. More empathetic people also report more pro-environmental values, intentions, and past donations; moreover, inducing perspective-taking with suffering people increases pro-environmental intentions [63]. In each of these effects, positive emotions and the affective mechanisms

that evolved to guide our relationships with other people can be redirected to improve our relationship with the larger natural world.

Common mechanisms and implications for future research

The studies reviewed above represent a sample of recent efforts to use positive affect and emotion as tools for behavior change. A recurring theme in this work is the importance of increasing the sense of reward and positivity associated with the desired behavior in the moment, rather than relying solely on abstract, distal incentives or frightening long-term outcomes. This approach invokes people's intrinsic motivation and 'want-to' goals — goals which involve enjoyment, are perceived as inherently meaningful, and/or are integrated into one's identity — as distinct from 'have-to' goals that reflect external obligations or the need to avoid negative outcomes [20**].

A variety of techniques have been found to successfully link desired behavior to an immediate reward. Immediate pleasurable effects can strengthen the value associated with the behavior itself, whereas promising distal rewards may actually inhibit intrinsic motivation [64**]. Rewards that are inherent to the desired behavior can be made more salient at the moment of choice, as in dietary interventions emphasizing the flavor and texture of healthy food choices [10*,12*,16]. Extrinsic rewards may be offered or emphasized as well. An important caveat for the latter approach is that offering economic rewards such as money, points, or prizes can backfire if not done with care, undermining downstream intrinsic motivation [65]. Economic incentives that are disbursed for an extended period on an intermittent, unpredictable schedule are most likely to promote behavior change that persists after rewards are withdrawn [55,56**,66]. Caution may also be needed in using reward orientation to inhibit problematic behaviors (e.g. substance use) rather than to promote desired behaviors, as in the examples above. For example, in one study photographic images that were pleasant and increased arousal and appetitive motivation produced an unintended increase in alcohol craving [67]. Immediate social rewards for the desired behavior appear less subject to these concerns and can be potent, provided that the influence is communicated through positive affect and social feedback rather than through nagging, threatening, or criticizing [22*,34*,35]. There is growing interest in gamification as well, which simply makes the behavior fun [68].

Other approaches link the desired behavior to a larger goal beyond short-term outcomes, and make that goal salient in the moment. For those with a high intrinsic motivation to achieve the distal reward (e.g. a fit figure due to healthy diet and exercise), priming their attention toward that reward can promote change [19]. Alternatively, innate goals for pleasant interactions with loved

ones, social status, and nurturing the young and vulnerable can be linked to a desired behavior, thereby activating social positive emotions and motivations that provide more proximal affective rewards. Promoting empathy and perspective-taking is a promising tool when the consequences of the undesired behavior are largely borne by someone or something other than the self.

In this analysis, we have emphasized the power of positive affect and emotion as *rewards* that motivate behavior change. It is important to clearly differentiate the effects of positive affect/emotion as actual or anticipated reward from those of *currently experienced* pleasant affect not directly linked to the desired behavior. A meta-analysis of studies using each type of manipulation uncovered robust effects of reward on health cognition and behavior, but weaker and more scattered effects of pleasant affect [6]. However, positive/pleasant affect may support behavior change indirectly, by promoting cognitive and/or behavioral action tendencies that facilitate change [7**]. For example, in the robust 'rose-colored glasses' effect discussed earlier, pleasant mood increases one's positive appraisal of the target of attention (e.g. products, messages, people, events) and optimism regarding the outcome [44]. One study that experimentally manipulated mood before a gambling task with electroencephalography (EEG) found that pleasant mood increased a neural marker of reward expectancy [69]. Consistent with this, a meta-analysis revealed that positive affect manipulations increased optimism regarding the likely outcomes of physical activity [6]. Moreover, positive emotion states are thought to broaden the individual's current mindset, allowing attention to expand beyond one's immediate gratification to more distal opportunities and to others' needs [31]. Dispositionally happier people are more proactive when addressing issues of concern, even when their level of worry is modest [70*], suggesting that positive affect may provide the activation or agency needed for effortful prosocial engagement. Positive emotions can increase self-efficacy as well [51**,71]. These findings all suggest promising directions, but much more research is needed to examine the varied, indirect pathways by which the current experience of positive affect might support behavior change.

Exploring ways in which incidental effects of specific positive emotions can support behavior change is also an important, much-needed direction for future research [6,8**]. For example, in two studies, teens and young adults who completed gratitude-focused writing exercises reported healthier subsequent dietary choices than those completing control writing tasks — effects that were mediated by reduced negative affect [72*]. Gratitude writing has also been found to increase glycemic control at a 12-week follow-up among adolescents with Type II diabetes [73]. Several studies have found that awe increases prosocial and pro-environmental attitudes and

behavior, mediated by a conceptualization of the self as small and relatively insignificant but connected to the surrounding world [74,75*]. Although few behavioral interventions have attempted to employ specific positive emotions in these ways, basic knowledge about these states is sufficient to support much wider investigation.

Conclusion

Researchers are increasingly finding creative ways to use positive affect and emotion in interventions to encourage healthy, prosocial, and pro-environmental behavior. In particular, extensive research has uncovered techniques by which one's own and others' positive affect can be used as proximal incentives for desired behaviors, ready to be deployed in new interventions. It is important to ensure that such rewards are either intrinsic to the desired behavior or are used to build healthy long-term habits, because short-term extrinsic rewards can undermine later intrinsic motivation. Beyond reward, positive affect and emotion also offer a variety of indirect mechanisms for encouraging change that await further investigation.

Conflict of interest statement

Nothing declared.

Acknowledgement

This work was supported in part by a grant from the European Research Council [Starting Grant 714977] to the fourth author.

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. Ajzen I: **The theory of planned behaviour: reactions and reflections.** *Psychol Health* 2011, **26**:1113-1127.
 2. Fisher JD, Fisher WA: **Changing aids-risk behavior.** *Psychol Bull* 1992, **111**:455-474.
 3. DiClemente CC, Corno CM, Graydon MM, Wiprovnick AE, Knobloch DJ: **Motivational interviewing, enhancement, and brief interventions over the last decade: a review of reviews of efficacy and effectiveness.** *Psychol Addict Behav* 2017, **31**:862-887.
 4. Kok G, Peters G-JY, Kessels LT, Ten Hoor GA, Ruiters RA: **Ignoring theory and misinterpreting evidence: the false belief in fear appeals.** *Health Psychol Rev* 2018, **12**:111-125.
- This literature review concludes that without high efficacy to enact the behavior change necessary to avoid negative outcomes, threatening communications typically have little effect, and may even backfire. Fear appeals may be effective among those who have high self-efficacy, or when the intervention raises self-efficacy; otherwise people may ignore or avoid the aversive message in order to minimize distress.
5. Cameron LD, Chan CK: **Designing health communications: harnessing the power of affect, imagery, and self-regulation.** *Soc Personal Psychol Compass* 2008, **2**:262-282.
 6. Cameron DS, Bertenshaw EJ, Sheeran P: **The impact of positive affect on health cognitions and behaviours: a meta-analysis of the experimental evidence.** *Health Psychol Rev* 2015, **9**:345-365.
 7. Van Cappellen P, Rice EL, Catalano LI, Fredrickson BL: **Positive affective processes underlie positive health behaviour change.** *Psychol Health* 2018, **33**:77-97.
- This review discusses a variety of mechanisms by which positive affect might be expected to support health behavior change, with particular focus on the Broaden and Build model of positive emotion.
8. Shiota MN, Campos B, Oveis C, Hertenstein MJ, Simon-Thomas E, Keltner D: **Beyond happiness: building a science of discrete positive emotions.** *Am Psychol* 2017, **72**:617-643.
- This article reviews empirical evidence differentiating the effects of several distinct positive emotion states on cognition, nonverbal expression, and other aspects of emotional responding. Functional analyses of discrete positive emotions are presented, and a case is made for the importance of considering effects that may be specific to particular positive emotions when developing positive affect-based behavioral interventions.
9. Dubois P, Albuquerque P, Allais O, Bonnet C, Bertail P, Combris P, Lahlou S, Rigal N, Ruffieux B, Chandon P: **Effects of front-of-pack labels on the nutritional quality of supermarket food purchases: evidence from a large-scale randomized controlled trial.** *J Acad Market Sci* 2020:1-20.
 10. Papias EK, Johannes N, Daneva T, Semyte G, Kauhanen L-L: **Using consumption and reward simulations to increase the appeal of plant-based foods.** *Appetite* 2020, **155**:104812.
- This research finds that plant-based food packages often have less attractive food descriptions than meat-based foods. However, language that refers to the sensory pleasure associated with eating experiences can increase the appeal of plant-based foods by facilitating eating simulations.
11. Turnwald BP, Boles DZ, Crum AJ: **Association between indulgent descriptions and vegetable consumption: twisted carrots and dynamite beets.** *JAMA Intern Med* 2017, **177**:1216-1218.
 12. Turnwald BP, Bertoldo JD, Perry MA, Policastro P, Timmons M, Bosso S, Connors P, Valgenti RT, Pine L, Challamel G *et al.*: **Increasing vegetable intake by emphasizing tasty and enjoyable attributes: a randomized controlled multisite intervention for taste-focused labeling.** *Psychol Sci* 2019, **30**:1603-1615.
- Several experiments reported here show that taste and enjoyment focused labels increase choice and consumption of vegetable dishes by increasing pleasant taste expectations.
13. Cadario R, Chandon P: **Which healthy eating nudges work best? A meta-analysis of field experiments.** *Market Sci* 2020, **39**:465-486.
 14. Segar ML, Eccles JS, Richardson CR: **Type of physical activity goal influences participation in healthy midlife women.** *Womens Health Issues* 2008, **18**:281-291.
 15. Woolley K, Fishbach A: **For the fun of it: harnessing immediate rewards to increase persistence in long-term goals.** *J Consum Res* 2016, **42**:952-966.
- This research finds that the pursuit of personal goals for delayed rewards (e.g. exercising to improve health) often provides consumers with immediate rewards (e.g. a fun workout) as well. Participants attending to the immediate rewards of health and academic activities showed greater persistence in these activities relative to those attending to delayed rewards, even though the activities were selected for the delayed rewards they provide. Overall, immediate rewards are stronger predictors of activity persistence than delayed rewards.
16. Muñoz-Vilches NC, van Trijp HC, Piqueras-Fiszman B: **The impact of instructed mental simulation on wanting and choice between vice and virtue food products.** *Food Qual Prefer* 2019, **73**:182-191.
 17. Buckland NJ, Er V, Redpath I, Beaulieu K: **Priming food intake with weight control cues: systematic review with a meta-analysis.** *Int J Behav Nutr Phys Act* 2018, **15**:66.
- This meta-analysis examines whether exposure to weight-related cues reduces eating behavior, and shows that such priming effects are typically small and occur only for strongly motivated individuals.
18. Papias EK: **Health goal priming as a situated intervention tool: how to benefit from nonconscious motivational routes to health behaviour.** *Health Psychol Rev* 2016, **10**:408-424.
- This paper presents a conceptual analysis of goal priming mechanisms and argues that to affect health behavior, primes need to tap into motives that are personally relevant to the in the perceiver.
19. Papias EK, Hamstra P: **Goal priming and eating behavior: enhancing self-regulation by environmental cues.** *Health Psychol* 2010, **29**:384-388.

20. Milyavskaya M, Inzlicht M, Hope N, Koestner R: **Saying “no” to temptation: want-to motivation improves self-regulation by reducing temptation rather than by increasing self-control.** *J Pers Soc Psychol* 2015, **109**:677-693.

This article differentiates goals involving intrinsic motivations and rewards from those reflecting perceived external pressures, linking the former (but not the latter) to more positive implicit associations and behavioral implications.

21. Lewis MA, McBride CM, Pollak KI, Puleo E, Butterfield RM, Emmons KM: **Understanding health behavior change among couples: an interdependence and communal coping approach.** *Soc Sci Med* 2006, **62**:1369-1380.
22. Young VJ, Burke TJ, Curran MA: **Interpersonal effects of health-related social control: positive and negative influence, partner health transformations, and relationship quality.** *J Soc Pers Relat* 2019, **36**:3986-4004.

In this cross-sectional study of 243 couples, use of positive social control (e.g. displaying positive emotion about the desired behavior, stating value of behavior, requesting the behavior) significantly predicted more positive health behavior transformations (including healthy diet) for the partner; negative social control (e.g. bargaining, guilt, giving orders) had no such effect.

23. Lyubomirsky S, King L, Diener E: **The benefits of frequent positive affect: does happiness lead to success?** *Psychol Bull* 2005, **131**:803-855.

This meta-analysis of correlational questionnaire-based research, diary and ecological momentary assessment studies, and experimental studies finds that happiness predicts, and in some cases causes, positive life outcomes across a wide range of domains including social, income, and health indices.

24. Bloom P: **Empathy and its discontents.** *Trends Cogn Sci* 2017, **21**:24-31.

This study examined prosocial action while challenging the limitations to empathy when making moral decisions in the modern world. The researchers concluded that compassion, the sense of valuing other people and caring about their welfare but without necessarily feeling their pain, may have all the advantages of empathy in and few of its weaknesses.

25. Kamas L, Preston A: **Empathy, gender, and prosocial behavior.** *J Behav Exp Econ* 2020, **92**:101654.

26. Cameron CD, Hutcherson CA, Ferguson AM, Scheffer JA, Hadjiandreou E, Inzlicht M: **Empathy is hard work: people choose to avoid empathy because of its cognitive costs.** *J Exp Psychol Gen* 2019, **148**:962-976.

27. Devlin HC, Zaki J, Ong DC, Gruber J: **Not as good as you think? Trait positive emotion is associated with increased self-reported empathy but decreased empathic performance.** *PLoS One* 2014, **9**:e110470.

28. Thoits PA, Hewitt LN: **Volunteer work and well-being.** *J Health Soc Behav* 2001:115-131.

29. Hui BP, Ng JC, Berzaghi E, Cunningham-Amos LA, Kogan A: **Rewards of kindness? A meta-analysis of the link between prosociality and well-being.** *Psychol Bull* 2020, **146**:1084-1116.

This meta-analysis examines the strength of the link between prosociality and well-being, examining a range of moderators including demographic factors, different types of wellbeing and methodological rigor.

30. Preston SD: **The origins of altruism in offspring care.** *Psychol Bull* 2013, **139**:1305-1341.

31. Fredrickson BL, Joiner T: **Reflections on positive emotions and upward spirals.** *Perspect Psychol Sci* 2018, **13**:194-199.

32. Kohls G, Perino MT, Taylor JM, Madva EN, Cayless SJ, Troiani V, Price E, Faja S, Herrington JD, Schultz RT: **The nucleus accumbens is involved in both the pursuit of social reward and the avoidance of social punishment.** *Neuropsychologia* 2013, **51**:2062-2069.

33. Wake SJ, Izuma K: **A common neural code for social and monetary rewards in the human striatum.** *Soc Cogn Affect Neurosci* 2017, **12**:1558-1564.

34. Spinrad TL, Gal DE: **Fostering prosocial behavior and empathy in young children.** *Curr Opin Psychol* 2018, **20**:40-44.

This succinct review of the literature addresses implications of rewarding children's prosocial/helping behavior. Although material rewards can

backfire, reducing intrinsic motivation, social reinforcements such as positive emotion, praise, and encouragement do foster future prosociality.

35. van Hoorn J, van Dijk E, Meuwese R, Rieffe C, Crone EA: **Peer influence on prosocial behavior in adolescence.** *J Res Adolesc* 2016, **26**:90-100.

36. Schnall S, Roper J, Fessler DM: **Elevation leads to altruistic behavior.** *Psychol Sci* 2010, **21**:315-320.

37. Sparks AM, Fessler DM, Holbrook C: **Elevation, an emotion for prosocial contagion, is experienced more strongly by those with greater expectations of the cooperativeness of others.** *PLoS One* 2019, **14**:e0226071.

38. Cavanaugh LA, Bettman JR, Luce MF: **Feeling love and doing more for distant others: specific positive emotions differentially affect prosocial consumption.** *J Market Res* 2015, **52**:657-673.

39. Algoe SB: **Find, remind, and bind: the functions of gratitude in everyday relationships.** *Soc Personal Psychol Compass* 2012, **6**:455-469.

40. Bartlett MY, DeSteno D: **Gratitude and prosocial behavior: helping when it costs you.** *Psychol Sci* 2006, **17**:319-325.

41. Ma LK, Tunney RJ, Ferguson E: **Does gratitude enhance prosociality?: a meta-analytic review.** *Psychol Bull* 2017, **143**:601-635.

42. Williams LA, Bartlett MY: **Warm thanks: gratitude expression facilitates social affiliation in new relationships via perceived warmth.** *Emotion* 2015, **15**:1-5.

43. Algoe SB, Dwyer PC, Younge A, Oveis C: **A new perspective on the social functions of emotions: gratitude and the witnessing effect.** *J Pers Soc Psychol* 2020, **119**:40-74.

In this series of studies, third-party observers to gratitude expression were found subsequently to be more helpful and affiliative toward both the beneficiary and benefactor in the gratitude interaction.

44. Clore GL, Schiller AJ, Shaked A: **Affect and cognition: three principles.** *Curr Opin Behav Sci* 2018, **19**:78-82.

45. Vincent LC, Emich KJ, Goncalo JA: **Stretching the moral gray zone: positive affect, moral disengagement, and dishonesty.** *Psychol Sci* 2013, **24**:595-599.

46. Siniver E: **Do happy people cheat less? A field experiment on dishonesty.** *J Behav Exp Econ* 2021, **91**:101658.

47. van Vugt M, Griskevicius V, Schultz PW: **Naturally green: harnessing stone age psychological biases to foster environmental behavior.** *Soc Issues Policy Rev* 2014, **8**:1-32.

48. Han T-I, Stoel L: **Explaining socially responsible consumer behavior: a meta-analytic review of theory of planned behavior.** *J Int Consum Market* 2017, **29**:91-103.

49. Zawadzki SJ, Steg L, Bouman T: **Meta-analytic evidence for a robust and positive association between individuals' pro-environmental behaviors and their subjective wellbeing.** *Environ Res Lett* 2020, **15**:123007.

This meta-analysis examined a variety of associations between pro-environmental behavior and aspects of psychological well-being. In particular, pre-environmental behavior is predicted by hedonic rewards for the behavior, personal meaning, and the 'warm glow' of performing a socially valued act.

50. Rezvani Z, Jansson J, Bengtsson M: **Cause it'll feel good! An investigation into the effects of anticipated emotions and personal moral norms on consumer pro-environmental behavior.** *J Promot Manag* 2017, **23**:163-183.

51. Odou P, Schill M: **How anticipated emotions shape behavioral intentions to fight climate change.** *J Bus Res* 2020, **121**:243-253.

This article reviews past studies that use anticipated emotions to predict behavioral change. They surveyed French adults to link self-reported emotions to intentions to act against climate change and engagement in current proenvironmental behavior. Structural equation modeling supported the Theory of Planned Behavior: both negative and positive emotions influenced intentions directly and through perceived behavioral control. Positive effects were stronger than negative in increasing

perceived control. Intentions were more influenced by positive emotions in people already acting more pro-environmentally but negative emotions actually increased intentions for those lowest and highest on engagement, but not the middle group.

52. Harth NS, Leach CW, Kessler T: **Guilt, anger, and pride about in-group environmental behaviour: different emotions predict distinct intentions.** *J Environ Psychol* 2013, **34**:18-26.
53. Schneider CR, Zaval L, Weber EU, Markowitz EM: **The influence of anticipated pride and guilt on pro-environmental decision making.** *PLoS One* 2017, **12**:e0188781.
54. Bissing-Olson MJ, Fielding KS, Iyer A: **Experiences of pride, not guilt, predict pro-environmental behavior when pro-environmental descriptive norms are more positive.** *J Environ Psychol* 2016, **45**:145-153.
55. Maki A, Burns RJ, Ha L, Rothman AJ: **Paying people to protect the environment: a meta-analysis of financial incentive interventions to promote proenvironmental behaviors.** *J Environ Psychol* 2016, **47**:242-255.
56. Miller KJ, Shenhav A, Ludvig EA: **Habits without values.** *Psychol Rev* 2019, **126**:292-311.
This paper offers a rigorous analysis of the extrinsic reward/reinforcement schedules most likely to lead to the development of 'value-free' or habitual behavior, rather than undermining intrinsic motivation after rewards are withdrawn.
57. Ro M, Brauer M, Kuntz K, Shukla R, Bensch I: **Making cool choices for sustainability: testing the effectiveness of a game-based approach to promoting pro-environmental behaviors.** *J Environ Psychol* 2017, **53**:20-30.
58. Griskevicius V, Tybur JM, Van den Bergh B: **Going green to be seen: status, reputation, and conspicuous conservation.** *J Pers Soc Psychol* 2010, **98**:392-404.
59. Berger J: **Signaling can increase consumers' willingness to pay for green products. Theoretical model and experimental evidence.** *J Consum Behav* 2019, **18**:233-246.
The authors argue that the 'green premium' (higher costs for environmental products that inhibit purchasing) can be ameliorated through costly signaling, tested with non-hypothetical economic choices. Across two studies, students are willing to pay more for green products, which correlates with their prosocial giving and pro-environmental giving and attitudes as well as money received in a trust game. People also trust others more (they give them more money to hold and return) when they make costly green purchases, particularly when the purchaser does not know their action is observed (more of an honest signal), and not if the premium for the green item is high.
60. Brown K, Adger WN, Devine-Wright P, Anderies JM, Barr S, Bousquet F, Butler C, Evans L, Marshall N, Quinn T: **Empathy, place and identity interactions for sustainability.** *Glob Environ Change* 2019, **56**:11-17.
In this theoretical review, the authors review studies on the link between empathy and sustainability. They argue that empathy is needed to increase sustainability and is fostered by place attachment and identity. In their view, empathy helps people perspective-take, expand their concern beyond their locale, and increases 'coordinated collective action.' They make recommendations for increasing empathy-based sustainability by reducing the inhibitory effects of parochialism.
61. Berenguer J: **The effect of empathy in environmental moral reasoning.** *Environ Behav* 2010, **42**:110-134.
62. Sevillano V, Aragonés JI, Schultz PW: **Perspective taking, environmental concern, and the moderating role of dispositional empathy.** *Environ Behav* 2007, **39**:685-705.
63. Pfattheicher S, Sassenrath C, Schindler S: **Feelings for the suffering of others and the environment: compassion fosters proenvironmental tendencies.** *Environ Behav* 2016, **48**:929-945.
64. Woolley K, Fishbach A: **It's about time: earlier rewards increase intrinsic motivation.** *J Pers Soc Psychol* 2018, **114**:877.
This series of studies experimentally manipulated the immediate versus delayed timing of rewards for behavior, and examined effects on subsequent intrinsic motivation for the target behavior. Results across studies showed that immediate rewards (including framing potential rewards as immediate versus more distal) led to increased intrinsic motivation, and that this effect was mediated by strengthened association of the activity with the reward.
65. Mantzari E, Vogt F, Shemilt I, Wei Y, Higgins JP, Marteau TM: **Personal financial incentives for changing habitual health-related behaviors: a systematic review and meta-analysis.** *Prev Med* 2015, **75**:75-85.
66. Wood W, Runger D: **Psychology of habit.** *Annu Rev Psychol* 2016, **67**:289-314.
67. Mason BJ, Light JM, Escher T, Drobos DJ: **Effect of positive and negative affective stimuli and beverage cues on measures of craving in non treatment-seeking alcoholics.** *Psychopharmacology (Berl)* 2008, **200**:141-150.
68. King D, Greaves F, Exeter C, Darzi A: **'Gamification': influencing health behaviours with games.** *J R Soc Med* 2013, **106**:76-78.
69. Paul K, Pourtois G, Harmon-Jones E: **Modulatory effects of positive mood and approach motivation on reward processing: two sides of the same coin?** *Cogn Affect Behav Neurosci* 2020:1-14.
70. Kushlev K, Drummond DM, Heintzelman SJ, Diener E: **Do happy people care about society's problems?** *J Posit Psychol* 2019:1-11.
This paper demonstrates that across multiple domains, feeling good predicts more, not less, action on contemporary societal challenges, including social, political, and environmental issues.
71. Schutte NS: **The broaden and build process: positive affect, ratio of positive to negative affect and general self-efficacy.** *J Posit Psychol* 2014, **9**:66-74.
72. Fritz MM, Armenta CN, Walsh LC, Lyubomirsky S: **Gratitude facilitates healthy eating behavior in adolescents and young adults.** *J Exp Soc Psychol* 2019, **81**:4-14.
This paper reports two studies in which teens and young adults who did gratitude-focused writing exercises reported healthier eating behavior than those completing control writing tasks; effects were mediated by reductions in negative affect.
73. Schache K, Hofman P, Serlachius A: **A pilot randomized controlled trial of a gratitude intervention for adolescents with type 1 diabetes.** *Diabet Med* 2020, **37**:1352-1356.
74. Piff PK, Dietze P, Feinberg M, Stancato DM, Keltner D: **Awe, the small self, and prosocial behavior.** *J Pers Soc Psychol* 2015, **108**:883-899.
75. Yang Y, Hu J, Jing F, Nguyen B: **From awe to ecological behavior: the mediating role of connectedness to nature.** *Sustainability* 2018, **10**:2477.
Using a narrative recall task, the authors induced awe, a neutral state, or amusement in Chinese students. Three studies showed that feeling awe decreased negative affect and increased positive affect, connectedness to nature, and rated likelihood of acting pro-environmentally (even more than another positive state: amusement). The relationship between awe and pro-environmental behavior was fully mediated by the sense of feeling connected to nature.