


# Why People Are in a Generally Good Mood

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## Abstract

Evidence shows that people feel mild positive moods when no strong emotional events are occurring, a phenomenon known as positive mood offset. We offer an evolutionary explanation of this characteristic, showing that it improves fertility, fecundity, and health, and abets other characteristics that were critical to reproductive success. We review research showing that positive mood offset is virtually universal in the nations of the world, even among people who live in extremely difficult circumstances. Positive moods increase the likelihood of the types of adaptive behaviors that likely characterized our Paleolithic ancestors, such as creativity, planning, mating, and sociality. Because of the ubiquity and apparent advantages of positive moods, it is a reasonable hypothesis that humans were selected for positivity offset in our evolutionary past. We outline additional evidence that is needed to help confirm that positive mood offset is an evolutionary adaptation in humans and we explore the research questions that the hypothesis generates.

## Keywords

well-being, evolutionary psychology, emotion

Might positive moods in neutral circumstances be an evolutionary adaptation in humans? Evidence suggests that people tend to experience positive moods when significant negative stimuli are not present and that a mild to moderate positive mood is the automatic baseline or offset in humans. Our reasoning begins with the finding that positive moods are ubiquitous around the world when assessed by self-report surveys as well as by other methods. The second set of findings pointing to a possible evolutionary origin for positive moods is evidence suggesting that positive moods are associated with a number of behaviors that would have been conducive to survival and reproductive success, including health and longevity, fecundity, sociability, and coping with environmental demands. Conversely, the absence of positive moods as seen in severe depression results in difficulties in health and fecundity, sociability, and coping. Because moods have a genetic underpinning, it is a reasonable hypothesis that human beings were selected for a baseline positive mood, and we hypothesize that positive mood offset may have been an evolutionary adaptation. However, additional research is needed to explore this hypothesis.

## Evolutionary Perspectives on Emotions

One evolutionary model of emotions (Nesse, 1990) posits that positive and negative emotions track the fitness consequences of a given behavior, situation, or stimulus to encourage adaptive behavior and discourage maladaptive behavior.

Opportunities (e.g., sexual intercourse) produce pleasure and other positive emotions so that the organism will be motivated to engage in them, whereas threats produce fear and other negative emotions so that the organism will be motivated to avoid them in the future (Nesse & Ellsworth, 2009).

Nesse (2004) suggested that positive and negative emotions are domain-general mechanisms designed to cope with difficult situations and aid the pursuit of specific goals. This theory highlights the positive functions of negative emotions and possible negative consequences of excessive positive emotions. Negative emotions are diagnostic of adaptive problems to be solved in the same sense that physical pains and illnesses are (Nesse & Williams, 1994). Cosmides and Tooby (2000; Tooby & Cosmides, 2008) argued that emotions coordinate the operations of independently functioning evolved psychological mechanisms to make sure that their outputs do not conflict with each other and to maximize their joint efficiency.

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Another theory relates to self-related feelings and evaluations to the person's social success. Leary's sociometer theory of self-esteem (Leary & Baumeister, 2000; Leary, Tambor, Terdal, & Downs, 1995) suggests that state of self-esteem monitors the quality of one's social relationships. When a person is valued as a relationship partner and included in social relationships, with attendant fitness benefits, her or his self-esteem increases. When one is not valued as a relationship partner and excluded from social relationships, one's self-esteem goes down. The increased self-esteem following inclusion will motivate people to continue and maintain their beneficial social relationships, and the decreased self-esteem following exclusion will motivate people to change and adapt so that they will be included in future relationships. In that self-esteem can be considered a form of subjective well-being, sociometer theory is similar to other evolutionary theories of affect in emphasizing that emotions arise to reinforce, punish, and motivate certain behaviors.

Scholars of affect often distinguish between moods and emotions. Moods tend to be long-lasting and not attributable to a single identifiable event. In contrast, emotions are often shorter lived, more intense, and due to specific events. Moods often are general positive or negative feelings, whereas emotions tend to have specific targets. *Affect* is a general term for feelings, including both moods and emotions. Whereas most evolutionary theories are about emotions, our hypothesis is about moods—the tendency to experience mild background positive affect most of the time when no emotional events are occurring. Positive mood offset refers to the tendency to feel pleasant and to be attracted to activities and the world in the absence of significant negative events. In this review, we suggest that people experience positive moods and emotions most of the time except when undesirable events trigger negative emotions, which may temporarily reduce or eliminate the positive feelings.

Our intention is *not* to supplant current evolutionary models of emotions but rather to *supplement* them with regard specifically to positive moods. Most current evolutionary models apply to *emotions*, which are affective states in response to some perceived environmental stimulus (Cosmides & Tooby, 2000; Haselton & Ketelaar, 2006; Nesse & Ellsworth, 2009; Tooby & Cosmides, 2008). Our model is intended to explain *positive mood offset*—the constant and usual state of mild positive affect *in the absence* of perceived evocative stimuli. Thus, humans may have evolved to react to positive stimuli with more intense positive feelings but at the same time to experience mild positive feelings in the absence of notable changes in circumstances.

Evolutionary models of emotions have been influential and have garnered supportive evidence. They explain important benefits of emotions and why they evolved their adaptive functions. However, when these evolutionary perspectives on emotions are applied to happiness and positive affect, several questions are apparent.

1. Most people are happy. However, by definition, at any given time in any given situation, half the population is achieving less than the median level of fitness and is in the bottom half of the hierarchy in terms of reproductive success. Thus, the evolutionary model of emotions as fitness indicators (Nesse, 1990) would predict that about half the people are more or less happy and the other half are more or less unhappy. However, a large number of studies from virtually all nations in the world show that “most people are happy” (e.g., Diener & Diener, 1996). Most studies show that the mean levels of life satisfaction and affect balance are above neutral, regardless of people's life circumstances. Indeed, the evolutionary model has a difficult time explaining why people such as prisoners and those living in other terrible conditions often return to a positive level after the initial exposure to those conditions.
2. People have happiness set-points. An evolutionary model of emotions (Nesse, 1990) suggests that an individual's current level of happiness reflects and fluctuates with his or her present fitness status. A large number of studies, however, suggest that individuals have “happiness set-points” to which they return after momentary perturbations to their baseline level of happiness (Headey & Wearing, 1989), although individuals' happiness set-points can shift over time (Diener, Lucas, & Scollon, 2006; Fujita & Diener, 2005). If happiness and positive affect are indicators that track the current level of reproductive success, why would individuals have happiness set-points to which they usually return? And why would these set-points be in the positive range for most people?
3. Happiness is heritable. An evolutionary model of emotions (Nesse, 1990) would predict that all individuals will be born with a neutral level of happiness and that their happiness will increase or decrease depending on their life circumstances and fitness status throughout their lives. In contrast, a large amount of evidence suggests that individuals' levels of happiness and life satisfaction are at least partly heritable (Lykken, 1999; Stubbe, Posthuma, Boomsma, & DeGeus, 2005). If happiness and positive affect are only indicators and trackers of fitness, why are some individuals born with higher levels of happiness than others?

### Positive Mood Offset as a Potential Psychological Adaptation

We propose a complementary perspective on affect as a cause and driver of fitness. We hypothesize that happy people may be more likely to engage in behavior that increases their chances of reproductive success (what Cosmides &

Tooby, 2000, called “total lifetime fitness consequences”), and as a result, positive mood offset—experiencing positive mood in the absence of adverse stimuli—has been evolutionarily selected.

We propose that positive mood offset may be a psychological adaptation and that its ultimate function may be to facilitate other psychological adaptations. Human beings possess a large number of evolved psychological mechanisms to aid survival and reproductive success in various domains (such as social exchange, mating, parenting, interpersonal relationships). Positive mood offset may have an impact on the operations of other evolved psychological mechanisms by allowing them to operate more effectively and efficiently when individuals are in mildly positive mood. For example, human beings possess evolved psychological mechanisms for mate selection (Buss, 1994). Happier individuals on average appear to execute such psychological mechanisms more effectively and are more highly motivated to engage in specific adaptive behaviors.

Our hypothesis is based on Cacioppo and Berntson’s (1994, 1999) description of “positivity offset,” the notion that people are built to be in a mildly positive mood when they are either in positive or neutral circumstances. We present evidence to show that positive mood offset appears universal in humans (as evolved psychological mechanisms are), and that happier people are more likely to engage in behaviors that promote survival and reproductive success. Both of these phenomena are consistent with our view that positive mood offset may be a psychological adaptation. However, we leave for future research the presentation of a full adaptationist account of positive mood offset, including the specification of the biological structures underlying the psychological adaptation (Cosmides & Tooby, 1994; Marr, 1982). Our goal in this article is to suggest the possibility initially and open the debate.

We show that positive moods produce desirable outcomes in several areas: physical health, including fecundity and longevity; sociability and supportive social relationships; and coping and resource building, including forethought, planning, and creativity. These factors promote success in adapting to the environment and gathering needed resources. In each case, we review evidence suggesting a causal path going from positive moods to desirable outcomes, as well as detrimental effects experienced by those with few or no positive moods.

We review evidence suggesting that positive moods help parenting and the acquisition of social and material resources. Positive moods extend life and therefore, the chance for grandparenting, which increases a person’s over-generations reproductive success. Scientists have discussed the evolution of happiness (e.g., Buss, 2000; Carstensen & Lockenhoff, 2003; Grinde, 2002), primarily focusing on factors that are likely to produce positive emotions in humans. We add to this the proposal that positive feelings not only help reinforce certain behaviors and thus build resources that will be useful

in the future, but that positive moods lead to greater evolutionary success because of the immediate outcomes they produce. Positive moods serve not only as reinforcement-learning devices, but as an instigator of current behavior.

In evolutionary science, adaptation is a “special and onerous concept” (Williams, 1966) that must be invoked *only* when all other explanations fail (P. W. Andrews, Gangestad, & Matthews, 2002). Proposed adaptations must meet stringent conditions such as reliability, efficiency, precision, and economy. We believe that our review of the evidence below suggests that positive mood offset may meet these criteria for an adaptation. It *reliably* emerges in all normally developing humans (judged by its universality in all human societies, even in those individuals in objectively adverse conditions). It *efficiently* induces behavior that promotes survival and reproduction, such as sociability, health, longevity, and fecundity, by allowing efficient operations of other evolved psychological mechanisms. It appears to have a *precise* effect on the efficient operations of such other evolved psychological mechanism, and it does so *economically* by having multifaceted motivational effects on various psychological mechanisms related to survival and reproduction without exerting many apparent reproductive costs or trade-offs. We suggest that positive mood offset may be an evolutionary adaptation because happier individuals are more likely to engage in behaviors that promote their survival and reproductive success.

## Positive Mood Offset Is Ubiquitous in Humans

Evidence from around the world reveals that most people feel happy a majority of the time. Diener and Diener (1996) reviewed extensive evidence showing that most people are happy. Their claim was not that most people are intensely happy or always happy, but that they experience some positive affect most of the time and are above neutral in terms of experiencing more positive feelings than negative feelings a majority of the time. We now have broader evidence to support the Diener and Diener claim, based on experience-sampling studies, diverse and representative samples of the world, and measures of affect that do not rely on self-report surveys. The data indicate that the majority of the people in the world are in a positive state most of the time, including even those living in difficult circumstances.

We studied a group of 42 American college students and assessed their momentary moods with experience sampling at random moments through the day for 6 weeks, with a total of 3,509 mood reports. In a new analysis of this experience-sampling study reported by Diener and Larsen (1984), we found that some level of happiness was reported on 94% of reporting occasions. Ninety-five percent of respondents reported more happiness than unhappiness a majority of their moments. Furthermore, the least happy respondent in the study reported at least some level of happy feeling on 68% of

all occasions. Most respondents virtually always experienced positive feelings, even if only mildly, and for almost all participants, most moments were more positive than negative.

Recall that the idea of positive mood offset suggests that positive moods will be experienced when there is no compelling negative stimulus. At negative moments, negative moods are likely to be stimulated and negative feelings often predominate over positive feelings. Thus, we also examined those moments when respondents reported no negative feelings. On these occasions, respondents reported some positive feelings 99.5% of the time. Respondents virtually never reported zero positive affect and zero negative affect. This pattern strongly suggests that people usually feel at least slightly positive when no negative feelings are present.

The findings generalize to broader samples beyond American college students. The first representative sample of the entire globe, the Gallup World Poll (GWP) from 2005 through 2011, included representative samples from 160 nations of the world. The 941,161 people sampled represent virtually all of humanity. Eighty-two percent of respondents reported that they experienced some positive affect much of “yesterday.” Of respondents who did not report negative affect “yesterday,” 91% said they experienced some positive feelings much of the day. In the least happy of the 160 nations, 57% of the respondents reported experiencing some positive affect much of yesterday, and in the happiest country, the figure was 96%. Given the difficult circumstances in many nations of the world, these figures are remarkably positive.

We analyzed informant reports from a study reported earlier (Diener, Smith, & Fujita, 1995) to demonstrate the positivity pattern beyond self-report measures. In that study, we obtained reports from three to five friends and family members about the happiness levels of 200 target participants. Informants rated only 8% of the targets below the midpoint of the happiness scale. In contrast, only 2% of the target participants were rated as above the midpoint on the unhappiness scale. When happiness and unhappiness were compared, 97% of the target participants were rated as having more happiness than unhappiness.

Brain asymmetry studies also suggest that the average person is above neutral in positivity. In these studies, more than half of the participants at resting baseline show left-prefrontal dominance, indicating the ascendancy of approach over avoidance (M. Schneider, Graham, Grant, King, & Cooper, 2009; Sutton & Davidson, 2000; Tomarken, Davidson, Wheeler, & Kinney, 1992). Thus, positivity is evident not only in people’s self-reports of happiness but also when using other measures that do not require the reporting of one’s experience. Importantly, the evidence shows that people do not merely report being happy, but that physiological and informant measures confirm that they are in a positive state most of the time.

In addition, research on the validity of the self-report mood scales indicates that happiness scales correlate with

the reports of family and friends, with memory for positive versus negative life events, with ratings of a trained rater based on an interview, and with experience-sampling measures (Sandvik, Diener, & Seidlitz, 1993). Self-reports of both life satisfaction and positive feelings correlate substantially with reports on the target individuals by family members and friends (L. Schneider & Schimmack, 2009). Thus, people not only report that they are happy, but their reports are corroborated by what other people say about them, what they remember about their lives, the way they describe their lives, and neuroscience indicators (see Diener, Inglehart, & Tay, 2013, for a review).

Cognitive measures also support a positivity bias. Because affect and cognition are inextricably intertwined (Clare & Ortony, 2008), with connections in both directions, the positivity bias in cognitions is quite relevant to the hypothesis of positive mood offset. People have a bias to generally perceive and think of the world in a positive way (Matlin & Stang, 1978). This cognitive bias is shown in many memory and attention tasks. For example, Matlin (1979) found that pleasant information is processed more quickly and accurately than unpleasant information. Not only did participants tend to have thoughts that are skewed in the direction of positivity, but reports of happiness and pleasantness were associated with such thoughts. Those who reported being happier also showed evidence of positive thoughts on tasks such as free associations, recall of pleasant versus unpleasant words, listing pleasant items earlier than unpleasant ones, and frequency judgments of pleasant versus unpleasant words. Across languages, people use more positive than negative words (Boucher & Osgood, 1969) and recall more positive than negative events from their lives (Seidlitz & Diener, 1993). Taylor and Brown (1988) reviewed evidence indicating that overestimates of control and mastery, exaggerated self-evaluations, and overly optimistic appraisals are widespread and characteristic of normal human thought (see Heine & Hamamura, 2007, for exceptions). They also concluded that negative incoming information is distorted in a positive direction.

### *Is Positivity Offset Due to Felicitous Circumstances?*

Are the findings of widespread happiness in the world due to the number of people who now live in relatively desirable conditions? Although levels of happiness are higher in benign conditions, the ubiquity of above-neutral happiness generalizes even to unfortunate circumstances. In the GWP, we examined individuals who had severe problems during the year—people who had gone hungry and did not have enough money for housing or food, and who also had been assaulted. Of the respondents in the world poll experiencing all of these unfortunate events together, 53% said that they enjoyed most of “yesterday,” and 60% said they laughed and smiled a lot yesterday.

Individuals with chronic mental disabilities were signaled in an experience-sampling study and were found to rate their mood above the neutral point of the scale a majority of the time (Delespaul & deVries, 1987). Likewise, a broad sample of the population of the United Kingdom in the British Household Panel Study revealed that the average for people becoming widowed and unemployed was below the sample mean but still above neutral in the positive zone of the scale (Clark & Georgellis, 2012). Similarly, people who within the past year lost a child or spouse, as well as people with a disability so severe that they could no longer work, were lower in subjective well-being than before the tragedy or disability occurred but still reported more happy feelings in their life than negative feelings (Lucas, 2007). Wheelchair-bound individuals are slightly above neutral on life satisfaction and above neutral on positive feelings (e.g., Chwalisz, Diener, & Gallagher, 1988).

Although prisoners respond negatively to incarceration when they are first imprisoned, after a period of adaptation, their moods are in the positive zone (Bronsteen, Buccafusco, & Masur, 2010; Zamble & Porporino, 1988). Thus, even those living in highly undesirable circumstances have predominantly positive moods after they adapt to their situation. The findings that prisoners, recent widows, and those suffering from severe disability or dire poverty have positive moods strongly suggest that people have a propensity to experience positive moods. People often strongly react to negative events but then over time, adapt back to the positive zone. Although people sometimes are not as happy as before the negative event, it is rare for people to stay permanently unhappy.

### **Positive Mood Offset Promotes Adaptive Behaviors**

Positive moods are not only widespread, but they tend to be associated with behavioral patterns that would have been adaptive during human evolutionary history. In the following section, we review evidence showing that people with more positive emotions tend to have more friends, mate more often, and acquire more social and material resources. Furthermore, they tend to be healthier and live longer, making them able to further the fitness of their offspring. Thus, positive moods facilitate a number of characteristics that would have been helpful to survival and reproduction.

#### *Benefits for Social Relationships*

One important reason that positive baseline feelings were likely adaptive is that they help to create and strengthen bonds between people, helping them to be social and mate more often. Happy individuals tend to be more skilled at social relationships and thus better equipped with the psychosocial resources necessary for raising healthy and well-functioning children. One characteristic that happy people have in

common is that they have close supportive social relationships (Diener & Seligman, 2002). Mehl, Vazire, Holleran, and Clark (2010) monitored people's everyday conversations for 4 days and assessed happiness through both self-report scales and informant reports. They found that compared with unhappy participants, happy participants spent about 25% less time alone and about 70% more time talking when they were with others. Furthermore, happy participants engaged in less small talk and more substantive conversations compared with their unhappy peers. Across cultures, positive feelings are associated with tendencies for affiliation, dominance, and amount of social interaction (Lucas, Diener, Grob, Suh, & Shao, 2000). Happy people tend to be more popular and likable (Boehm & Lyubomirsky, 2008). Positive feelings predict later successful social relationships. Unmarried people high in life satisfaction are more likely to get married in the following years and less likely to become separated or divorced if they get married (Stutzer & Frey, 2006; Luhmann, Eid, Lucas, & Diener, 2013).

Absence of positive affect is accompanied by feeling unsociable, bored and uninterested in things, and slowed down and unenergetic (Watson et al., 1995). Again, we reanalyzed data from the Diener and Larsen (1984) study in which college students were signaled at random moments twice each day for 6 weeks. When signaled, the respondents reported on their feelings. Reported happiness at the moment was associated with feeling more sociable, caring, in harmony with others, energetic, interested, and optimistic. For example, people very high in happiness at the moment were 13 times more likely to say they felt sociable rather than wanting to be alone. In contrast, those low in momentary happiness were twice as likely to want to be alone. Those who were very happy at the moment were 30 times more likely than those low in momentary happiness to be interested in what they were doing, as opposed to being bored, which was the strongest feeling in those who were low in momentary happy mood. We found that even when alone, the respondents felt more sociable when they were in a positive mood ( $r = .51$ ).

Experimental research supports the causal connection moving from positive feelings to sociability, as well as higher quality social relationships. Children put in a positive mood through a success experience showed greater social skills and confidence in social behavior compared with those in a control condition (Kazdin, Esveldt-Dawson, & Matson, 1982). Similarly, individuals in a positive mood induction condition showed greater compassion, perspective taking, and sympathy for a person experiencing distress compared with those in the neutral and negative mood conditions (Nelson, 2009). People put in a positive mood compared with a negative mood were more talkative and self-disclosing (Cunningham, 1988a). In an experimental study of long-term positive mood produced through meditation (Kok et al., 2013), the positive mood group showed greater increases than a waitlist control group in vagal tone, which is associated with emotion regulation and social connections.

Research participants placed in a positive mood expressed greater interest in social and prosocial activities compared with those in a neutral condition, whereas those placed in a negative mood indicated lower interest in social and strenuous activities (Cunningham, 1988b). The participants who were placed in a negative mood expressed greater interest in being alone and taking a nap. This pattern was replicated in a second study that found that interest in social and prosocial activities among those in a good mood followed from a greater expectancy for positive outcomes in these activities.

During human evolution, intragroup aggression must have been dampened owing to the need for group living that could provide prolonged care and parenting for the young. Furthermore, living in groups allowed the sharing of resources such as food by averaging rewards across individuals to produce less variation over time. Substantial data indicate that in general, positive emotions boost cooperative behavior (e.g., Carnevale, 2007). Individuals placed in a positive mood are more cooperative and less contentious, and reach better joint solutions in negotiations (Carnevale & Isen, 1986). Happier individuals are later more likely to be altruistic, for example, by donating blood, even controlling for altruism at baseline (Shin, Choi, Suh, & Koo, 2013). Thus, happy individuals are particularly cooperative and giving.

Depressed individuals can yield clues about the effects of absence of positive affect. Although many people think of depression as the experience of high levels of negative feelings, in fact, depression is usually characterized as well by absence of positive feelings. Indeed, the absence of positive affect was a significantly stronger predictor of depression in a geriatric sample than was the presence of negative affect (Harralson & Lawton, 1999), and the absence of positive affect is a consistent characteristic of depression (Watson, Clark, & Carey, 1988). Thus, although we cannot be certain that the results of depression are due to absence of positive affect (because both this absence and the presence of some negative affect are usually present, as well as other symptoms), it can be informative to examine how depression influences behavior in terms of convergence with other types of evidence on the absence of positive affect.

Depressed people are characterized by fatigue, loss of interest, and loss of motivation (Nutt et al., 2007). They tend to show hunched posture, low eye contact, loss of appetite, loss of interest in sex, and sleep disturbance (Hendrie & Pickles, 2010). It is thus unsurprising that people who are depressed have problems in social relationships, have limited social support, and keep distancing from their neighbors (Gotlib & Hammen, 2009). Even minor depression is associated with problems in social relations, for example, higher rates of divorce (Beck & Koenig, 1996). Those recovering from depression show impairments in both social and occupational functioning (Romera et al., 2010).

Both health and behavioral problems accompany depression (Kessler, 2012). The evidence shows that depression is

associated with greater impairments in role functioning than cancer, diabetes, and heart disease. The deficits experienced by people who are depressed are so profound that it is sometimes forgotten that the problem is a disturbance of normal moods. Depressed individuals are less likely to get married and are more likely to get divorced. In a study of functioning in relationships (Kessler et al., 2003), only 3% of depressed individuals had no impairments in role functioning at home and at work. At work, 80% of depressed people had impairment, 91% at home, and 85% in their relationships.

Alleviation of depression improves relationships. Follow-up surveys over the next 18 months revealed that people receiving drug treatment or cognitive therapy for depression showed better marital adjustment (Whisman, 2001). This effect was mediated completely by decreases in depression. Several types of treatment for depression are followed by increased social support, and the changes in social support are mediated by improvements in mood (Mohr, Classen, & Barrera, 2004). Thus, both experimental and longitudinal evidence suggests that positive moods promote sociability and successful social relationships, and experimental work on the alleviation of depression is consistent with the idea.

Human beings are an ultrasocial species (Richerson & Boyd, 1998). They live in social groups of many generations and their lives are permeated with social activity. As we have shown, positive mood offset appears to be a critical factor motivating social contact and allowing interaction to frequently occur with fewer disruptive conflicts. In sum, positive feelings cause people to feel sociable and behave more socially, but they also tend to produce higher quality relationships that are characterized by cooperation and stability.

### *Benefits for Physical Health and Longevity, Fertility, and Parenting*

Natural selection favors those who live long and fertile lives and whose offspring survive and reproduce (Williams, 1966). In addition to fertility and healthy births of offspring, many mammals also must have sufficient health, longevity, and resources to permit parenting that ensures the survival and reproductive fitness of their offspring. Positive feelings have been found to predict health and longevity. Furthermore, factors that increase people's resources that are needed to care for their children also follow from positive moods. For instance, positive moods have been found to predict higher income, lower rates of divorce, and sociability—all factors that favor reproductive advantage for the individual and her or his descendants.

Longevity is relevant to evolution in that individuals must survive long enough to reproduce. If they live longer than their childbearing years they can provide care to their children and grandchildren. Longitudinal evidence suggests that positive feelings predict future health and longevity, controlling for other factors such as income (e.g., Danner, Snowdon,

& Friesen, 2001; Pressman & Cohen, 2012). Reviews and meta-analyses of research suggest that positive moods often cause better health and longevity (Howell, Kern, & Lyubomirsky, 2007; Lyubomirsky, King, & Diener, 2005; Pressman & Cohen, 2005). Meta-analyses of prospective studies find positive predictive relationships between various forms of subjective well-being, including lack of chronic stress and anger, and health and longevity (e.g., Chida & Steptoe, 2008; Rugulies, 2002; Russ et al., 2012), even when initial health and other factors are controlled.

Diener and Chan (2011) reviewed several types of evidence that point to a causal connection going from subjective well-being to health and longevity. They reviewed longitudinal studies with adults, animal experiments, experiments in which participants' moods were manipulated and biomarkers were assessed, natural quasi-experiments, and studies in which moods and biomarkers were tracked together over time in natural settings. Diener and Chan concluded that the evidence is compelling, although not beyond a doubt, that positive affect is causally related to health and longevity. Not only do negative emotions predict illness, but positive emotions often predict health and longevity controlling for negative affect. Furthermore, even mild depression is associated with increased risk of death in people with predisposing health factors (Bush et al., 2001). A review of mediating and moderating mechanisms and long-term experimental alterations in moods also indicate that positive moods are beneficial to health and longevity (Diener, Lin, & Pressman, 2014).

Places with higher life satisfaction have greater life expectancies, with lower mortality from heart disease, homicide, liver disease, diabetes, and cancer (Lawless & Lucas, 2011). Blanchflower and Oswald (2008) found across 16 European nations that life satisfaction was correlated with lower blood pressure. Controlling for sex, age, and other factors, orangutans who were rated happier by their keepers lived longer (Weiss, Adams, & King, 2011). Indeed, animals one standard deviation above and below the mean on rated happiness had an average life span difference of more than 11 years.

Evidence points to specific physiological changes that mediate the effect of positive feelings on health (Ong, 2010). Among middle-aged men and women, those high in positive affect had lower inflammatory, cardiovascular, and neuroendocrine problems (Steptoe, Wardle, & Marmot, 2005). Happiness was associated with lower ambulatory heart rate and lower cortisol output across the day. Likewise, results from an experiment showed that induced positive feelings lead to quicker cardiovascular recovery after viewing an anxiety-inducing film (Fredrickson & Levenson, 1998; Fredrickson, Mancuso, Branigan, & Tugade, 2000). Experimentally induced smiling caused quicker heart rate recovery than a neutral facial expression when participants were exposed to a stressor (Kraft & Pressman, 2012). Experimental inductions of mood in randomized studies can heighten various immune parameters (Marsland, Pressman,

& Cohen, 2007), thus providing yet another causal pathway from positive moods to health outcomes. Similarly, interventions to reduce negative affect often lead to improvements in immune function.

Another mediator of the connection between positive feelings and health is health behavior. Boehm and her colleagues (Boehm & Kubzansky, 2012; Boehm, Peterson, Kivimaki, & Kubzansky, 2011) found that optimism and positive emotions protect against cardiovascular disease and predict slower disease progression. They discovered that those with positive moods more often engaged in positive health behaviors such as exercising and eating a nutritious diet. Furthermore, positive affect was associated with beneficial biological markers such as lower blood fat and blood pressure, and a healthier body mass index. These associations held even controlling for levels of negative moods. Happier individuals have a healthier diet, eating more fruits and vegetables (Blanchflower, Oswald, & Stewart-Brown, 2013), and healthy parents in turn are likely to have healthier offspring (e.g., Carone et al., 2010). Conversely, people with depression are more likely to use alcohol to excess, be physically inactive, smoke, be obese, and suffer illnesses such as diabetes and cardiovascular disease (Strine et al., 2008).

Happy people not only have better health but also have higher levels of fecundity. They are more likely to marry, stay married, and have children (Luhmann, Lucas, Eid, & Diener, 2013). From frequency of sexual intercourse to fertilization to full-term healthy births, the experience of positive moods aids reproductive fitness. Happy men and women participate in sexual intercourse more frequently than less happy individuals, with the highest levels of sex for those who are very happy (Blanchflower & Oswald, 2004). Similarly, people who are satisfied with their marriage have more frequent sexual intercourse (Donnelly, 1993). Suggesting a causal relation going from positive mood to sex, when participants were exposed to erotic stimuli, a positive mood induction led to greater objective and subjective sexual arousal compared with both baseline and a neutral mood induction (Mitchell, DiBartolo, Brown, & Barlow, 1998). Furthermore, the negative mood induction led to less arousal than either the baseline or neutral mood induction.

Not only do happy people have more frequent sex, but intercourse is more likely to result in pregnancy and a full-term birth for happy individuals. Depression and stress are both associated with lower fertility (Buck et al., 2010; Gurhan, Akyuz, Atici, & Kisa, 2009; Matthiesen, Fredriksen, Ingerslev, & Zachariae, 2011), and there is a positive correlation between optimism and carrying a baby to full-term (Rasmussen, Scheier, & Greenhouse, 2009). Suggestive of a causal direction, people who were high in life satisfaction are more likely to have a baby in the next several years (Luhmann et al., 2012). Adding to the case for positive feelings promoting fertility, evidence suggests that treatment for depression can increase fertility and pregnancy in couples desiring it. In a meta-analysis of 21 controlled studies, infertile couples

receiving treatment for depression had higher rates of pregnancy, although measured mental distress was not significantly affected by the treatments (Hammerli, Znoj, & Barth, 2009). In a randomized controlled experiment, two types of psychological interventions significantly increased the rates of pregnancy in infertile women compared with an untreated control group (Domar et al., 2000). Thus, treatments that lower negative affect and raise positive affect may increase levels of fertility.

In a number of studies, it has been found that depression during pregnancy is related to a greater likelihood of preterm birth. Depressed parents are likely to experience prenatal, perinatal, and postnatal complications (Field, Diego, & Hernandez-Reif, 2006). Depressed pregnant mothers are more likely to have preterm and low-birth-weight infants (Field et al., 2009; Neggers, Goldenberg, Cliver, & Hauth, 2006; Orr & Miller, 1995; Wisner et al., 2009). These two factors account for the majority of neonatal deaths and almost half of long-term neurological disabilities (Williamson et al., 2008).

In experimental studies, stressed rat mothers have poorer birth outcomes (e.g., Gotz, Martin, & Volker, 2008) and offspring with more neurodevelopmental disorders (Mueller & Bale, 2008). Because of the experimental work, as well as the longitudinal nature of several of the studies, it appears that a causal arrow does move from positive moods to pregnancy and more healthy births, and not simply in the alternate direction. The absence of positive emotions evidenced in depression has a devastating impact on a range of outcomes that are related to survival and reproduction. When treatment for depression has been studied in randomized controlled trials, health-related quality of life improved (e.g., O'Neil, Sanderson, Oldenburg, & Taylor, 2011). Thus, both longitudinal and experimental evidence suggests that positive moods help to promote health and fecundity.

### ***Benefits for Grandparenting***

Older individuals who experienced more positive than negative emotions in everyday life were more likely to have survived over the 13-year follow-up period, controlling for age, sex, and ethnicity (Carstensen et al., 2011). A recent finding is that stress is related to the length of people's telomeres, the endcaps protecting DNA (Epel et al., 2004). This finding suggests that unhappiness can produce more rapid aging because cells fail to replicate with fidelity when the telomeres are gone (Diener & Chan, 2011; Epel et al., 2004). Why is longevity important for evolutionary adaptation in humans? Men can have children well into old age. For women, who may live many years beyond reproductive capacity, the answer is likely grandparenting (Voland, Chasiotis, & Schiefenhover, 2005).

Living longer means that individuals can help not only their children survive to reproductive age but their grandchildren as well. The advantages of having grandparents

increased when human interactions became symbol-based, with art and language developing (Caspari, 2011). Growing evidence suggests that grandparents contribute economic and social resources to their descendants, thus increasing the likelihood of survival of their grandchildren (Caspari, 2011). For example, grandparents help to guard their grandchildren against risks and adverse events (Coall & Hertwig, 2010). In the United States, 28% of mothers rely on their children's grandparents for child care.

Carstensen and Lockenhoff (2003) proposed that grandparents were important in evolution for the survival and success of their grandchildren, and outlined evidence showing the benefits of grandparents in both economically developed and less developed societies. They also reviewed evidence showing that across the adult life span, negative affect tends to decrease and positive affect increases. They suggested that this pattern of emotions is critical in nurturing the young. Thus, it is relevant to evolutionary adaptation that happier individuals live longer into the grandparenting years.

### ***Benefits for Coping, Planning, Creativity, and Resource Building***

Fredrickson's (1998) broaden-and-build theory of positive emotions and data supporting this conception suggest that positive feelings broaden a person's repertoire of skills that might be needed in the future, as well as build resources such as social connections that also can be beneficial. When no threats are imminent, it is adaptive for people to build a variety of resources that might benefit them in future challenging situations. Those in a positive mood are likely to build social bonds, learn new facts and ideas, and create new products and ideas (Fredrickson, 2001). However, we suggest that positive emotions are not just for resource building for the future, but they also motivate behaviors that are helpful in the present. Positive moods seem to bestow energy and motivation.

Not only are happy people more likely to have children but they are able to provide their children with more material resources to help them grow to maturity. People high in subjective well-being in adolescence and young adulthood have been found to later earn higher incomes in several longitudinal studies (De Neve & Oswald, 2012; Diener, Nickerson, Lucas, & Sandvik, 2002; Graham, Eggers, & Sandip, 2004; Koo & Suh, 2013; Marks & Fleming, 1999). Boehm and Lyubomirsky (2008) examined cross-sectional, longitudinal, and experimental evidence regarding the effect of happiness on the job and found that happiness is associated with workplace success and not losing one's job. Happy workers—optimistic and helpful, resilient, and high in self-efficacy—are more likely to be rated higher by their supervisors and to make more money (Peterson, Luthans, Avolio, Walumbwa, & Zhang, 2011). Employees lower in positive mood are more likely to be absent from work (Pelled & Xin, 1999). Depressed people are more likely to drop out of school and



to be unemployed. Depressed employees tend to have lower incomes and to miss more workdays (Kessler, 2012), and those low in life satisfaction are more likely to lose their jobs in the future (Luhmann, Lucas, Eid, & Diener, 2013).

Positive moods that were induced in a laboratory experiment influenced productivity (Oswald, Proto, & Sgroi, in press). The researchers found that participants placed in a positive mood had higher work output, with no less quality. Furthermore, a negative mood caused by family illness or bereavement had a detrimental impact on productivity. Although paid employment and monetary income did not characterize most of our evolutionary past, strong parallels exist in terms of our ancestors' need to cooperate with others, use long-term planning, cooperate and negotiate with others, be healthy, and so forth.

Supporting the causal influence of moods, therapy for depression in a randomized controlled experiment led to greater rates of employment (Schoenbaum et al., 2002). Whereas 72% of those receiving treatment were employed at 6 months follow-up, only 53% of the no-treatment control group were. In a longitudinal follow-up study, those who received treatment for depression had fewer lost workdays over the course of the next year (Zhang, Rost, Fortney, & Smith, 1999). Depressed individuals are significantly less productive in the workplace (Dewa, Thompson, & Jacobs, 2011). Furthermore, those treated for depression were 2.5 times more likely to be highly productive compared with those who had no treatment. For those with severe depression, treatment increased productivity sevenfold.

Higher parental workplace success and income are important because children in families with more resources are likely to experience better health, and this effect becomes more pronounced as children grow older (Case, Lubotsky, & Paxson, 2002). Controlling for confounding factors, poverty is predictive of neonatal and post-neonatal mortality rates, greater risk of accidental injuries, neglect, and abuse, as well as lower developmental scores (Aber, Bennett, Conley, & Li, 1997). Early malnutrition and disease leave a residue that is evident in adult height and late-life disease (Bozzoli, Deaton, & Quintana-Domeque, 2009). Poor children are more likely to have low birth weight, more hospitalizations, poor health, and higher infant mortality (Brooks-Gunn & Duncan, 1997). Thus, because happy parents earn on average higher incomes, they are more likely to possess resources that allow them to have more and healthier children.

Creativity, an important human trait throughout human evolutionary history, involves the capability to plan, the ability to see new connections, and sociality so that useful inventions are passed on to others. Research findings show a connection between positive moods and creativity. A large experimental research literature shows that people who are put in a good mood tend to be more creative and show greater cognitive flexibility compared with control groups (e.g., Baas, De Dreu, & Nijstad, 2008; Isen, Daubman, & Nowicki, 1987). People put in a positive mood show broader attention,

both externally and internally (Rowe, Hirsh, & Anderson, 2007), as well as attend more to the contextual surround of stimuli (Schmitz, DeRosa, & Anderson, 2009). Similarly, the Duchene smile, which is associated with positive feelings, is related to attentional breadth and flexibility (Johnson, Waugh, & Fredrickson, 2010). For example, accurate diagnoses by physicians were quicker when they were put into a positive mood, owing to the fact that they broadly integrated information more quickly (Estrada, Isen, & Young, 1997).

Workers are more creative when they experience positive moods (Amabile, Barsade, Mueller, & Staw, 2005; George & Zhou, 2007). Positive affect, but not distress, is associated with curiosity (Jovanovic & Brdaric, 2012). Happy people are more likely to feel energetic and interested in doing things, and score higher on curiosity scales (Leitzel, 2000). Thus, greater creativity may result from positive moods both because of more flexible and broader mental processing, but also because feelings of energy can motivate trying out new ideas.

Our explanation of art and creativity adds to the evolutionary explanation of these phenomena articulated by Miller (2000), who argued that artistic and creative expressions are courtship displays evolutionarily designed to attract mates. We suggest that they can also be the results of positive mood offset. Once again, however, our view is not in direct conflict with Miller's; both views can provide partial evolutionary explanations for the origin of art and creativity. Our view is able to explain artistic and creative expressions in both sexes, whereas Miller's view is primarily applicable to men's courtship displays to attract women.

Feelings of energy are an inherent component of positive emotions (Watson, Clark, & Tellegen, 1988). Research participants exposed to humor thereafter felt more energetic (Dienstbier, 1995). Thus, positive moods increase the likelihood that happy people will be both energetic and creative, and these characteristics are often adaptive.

Perhaps more than any other species, human beings plan for the future and postpone immediate gratification for later greater rewards. Humans are unique in the degree to which they can plan for future events, but long-term planning requires the ability to postpone immediate gratification. Positive moods are associated with self-regulatory abilities. Adolescents who have more positive emotions exhibit more critical thinking, cognitive flexibility, creativity, and active planning compared with adolescents who experience less positive feelings (Gilbert, 2012). Experimental research indicates that positive moods increase self-regulation (Aspinwall, 1998; Isen, 2000). For instance, in a series of experiments, research participants put in a good mood were able to resist an immediate small reward for a much larger later reward better than those in a neutral-mood control group (Fry, 1975; Lerner, Li, & Weber, 2013). In contrast, people in a sad mood were likely to accept a tiny current reward rather than a much larger reward in the near future. Positive mood inductions strengthened people's self-regulatory abilities after they had

Type of Evidence	Success in Three Domains		
	Social Life	Work and Employment	Health, Longevity, and Fertility
Correlational	The happiest people have high levels of social support	Happy workers receive higher supervisor ratings	Happy people have higher fecundity, and depressed people are less fertile
Longitudinal	Happiness predicts likelihood of marrying, higher quality marriages, and a lower rate of divorce, controlling for possible confounds	Happiness predicts higher incomes, and lower unemployment. Workplace satisfaction predicts future productivity	Happiness predicts later health and longevity, controlling for other initial conditions
Laboratory experimentation	Induced positive moods lead to greater sociability and self-confidence	Induced positive moods lead to greater creativity, productivity, and delay of gratification	Induced positive moods strengthen immune function
Alleviation of depression in controlled experiments on treatments	Treatment of depression leads to more social support and marital adjustment	Those treated for depression have higher employment, miss fewer workdays, and are more productive	Therapy for depression improves health-related quality of life
Dynamic association of the variables over time	Positive moods are accompanied by greater feelings of sociability, even when people are alone	Employees are more creative at times when they are in a positive mood	Respondents feel healthier and more energetic when they are in a good mood
Mediators of the dynamic causal process have been discovered	People in a good mood feel more self-confident, and others like them more. They are more likely to expect social interactions to be rewarding	Happy workers have lower turnover, create greater customer loyalty, and are better organizational citizens	Happy moods produce stronger immune function, cardiovascular recovery after stress, and more health-producing behaviors

**Figure 1.** Examples of different types of evidence for the causal benefits of positive mood offset.

been depleted by a prior self-regulation task (Tice, Baumeister, Shmueli, & Muraven, 2007). Although our evolutionary past is different in many ways from modern life, planning, self-regulation, and creativity would certainly have been critically important then as it is now.

An absence of positive moods interferes with executive functioning. Depressed individuals suffer deficits in problem solving and planning (Fossati, Ergis, & Allilaire, 2002). Depressed people suffer substantial deficits in executive functions such as planning, with strong effect sizes varying from .32 to .97 (Snyder, 2013). They also are poorer at mental flexibility and control, and show cognitive signs paralleling those of brain damage (Veiel, 1997). Depressed individuals also were found to be deficient in visual-motor tracking and verbal fluency.

### Causal Direction

Figure 1 presents the types of evidence that point to a causal path going from positive moods to adaptive outcomes. Although psychologists give high priority to formal experiments in confirming causality, other types of evidence are needed as well. For one thing, it is important to establish not just that something can cause an outcome, but also that it actually does so in everyday life. Furthermore, experimental outcomes are always probabilistic (some people are affected

and some are not, even in the experimental group) and do not establish whether the putative cause is necessary or sufficient for the outcome. Experiments also usually do not establish the boundary conditions under which the causal relation holds. Thus, in the table, we describe the outcomes of methodologies because they help to establish and understand causal associations in the everyday world outside the laboratory.

The figure suggests that moods causally influence behaviors that are helpful to survival and reproduction. The findings presented in the figure are meant to be illustrative of the wide range of types of causal evidence that are available and are not intended to be thorough reviews of each area. Longitudinal studies suggest causality because initial happiness predicts later outcomes, controlling for possible confounds and other causes. Laboratory experimental mood-induction studies and randomized controlled trials of treatment for depression tend to strongly support the idea that causality can move from positive affect to outcomes that are beneficial for survival and reproduction. The data also suggest that low positive affect can lead to negative life outcomes. Furthermore, certain mediators of the causal connections have been uncovered, adding to our confidence. Although one might attribute the effects of mood manipulations in the laboratory to the cognitions accompanying the mood change, diverse manipulations of mood—from music

to humorous movies, and from small gifts to recalling past events—have led to similar outcomes.

The data suggest that a causal arrow only from adaptive outcomes to positive moods is insufficient to completely describe the association between the two. A common evolutionary explanation of emotions (Nesse, 1990) may be true, but the figure reveals that it is likely to be incomplete. It seems likely that some causal influence moves from positive moods to certain outcomes. Because positive moods seem to influence multiple behaviors that are relevant to reproduction and survival, it is a reasonable hypothesis that positive moods were selected for during our evolutionary history.

### Does Positive Mood Offset Result From Evolution?

The positive mood offset is almost universal in humans, and the pervasive tendency to experience positive moods clearly promotes behaviors that are beneficial to survival and reproduction. However, to make the connection between evolutionary fitness and positive mood offset more compelling, we must address additional questions. First, is there a genetic basis of mood propensities? Second, do people in a negative mood tend to move back toward a positive mood, whereas the converse is not true? Third, are the behaviors facilitated by positive moods likely to have benefitted people in our evolutionary ancestral past? Finally, if positive moods are adaptive, why are people not euphoric all of the time?

#### *Mood Propensities Have a Genetic Basis*

For evolution to select for positive mood offset, our moods and emotions must be influenced by genes. Extensive evidence shows that positive feelings are partly heritable and that genes influence our propensity to certain moods. Experimental work with animals indicates that temperament characteristics are partly genetic in origin and are subject to selection. Studies of selection of certain temperaments in animals as diverse as cattle, dogs, foxes, and mice indicate that over generations, characteristics such as docility, fear, aggressiveness, and temperament can be influenced by selective breeding (e.g., Gauly, Mathiak, Hoffmann, Kraus, & Erhardt, 2001; Goddard & Beilharz, 1983; Lagerspetz & Lagerspetz, 1971; Trut, 2010). Temperaments are heritable, are linked to fitness, and are of importance to evolution (Reale, Reader, Sol, McDougall, & Dingemans, 2007). The selective breeding studies show that animals can be selected for temperament and that mean differences occur over time between groups selected for different temperaments. Happiness in chimpanzees is highly heritable (Weiss, King, & Enns, 2002).

Among human beings, heritabilities for positive affect are high both for men and women, .60 and .59, respectively (Boardman, Blalock, & Button, 2008). Lykken (1999) described strong heritabilities for happiness based on the

Minnesota Twin Study, and Lesch et al. (1996) reported on a gene related to serotonin reuptake and anxiety. Likewise, the heritability of life satisfaction is high (Stubbe et al., 2005). A meta-analysis of five large studies of depression concluded that familial associations are largely genetic in origin (Sullivan, Neale, & Kendler, 2000). Even specific forms of subjective well-being such as job satisfaction and work stress have a genetic component (e.g., Judge, Ilies, & Zhang, 2012).

Several types of positive feelings and sociability show strong genetic connections, whereas shared environments explain little of the common variance between sociability and positive feelings (Eid, Riemann, Angleitner, & Borkenau, 2003). In conclusion, based on studies of heritability, selective breeding, and single gene polymorphisms, there appears to be a considerable genetic effect on positive affect. Thus, positive mood offset would have been subject to natural selection.

#### *People in Negative States Tend to Move Back to a Positive Mood*

As reviewed above, although people may react to negative events in most cases, they revert over time back to a positive state. For example, to some degree, people adapt to widowhood, divorce, disability, and unemployment over time (Lucas, 2007). Although respondents do not always fully return to their former levels after the negative event, they usually adapt sufficiently to place them in the positive zone.

People tend to rebound quickly from a negative mood and are much more likely to move from a negative to a positive mood than from a positive to a negative mood. We reanalyzed the Diener and Larsen (1984) sample regarding times during the early part of the day when respondents reported being in a negative mood, and then examined their next mood of that day following the negative report. Eighty percent of the respondents were on average in a positive mood in the moments later in those days following their negative mood reports. Following a positive mood early in the day, virtually all respondents reported a positive mood later in the day. Only 1 of 42 respondents was on average in a negative mood following positive mood reports earlier in the day. Based on all mood reports by all respondents, a negative mood following a positive mood earlier in the day was reported only 11% of the time. Regardless of people's current mood, several hours later, they are likely to be in a positive mood.

Surprisingly, only a minority of people show severe problems immediately after a natural disaster (usually less than 30%), and most experience only transient distress (Bonanno, Brewin, Kaniasty, & LaGreca, 2010). Bonanno et al. (2010) stated, “. . . the most common outcome across studies tends to be a relatively stable trajectory of healthy adjustment, or resilience” (p. 11). It appears that people frequently move back toward their original positive state after a bad situation, and after very bad and ongoing events, they often return to a

positive level of subjective well-being, even if they are lower than before the event. Extensive evidence shows that people tend to react strongly to negative events but then rapidly dampen and minimize them after the initial response (Taylor, 1991). Thus, people in a negative state spontaneously tend to move back to positive, whereas the converse of moving from positive to negative requires a negative trigger. In addition, people across cultures tend to show faster fading of memories for negative than for positive events (Ritchie et al., in press). What psychologists label “resilience” might characterize the normal state of affairs in most situations for most people.

### *The Behaviors Induced by Positive Moods Likely Would Have Benefitted Our Ancestors*

Our prehistoric ancestors before the advent of agriculture lived in small groups or bands of related individuals that were multigenerational in nature. These individuals used tools that they invented and created, which were used for a variety of survival tasks. These people mastered the use of fire, and passed down knowledge extensively from one generation to the next, and across groups. They often hunted and gathered food in cooperative groups. During the later Paleolithic period, people produced art work and engaged in spiritual practices such as ritual burials. Once they left Africa, people spread relatively rapidly across much of the earth and learned to live in a wide variety of environments. Only the most remote and harshest places were not inhabited by humans. Thus, everything we know about our ancestors suggests that their behaviors are the types that are produced by positivity offset.

It is likely that social relationships and the sociability that enables them were even more important for our ancestors than they are for us today (Caporael, 1997). Our ancestors lived as hunter-gatherers in small bands (Dunbar, 1992). Molecular genetic evidence suggests that our ancestors likely practiced female exogamy (Seielstad, Minch, & Cavalli-Sforza, 1998); ancestral men remained in their natal groups all their lives and ancestral women married into neighboring groups where they remained all their adult lives (Geary, Byrd-Craven, Haord, Vigil, & Numtee, 2003). In such settings, it is extremely important to stay on good terms with everyone and not to damage one’s social relationships (Caporael, 1997).

In contemporary society, we have the option of leaving some relationships that are no longer working for us and moving on to new circles of friends. We can join another church, get a new job, move to a different neighborhood, and make new friends. These are options that our ancestors likely never had. They had to maintain lifelong friendships and alliances with everyone in their band. Given the available evidence, it is reasonable to assume that friendship ties and alliances were an important and ubiquitous aspect of life in

small hunter-gatherer bands. They might be a major reason why positive mood offset has been evolutionarily selected.

### *Problems of Intense Positive Moods and the Benefits of Negative Emotions*

We are agnostic on the issue of whether the causal mechanism we posit—where positive mood is evolutionarily selected for its beneficial reproductive consequences—is still in operation today and people are increasingly becoming happier, or whether the positive mood offset has reached a stable level due to balancing selection or trade-offs. For example, positive moods may increase optimism, but individuals who are “too happy” and too optimistic might become less cautious and disregard potential risks, thereby becoming more likely to die of environmental dangers. We will leave to future research the question of whether human beings are still becoming happier and positive mood offset is still evolutionarily selected today, and whether even greater levels of positive moods would be more adaptive.

Our evolutionary argument does not suggest that people’s moods ought to be intensely positive. Although intensely positive moods might be adaptive on some occasions, they can have negative effects. For example, evidence suggests that intensely aroused positive moods might be detrimental to health and survival (Pressman & Cohen, 2005). Furthermore, people with the highest levels of happiness may do somewhat less well in the work domain than moderately happy people (Oishi, Diener, & Lucas, 2007). Beyond the higher risks that intensely happy people may take, intensely positive moods cut the person off from the potential reward value of good events. As with most beneficial traits, there is likely to be an optimum level beyond which further increases would be detrimental.

Intensity, frequency, and duration of positive affect are distinct features of affective experiences (Schimmack & Diener, 1997; Schimmack, Oishi, Diener, & Suh, 2000). Most people experience intense emotions infrequently, and experiencing intense positive moods often might be detrimental (Gruber, Mauss, & Tamir, 2011). The positive mood offset is in the mild to moderate intensity range. Most people feel negative emotions occasionally and rarely feel intense positive moods (Diener, Sandvik, & Pavot, 1991). Thus, our hypothesis is not that people are always in a positive mood, or that they should be. In some situations, negative emotions are likely to produce desirable outcomes (e.g., Forgas, 2007; Gruber et al., 2011) and positive emotions can produce less desirable outcomes in some situations (e.g., McNulty, 2010; Melton, 1995; Tan & Forgas, 2010). Grant and Schwartz (2011) argued that happiness is a good thing, but one can have too much of this good thing, as is true with many desirable characteristics. Thus, although positive mood offset is beneficial, this does not imply that people should feel extremely positive all of the time.

How can we account for the common observation that our negative emotional reactions are often stronger than our positive ones? Our negative emotions can capture our attention and motivate intense behavior. Taylor (1991) reviewed evidence indicating that negative events rapidly and intensely mobilize a set of physiological, cognitive, and behavioral responses. In other words, people often react strongly to threat and other negative events. However, Taylor also reviewed evidence showing that people usually rapidly dampen and minimize negative emotions, so that they are short lived. Thus, negative emotions can be strong and memorable, but they tend not to persist. Positive emotions do not show this pattern. Instead, positive emotions exist at a mild level most of the time, even with very weak positive or neutral input (Cacioppo & Berntson, 1994, 1999).

## Depression

In contrast to positive moods, depression is much more infrequent. A significant aspect of depression is loss of pleasure, energy, and interest—a loss of positive affect (Nutt et al., 2007). Depression entails as a central component an absence or very low levels of positive feelings. Clinical depression involves anhedonia, the loss of pleasure from activities that are normally enjoyable. Thus, it is informative to find that clinical depression is infrequent, and that it is very debilitating when it does occur.

Most individuals live their entire lives without ever experiencing severe depression. Kessler, Chiu, Demler, and Walters (2005) found in a national probability sample of the U.S. population that 2.2% had serious depression during a 1-year period. Given that more than half of depression is remitted in less than a year, at any one time, 1% of the population is likely to be severely depressed. Taking milder forms of depression into account, 6.7% suffered sometime during the 1-year study (see also Kessler et al., 2003). Most people recover from depression so that it is not a permanent state. One study found that 88% of depressed persons had recovered by 5 years, and half recovered within 6 months (Keller et al., 1992). Relevant to the proposal that most people are happy is the finding that only 2.7% of the population was found in their lifetime to have chronic depression, defined as dysthymia lasting 2 or more years (Satyanarayana, Enns, Cox, & Sareen, 2009). Thus, more than 97% of the population never experiences prolonged depression. Although all people suffer bouts of unhappiness, these are rarely prolonged over long periods of time. In sum, depression is a relatively infrequent occurrence, with the majority recovering in less than a year.

If depression is comparatively infrequent compared with positive moods, why is it considered such a problem, and why does it receive so much research and mental-health attention? It is the severity of the debilitating effects of depression—misery, health problems, work issues, and substantial social deficits—that makes it such a severe problem

despite its infrequency. The absence of positive mood offset seen in depression creates problems in virtually all areas of the afflicted person's life and can be more debilitating than many physical illnesses.

## Could Mood Neutrality Be the Offset?

It might be argued that mood neutrality should be the offset value, and positive and negative moods both occur only in response to desirable or undesirable events, respectively. This is indeed what a common evolutionary model suggests (Nesse, 1990). Several considerations argue against this possibility. There is the empirical fact that mood neutrality is rarely reported. Diener and Iran-Nejad (1986) found that on only 1 occasion out of 1,416 did anyone report no feelings whatsoever (however, see Mesquita & Karasawa, 2002, for an exception among Japanese). Furthermore, people seem to perceive positivity even in what appears to be neutral stimuli, so that the perceived environment tends to be positive. When people are in a negative mood, they tend to move back toward a positive mood even in the absence of any strong positive events.

## Scaling Issues Regarding the Neutral Point

A question might arise regarding whether reporting higher levels of positive affect than negative affect represents truly positive moods. It is often found that negatives are stronger than positives, and therefore, a higher number on positive versus negative moods might not truly represent moods that are more positive than neutral. Fortunately, much evidence for positive mood offset goes beyond self-report evidence that depends on ratings on comparing positive mood ratings with negative mood ratings. For example, bipolar survey scales have been used that range from positive to negative, with an explicit neutral midpoint. In the experience-sampling scale described earlier, 69% of the times participants were signaled they reported being interested in what they were doing, in contrast to 25% of the time feeling bored. Similarly, 67% of the time they felt above neutrality in cheerfulness, and only 22% of the time did they report being irritable. Sixty-five percent of the time participants reported feeling that the world is beautiful and only 18% of the time did they feel that it is ugly.

These same above-neutral patterns have been found when bipolar scales have been used with large and representative samples (e.g., Campbell, Converse, & Rodgers, 1976). For instance, F. M. Andrews and Withey (1976) used bipolar scales with a neutral midpoint to assess the satisfaction with various domains in broad samples. They found that the vast majority of every sample they examined rated diverse domains—from their lives as a whole, to their friends, to their job—above the neutral point of the scale. The only exception was satisfaction with local and national

government. Whether the scale was anchored with smiling versus frowning faces, shaded circles, or verbal adjectives, most ratings were above the neutral point of the scale in satisfaction.

Furthermore, many measures ask respondents how frequently they feel various moods, not how strongly they feel them. These data are very relevant to positive mood offset, which concerns feeling positive most of the time rather than the intensity of their positive feelings. For example, Campbell (1981) reported data from several large samples showing that people report experiencing positive feelings most of the time and report negative feelings much less of the time. Furthermore, positive mood offset is found with physiological, memory, and reaction time measures. Thus, positive mood offset is unlikely to be an artifact of self-report measurement.

### *Individual, Cultural, and Species Differences*

There are individual and cultural differences in moods (e.g., Diener et al., 1991; Diener & Suh, 2000; Ito & Cacioppo, 2005; Oishi, 2012) such that people vary in the amount of positive and negative affect they experience and report over time. Are these individual and cultural differences compatible with the idea of evolutionary selection of positive mood offset? Many human characteristics that are thought to have been sculpted by evolution show individual and cultural differences—high intelligence, long-distance running ability, sociability, language ability, and so forth (Kanazawa, 2009, 2010; Tooby & Cosmides, 1990). Although evolution might favor a particular characteristic such as positive moods, it might not select for a specific value on that characteristic. A threshold value may be selected for, but above that values may vary, and different values might be most adaptive in different circumstances. In fact, perhaps an absence of positive moods was heavily selected against, whereas a specific level of positive mood offset might not have been consistently advantageous for it to be selected. The fact that people who experience more positive affect now seem to be most successful raises the possibility that the trait is still under selective pressure and has not yet reached an equilibrium point.

We know so little about positive moods and positive mood offset in other species that it is perhaps premature to speculate on this topic. The challenge is to assess moods in various species. We conjecture that several factors might be relevant to the existence of positive mood offset in other species. There must be behavioral flexibility so that behavior can be affected by moods. Organisms such as ants with mostly hardwired behavioral patterns are not likely to be affected by emotions and moods. In contrast, the more flexible behavior of mammals should allow the influence of positivity offset. Another variable that might be relevant is the amount of danger that the species regularly experiences. Elephants, for instance, are at much less risk of attack than are antelopes, and the latter might therefore have an offset value set more

toward negative mood (i.e., nervousness). Nervousness among prey species is perhaps more likely than it is among those who are at the top of the food chain, or who are virtually invulnerable to attack. Other factors that might influence the level of positivity offset of a species are longevity, a prolonged childhood, a big brain, and behavioral flexibility, and the ability to build and maintain social, material, and cognitive resources. This area is wide open for future study.

### **Needed Scholarship and Research**

Our review suggests that mild positive affect, as assessed by both self-report and non-self-report methods, appears to be ubiquitous. Evidence also indicates the many benefits of positive emotions. People who have a preponderance of positive emotions thrive in a number of domains. However, several questions need to be answered to confirm or disconfirm this hypothesis.

### *Alternative Explanations*

The most prominent alternative explanation of our finding that most people are happy is that people report widespread happiness because circumstances are relatively benign compared with our ancestral past. Even those living in what currently is considered poverty might be advantaged compared with our distant ancestors, whose survival was perhaps a daily struggle. Evidence suggests that current hunter-gatherers do not work longer hours than their agricultural counterparts to obtain basic necessities (Sackett, 1996) and that they have comparatively long life spans (Gurven & Kaplan, 2007). This finding suggests that the human ancestral past might not always have been brutish and terrible. Nonetheless, modern hunter-gatherers do not necessarily reflect life in the distant past. Thus, a more systematic analysis of the Paleolithic life of humans and an analysis of positive affect in those with similar lives would prove instructive. How happy are humans living in the closest conditions to those likely to have characterized our Paleolithic past (Buss, 2000)? Are there any present-day circumstances that lead to long-term moods in the negative zone even after a period of adaptation?

### *Causality*

We have attempted to show that positive moods cause certain adaptive outcomes such as better social relationships. Our evidence is based on long-term longitudinal studies in which positive feelings precede positive outcomes, experimental evidence in which positive mood inductions lead to sociability, over-time experience-sampling studies in which sociability and positive affect move up and down together, and process studies in which psychological processes such as feeling sociable are linked to positive feelings. In the experimental studies, diverse types of positive mood manipulations

have been used, strengthening the case for the causal role of moods. Health processes such as cortisol production, blood pressure, and immune strength have been shown to be influenced by positive moods, and in turn, these processes influence health. Nonetheless, we recognize the need for more extensive studies on the causal influence of positive feelings. For instance, the role of positive moods in fertility has been analyzed in relatively few studies, and the role of positive moods in grandparenting has not received sufficient research attention. Research also is needed to assess the effects of long-term increases in positive mood in randomized controlled trials.

### *Paleolithic Analyses*

To draw inferences about evolutionary origins for positivity offset, an analysis of the behaviors essential to adaptation in the Paleolithic past, and the potential rewards and costs of those behaviors, is needed. Given what is known about life in our ancestral past, what behaviors would be helpful versus detrimental, and how are positive and negative emotions related to those behaviors?

### *Costs Versus Benefit Analyses*

Although benefits often derive from positive affect, the behaviors following from positive feelings also have costs and risks, and can be maladaptive in some situations. For example, creativity has the benefit of people thinking of new technologies that can aid survival and reproduction. However, creativity can also expose people to risks and to forms of behavior that turn out to be disadvantageous. Similarly, the cooperation and altruism that often seem to follow positive emotions have clear costs as well as benefits. Thus, a thorough evolutionary analysis of positivity offset will require a systematic analysis of the costs and benefits of the behaviors that positive affect seems to promote. A challenge in this endeavor is to specify the likely costs and benefits of these behaviors in our ancestral past.

### *Optimal Levels of Positive Affect*

Our hypothesis does not suggest that evolution would have selected for yet happier and happier individuals. Certainly, there would be optimum levels, and above that level, the risks of positive moods would offset the benefits, for example, in exposure to dangers. Our research has shown that in some domains, moderately happy individuals perform better than the super-happy. Research by Gruber and her colleagues (2011) shows that in certain circumstances, people experiencing negative affect perform better than people in a neutral or positive mood. Thus, there is certainly an optimal range of positive moods. What we do not know is how this optimal level might vary by the type of behavior being considered and by the circumstances in which the person lives.

Furthermore, the optimal levels of positive moods in the economically developed world might be different from those in the Paleolithic past. Much is unknown regarding optimal moods, and very little research has so far been conducted. Thus, we see this as a very important area for future research.

### *Positive Mood Offset Measurement*

Concerns arise about the validity of self-report measures and their susceptibility to biases of various kinds. For instance, perhaps people report positive moods when negative moods are absent because negative moods weigh so heavily that their absence is considered positive. We have attempted to go beyond self-report surveys in examining other measures of moods. Nonetheless, more research should be conducted in this area, for example, using physiological and response-time measures of positive moods in broader samples around the globe, as well as samples of individuals who live under conditions of hardship or deprivation.

### *Specifically Assessing Positive Mood Offset*

We reviewed research that is sometimes based on moods, sometimes on emotions, and sometimes on satisfaction. For instance, we reviewed health studies that used life satisfaction in long-term longitudinal studies rather than positive affect per se. In defense of this broad bandwidth approach using several types of measures, we point to the overlap among these constructs. For example, we found in an experience-sampling study that people who reported positive levels of life satisfaction at that moment experienced more positive than negative affect on 87% of those occasions. Similarly, in the GWP, 79% of respondents reporting life satisfaction above neutral also reported experiencing enjoyment most of the previous day. Thus, although imperfect, using life satisfaction as a proxy for positive affect is not unreasonable when an explicit measure of positive affect was not available.

Although emotion theorists draw a distinction between moods and emotions, operationally, it was not possible to do this in the majority of studies that we reviewed. Many of the experimental studies seem to produce emotions (responses to specific stimuli) and many of the experience-sampling studies are probably examining primarily moods. However, without dense and frequent measurement over time, it is impossible to determine in the existing studies which concept is being studied. We believe that positivity offset is a mood phenomenon in that it does not occur in response to a specific event, but in the existing literature, we cannot be certain that the mood reports are not emotional in nature. Thus, separating positive emotions from moods is an important task for future research. Similarly, our hypothesis is about positive mood offset, but much of the outcome research is about differences in positivity rather than about positive mood offset per se. Thus, in future research, the specific

impact of positive mood offset per se needs to be separated from momentary moods and emotions.

## Conclusion

We present an evolutionary hypothesis about positive mood offset, which is intended to supplement, not supplant, common evolutionary models of affect. We propose that positive mood offset may have been a psychological adaptation whose ultimate function is to facilitate the efficient operation of other psychological mechanisms. Our perspective can explain why most people are happy most of the time. According to our hypothesis, humans have been evolutionarily selected to have a positive mood offset, and the higher-than-neutral level of happiness is genetically transmitted from parents to children, while chronic depression and lack of positive affect have been selected out. Although our opposable thumbs, big brains, and upright posture have all received in-depth attention and study as reasons for human success, it is time to consider how positive mood offset might have also contributed.

We hypothesize that human beings have mildly to moderately positive set-points because long-term baseline levels of happiness are not just an indicator of current fitness levels but are also a primary driver to increase reproductive success. People are happy most of the time because they are descended from ancestors who were happier and engaged in fitness-maximizing behavior more frequently than their neighbors who were less happy. Current good and bad events can move people temporarily away from their baseline levels, but people will return toward that level over time. Long-term bad and good circumstances can move the baseline up or down, but only within a range. It remains to be determined whether further increases in the human baseline for positive feelings will be advantageous in the life circumstances of the modern world.

Scientific debates continue about the evolutionary role of emotions and moods, with differing theoretical explanations being offered. We do not propose to settle those long-standing debates. Rather, we hope to add two findings that must be considered in theories of moods and emotions—that mild long-term positive moods are ubiquitous in humans and are generally adaptive in the long run. We believe our review provides strong evidence for both of these assertions, even if we have not proved them beyond a reasonable doubt. If these assertions are indeed true, theories of moods and emotions need to explain them.

Our hypothesis can explain several findings that other models do not explain. For example, our hypothesis explains why people around the world, even in what appear to be difficult circumstances and in varying cultures, report positive levels of moods, recall more positive than negative life events, and show cognitive biases indicating positivity. Our hypothesis also explains why people move back to the positive zone in mood reports after negative events. However,

several types of studies are needed to confirm our hypotheses and to fill in important details. Thus, we are optimistic that our proposal can stimulate rigorous research to examine and refine our hypothesis.

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