The Savanna Theory of Happiness

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Abstract and Keywords

Happiness is a topic that has received significant attention in recent years, as researchers and governments alike have become increasingly interested (Diener, Oishi, & Lucas, 2015). For Americans, happiness has always been important, as evidenced by "happiness" appearing twice in the Declaration of Independence and even a third time in an earlier draft penned by Thomas Jefferson. More recently, Baker (2014) identified the pursuit of happiness as one of 10 core American values. Happiness, however, is not just an American or Western concept (Oishi, Graham, Kesebir, & Galinha, 2013). In Bhutan, for example, gross national happiness (GNH) has replaced gross domestic product (GDP) as the country's main development indicator (Biswas-Diener, Diener, & Lyubchik, 2015).

In the past few decades, positive psychologists have accumulated an impressive amount of knowledge on who is happier than whom, when, and how (Diener, 2012). Yet, despite all the attention and research, very little if anything is known about why some individuals are happier than others. In this chapter, we describe an evolutionary perspective called the savanna theory of happiness (Kanazawa & Li, 2015; Li & Kanazawa, 2016), which, along with various lines of associated empirical support, can potentially explain a great deal of why some individuals garner happiness more easily than others.

The Savanna Theory of Happiness

With a few exceptions (Diener, Kanazawa, Suh, & Oishi, 2015; Heintzelman & King, 2014), positive psychologists have not drawn on insights from evolutionary psychology, the branch of psychology that deals with ultimate causations of psychological phenomena (Buss, 1995; Cosmides & Tooby, 2013; Tooby & Cosmides, 1992). One of the fundamental observations in evolutionary psychology is that, just like any other organ of any other species, the human brain is designed for and adapted to the conditions of the (p. 172) ancestral environment, not necessarily the current environment, and is therefore predisposed to perceive and respond to the current environment as if it were the ancestral environment (Tooby & Cosmides, 1990). Known variously as the Savanna Principle (Kanazawa, 2004b), the evolutionary legacy hypothesis (Burnham & Johnson, 2005), or the mismatch

hypothesis (Hagen & Hammerstein, 2006; Li, Lim, Tsai, & O, 2015), this observation suggests that the human brain may have difficulty comprehending and dealing with entities and situations that did not exist in the ancestral environment, roughly the African savanna during the Pleistocene Epoch.

The Savanna Principle explains why some otherwise elegant scientific theories of human behavior, such as game theory, often fail empirically, because they posit entities and situations that did not exist in the ancestral environment. For example, nearly half the players of one-shot prisoner's dilemma games make the theoretically irrational choice to cooperate with their partner (Sally, 1995). The Savanna Principle suggests that this may be because the human brain has difficulty comprehending completely anonymous social exchange and absolutely no possibility of knowing future interactions (which together make the game truly one-shot and defection the only rational choice) (Hagen & Hammerstein, 2006; Kanazawa, 2001). Neither of these situations existed in the ancestral environment, where all social exchanges were in person and potentially repeated; however, they are crucial for the game-theoretic prediction of universal defection.

Further, recent developments in evolutionary psychology indicate that general intelligence may have evolved to solve evolutionarily novel problems (Kanazawa, 2004a, 2010). Evolutionarily novel problems are those that our ancestors did not encounter routinely and repeatedly in the ancestral environment, whereas evolutionarily familiar problems are those that our ancestors encountered routinely and repeatedly in the ancestral environment. Psychological mechanisms evolved to solve adaptive problems that recurrently presented themselves in different domains of life throughout human evolutionary history, such as social exchange, infant care, and incest avoidance (Tooby & Cosmides, 1990). They are domain-specific and operate only within narrow domains of life, taking as input very specific types of information.

Recent theoretical developments suggest that general intelligence may also have evolved as such a domain-specific evolved psychological mechanism. It may have evolved to allow individuals to solve a wide variety of non-recurrent adaptive challenges that also directly or indirectly affected survival or reproduction. All such non-recurrent adaptive problems were evolutionarily novel. General intelligence may thus have evolved to solve evolutionarily novel problems, as a psychological adaptation for the domain of evolutionary novelty.

This suggests that the evolutionary constraints on the human brain—on the operations of the evolved psychological mechanisms—proposed by the Savanna Principle may be stronger among less intelligent individuals than among more intelligent individuals. Even though all humans may have these evolutionary constraints on their brain, making it more difficult to comprehend and deal with evolutionarily novel entities and situations, such constraints may operate to a greater extent among less intelligent (p. 173) individuals than among more intelligent individuals. Less intelligent individuals may therefore have greater difficulty comprehending and dealing with such evolutionarily novel entities and situations than more intelligent people do. More intelligent individuals, who possess higher levels of general intelligence and thus greater ability to solve evolutionarily novel problems, may face less difficulty in comprehending and dealing with evolutionarily novel entities and situations than less intelligent individuals do.

Consistent with this reasoning, more intelligent individuals are more likely to make the theoretically rational choice to defect in one-shot prisoner's dilemma games (Kanazawa & Fontaine, 2013). This may be because more intelligent individuals are better able to comprehend the evolutionarily novel situations of complete anonymity and absolutely no possibility of knowing future interactions and make the rational decision to defect. In contrast, less intelligent individuals may have greater difficulty comprehending such evolutionarily novel situations, and, as a result, make the theoretically irrational (albeit evolutionarily rational) decision to cooperate.

The Savanna Principle in evolutionary psychology, applied to happiness, suggests that it may not be only the consequences of a given situation in the current environment that influence individuals' happiness but also what its consequences would have been in the ancestral environment. Having implicit difficulty comprehending and dealing with evolutionarily novel situations, the human brain may respond to the ancestral consequences of the current situation and individuals' happiness may fluctuate accordingly. Further, the effect of such ancestral consequences of current situations on happiness may be greater among less intelligent individuals, for whom the evolutionary constraints specified by the Savanna Principle are stronger, than among more intelligent individuals, for whom they are weaker.

The savanna theory of happiness therefore suggests that, having implicit difficulty comprehending and dealing with evolutionarily novel situations, the human brain may respond to the ancestral consequences of the current situation and individuals' happiness may fluctuate accordingly. Situations and circumstances that would have increased our ancestors' happiness in the ancestral environment may still increase our happiness today, and those that would have decreased their happiness then may still decrease ours today. The savanna theory further suggests that such effects of ancestral consequences on current happiness may be stronger among less intelligent individuals than among more intelligent individuals.

Positive psychologists have long debated the precise definition of happiness and related concepts, such as life satisfaction and subjective well-being (Miao, Koo, & Oishi, 2013; Oishi et al., 2013; Pavot & Diener, 2013). The savanna theory of happiness is not committed to any particular definition and is compatible with any reasonable conception of happiness, subjective well-being, and life satisfaction (cognitive vs. affective; hedonic vs. eudaimonic, etc.). The theory does, however, treat happiness as a state, rather than a trait; it cannot by itself explain the (partly genetically determined) "happiness set point" (Headey & Wearing, 1989), to which individuals tend to return after momentary and situational perturbations to their baseline levels of happiness. The theory instead explains such temporary and situational fluctuations from the happiness (p. 174) baseline as a function of the potential evolutionary consequences of the current situations and circumstances.

Available Evidence in Support of the Theory

Various lines of evidence have recently come to light with regard to the savanna theory of happiness. We describe below such empirical evidence in a variety of domains in life.

Ethnic Differences in Happiness

There are observable ethnic differences in happiness (Krause, 1993; Okazaki, 1997; Scollon, Diener, Oishi, & Biswas-Diener, 2004).1 However, there currently exist no comprehensive explanations for such ethnic differences. The savanna theory of happiness provides one potential explanation.

Our ancestors lived their entire lives in ethnically homogeneous groups (Oppenheimer, 2003). A multiethnic society like the United States today is a very recent phenomenon in human evolutionary history. Perhaps the clearest evidence of the evolutionary novelty of ethnic diversity is the fact that, while humans appear to possess evolved psychological mechanisms to classify others automatically by sex and age, they do not possess a comparable mechanism to classify them by ethnicity (Kurzban, Tooby, & Cosmides, 2001). From the perspective of the Savanna Principle, this may be because individuals of varied sexes and ages existed in the ancestral environment and thus were evolutionarily familiar, whereas individuals of varied ethnicities did not exist in the ancestral environment and thus are evolutionarily novel.

In the ancestral environment, being among others who dressed, looked, spoke, and behaved differently from oneself usually meant that one was captured or abducted by a neighboring group or at the very least that one was living without the assistance and cooperation of one's genetic kin and allies. Even though people of different ethnicities can and do live together harmoniously in modern multiethnic societies, being an outgroup minority would have been precarious in the ancestral environment, as neighboring tribes were often unfriendly (Diamond, 2012).

Thus, despite the fact that living among others of different ethnicities today, especially in multiethnic societies like the United States, poses very few negative consequences that threaten survival and reproduction, the human brain, designed for and adapted to the ancestral environment, may nonetheless experience such situations as a potential threat, as it would have been in the ancestral environment. Individuals may consequently experience lower levels of happiness. For instance, in a recent study, using an ingenious within-subject design, Burrow and Hill (2013) showed that train passengers experienced increased distress and negative mood when they were surrounded by (p. 175) passengers of different ethnicities. The savanna theory of happiness therefore suggests that the human brain may implicitly experience being surrounded by others of different ethnicities and being an ethnic minority as a potential threat, and, accordingly, happiness may be lower in such circumstances.

The theory further suggests that such an effect of living as an ethnic minority among others of different ethnicities on happiness may be stronger among less intelligent individuals. More intelligent individuals may be better able to comprehend the evolutionarily novel situation of ethnic diversity and living as an ethnic minority for what it generally is today—benign and safe. In contrast, less intelligent individuals may have greater difficulty comprehending the same evolutionarily novel situation of ethnic diversity and living as an ethnic minority and may perceive it as if it were in the ancestral environment—potentially dangerous and threatening. Accordingly, less intelligent individuals' happiness may decrease to a greater degree than that of more intelligent individuals when faced with ethnic diversity and living as an ethnic minority. The theory would therefore suggest that ethnic diversity and intelligence may have a statistical interaction effect on happiness.

Specifically, the degree of ethnic homogeneity—the extent to which one lives among others of the same ethnicity—may have a positive effect on happiness and further that such an effect of ethnic homogeneity on happiness will be stronger among less intelligent individuals. In particular, it would lead us to predict that, in a society with a clear ethnic majority population like the United States, the majority—White Americans—will experience greater happiness than all other ethnic groups, but such ethnic differences in happiness will disappear once the ethnic composition of the immediate environment is controlled. It would also lead us to predict that the statistical effect of ethnic composition on happiness will interact significantly with individual's intelligence.

An analysis of the National Longitudinal Study of Adolescent Health (Add Health) confirmed both of these predictions (Kanazawa & Li, 2015). Relative to the reference category of White Americans, all ethnic minorities had significantly lower life satisfaction, even when we controlled for sex, age, education, and current marital status.2 However, once we controlled for the proportion of the state population that was the same ethnicity as the respondent, African Americans and Native Americans no longer had lower life satisfaction than White Americans. While Asian Americans still had lower overall satisfaction than White Americans, this difference was significantly smaller in states with larger Asian populations. The state ethnic composition itself had a marginally significantly positive association with life satisfaction.

The results were the same if we controlled for the proportion of the county population that was the same ethnicity as the respondent. African Americans and Native Americans no longer had lower life satisfaction than White Americans, and, while Asian Americans were still less satisfied overall than White Americans, this difference was significantly smaller in counties in which the Asian population was larger. The county ethnic composition itself had a statistically significantly positive association with life satisfaction.

Figure 9.1 Mean life satisfaction by county proportion own ethnicity.

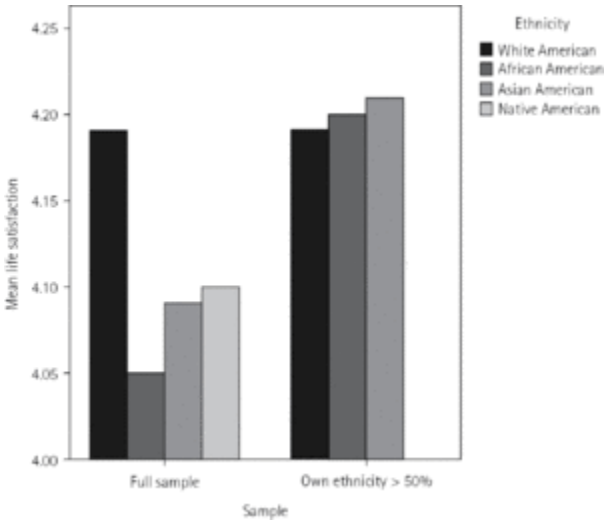

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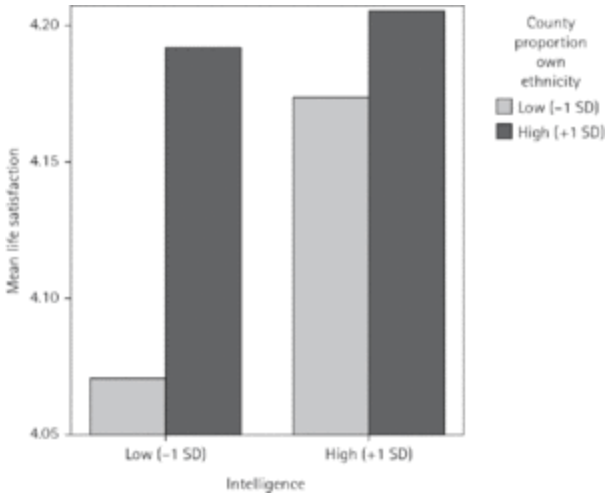
Figure 9.1 shows the statistical effect of county ethnic composition on ethnic differences in life satisfaction. The left panel shows that, in the full sample of Add Health respondents, White Americans had significantly higher life satisfaction (M = 4.19) (p. 176) than African Americans (4.05), Asian Americans (4.09), and Native Americans (4.10) ($F(3, 14773) = 26.868$, $p < .001$). Among Add Health respondents who lived in counties that consisted of 50% or more of their own ethnicity (right panel), however, there were no ethnic differences in life satisfaction ($F(2, 9624) = .004$, $p = .996$). In fact, White Americans (M = 4.19) had very slightly (though nonsignificantly) lower life satisfaction than African Americans (4.20) and Asian Americans (4.21). (There were no Native American respondents in Add Health who lived in majority-Native American counties.)

Figure 9.2 Interaction effect between intelligence and county ethnic composition on life satisfaction.



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Further statistical analyses showed that, consistent with the prediction, the association between ethnic composition and life satisfaction was significantly stronger among less intelligent individuals than among more intelligent individuals. The interaction term between intelligence and ethnic composition was significantly negative for both state and county. Figure 9.2 presents the statistical interaction effect graphically. Among less intelligent individuals (with a mean IQ of 81.39, one standard deviation below the mean), county ethnic composition had a relatively large association with life satisfaction. Those living in a county with a high (.9102) proportion of own ethnicity indicated greater life satisfaction (M = 4.192) than those living in a low (.2816) proportion did (4.071). In contrast, among more intelligent individuals (with a mean IQ of 115.57, one standard deviation above the mean), there was a much smaller difference in life satisfaction between those living in a high proportion of their own ethnicity (4.205) and those living in a low proportion (4.174). (p. 177)

Wave III of Add Health measured other affective states besides life satisfaction, such as depression and self-esteem. However, the patterns of ethnic differences in depression and self-esteem were completely different from those in life satisfaction (Kanazawa & Li, 2015, p. 115). While Asian Americans had the lowest level of life satisfaction, they had the lowest level of depression. At the same time, while White Americans had the highest level of life satisfaction, they had the highest level of depression. And, consistent with previous studies (Graham, 1994; Tashakkori & Thompson, 1991), African Americans had a significantly higher mean level of self-esteem than any other ethnic group. It therefore appeared that the pattern of ethnic differences in life satisfaction that we documented above, where all ethnic minorities had significantly lower levels of life satisfaction than White Americans, and that we partially explained as a function of local ethnic composition, may be unique to life satisfaction and not shared by other affective states like depression and self-esteem.

Population Density

Ruralites in economically developed nations tend to be happier than their urbanite counterparts (Berry & Okulicz-Kozaryn, 2009; Easterlin, Angelescu, & Zweig, 2011).3 Even in the still-developing China, rural residents report higher levels of happiness (p. 178) than urban residents, despite the fact that city dwellers are vastly wealthier (Knight & Gunatilaka, 2010). In the United States, there is an "urban–rural happiness gradient," whereby residents of rural areas and small towns are happier than those in suburbs, who in turn are happier than those in small central cities, who in turn are happier than those in large central cities (Berry & Okulicz-Kozaryn, 2011). What accounts for the differences in happiness across these residential settings? Why are ruralites happier than urbanites?

A current leading explanation for the lower level of happiness in cities is that urban life is accompanied by numerous "social ills," such as anomie, alienation, social disorganization, and depression (Berry & Okulicz-Kozaryn, 2011; Evans, 2009; Wirth, 1938). A functional magnetic resonance imaging (fMRI) study shows that the brains of current city dwellers and those who grew up in cities respond to stress with greater activities than those of current country dwellers and those who grew up in the country (Lederbogen et al., 2011). These studies, however, simply raise further questions: Why does the human brain perceive urban life, but not rural life, as stressful, alienating, and depressing? Why does urban life, but not rural life, induce alienation and depression?

The savanna theory of happiness offers one potential answer. There is converging evidence to suggest that our ancestors lived in groups of about 150 individuals. Comparative data on relative neocortex size in the brain and the group size among 38 genera of primates suggest that the natural size for human groups given its neocortex ratio is about 150 (Dunbar, 1992). Indeed, the mean band or village size of nine modern hunter-gatherer societies is 148.4 (Dunbar, 1993). Computer simulations of the evolution of risk aversion suggest that it can only evolve in

small groups of about 150 individuals (Hintze, Olson, Adami, & Hertwig, 2013). The mean size of personal networks suggested by the number of annual Christmas cards sent is 153.5 (Hill & Dunbar, 2003). The mean size of social networks suggested by two "small world" experiments is 134 (Killworth, Bernard, & McCarty, 1984). The typical size of Neolithic villages in Mesopotamia was 150–200 (Oates, 1977); the mean size of Hutterite farming communities in Canada is 107 (Mange & Mange, 1980); and the mean size of Amish parishes in central Pennsylvania is 112.8 (Hurd, 1985). The typical size of military unit in the classical Roman army was 120–130, and the mean company size of armies in World War II was 180 (MacDonald, 1955). Gautney and Holliday (2015) estimate the population density in Africa and Eurasia during the Pleistocene Epoch to be between .03 and .12 individuals per square kilometer, about one-tenth of the population density of the least dense state in the United States (Alaska = .46 individuals/km2) in 2010 but denser than the least dense counties in the United States (Yukon-Koyukuk Census Area, Alaska = .015; and Lake and Peninsula County, Alaska = .027).

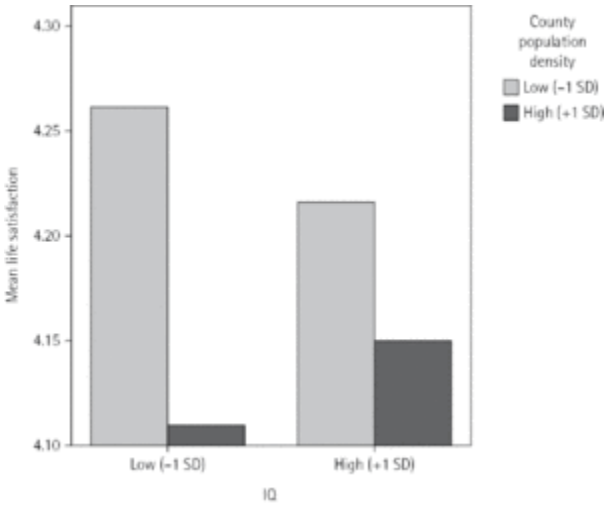
When the number of individuals in a group exceeds 150–200, the group typically fissions into and forms two separate groups, because in larger groups social organization based on cooperation and reciprocity becomes exceedingly difficult (Chagnon, 1979). Because the major constraint on human group size is cognitive (Dunbar, 1992, 1993), it is possible that as the population density becomes too high, the human brain feels uneasy and uncomfortable, and such unease and discomfort may translate into reduced (p. 179) happiness. For example, job satisfaction is significantly negatively associated with organizational size (Indik, 1965; Porter & Lawler, 1965). The savanna theory of happiness may therefore suggest that group sizes and population densities much higher than were typical in the ancestral environment may decrease subjective well-being. It further suggests that such a negative effect of population density on happiness may interact with general intelligence, such that the negative effect is greater among less intelligent individuals than among more intelligent individuals.

The analysis of the Add Health data confirmed both of these predictions (Li & Kanazawa, 2016). Whether measured at the level of census block group (a subdivision of a census tract and the smallest geographic unit for which the Census Bureau tabulates aggregate data), census tract, county, or state, population density was significantly negatively associated with Add Health respondents' life satisfaction. This did not change at all when we controlled for sex, age, ethnicity, education, and current marital status. Consistent with the prediction derived from the savanna theory of happiness, the higher the population density of the immediate environment, the less satisfied with life Add Health respondents were.

Further analyses showed that, consistent with the prediction, the negative association between population density and life satisfaction was significantly stronger among less intelligent individuals than among more intelligent individuals. The interaction terms between population density and intelligence were statistically significantly positive for block group, census tract, county, and state.

Figure 9.3 presents the statistical interaction graphically. While county population density had a significantly negative association with life satisfaction among both less intelligent (with IQ of 81.39) and more intelligent (with IQ of 115.57) individuals, the negative association was greater among less intelligent individuals (M = 4.2617 vs. 4.1090) than among more intelligent individuals (M = 4.2161 vs. 4.1495). In other words, in a county with low population density (41 persons/km2, one standard deviation below the mean), less intelligent individuals had higher mean life satisfaction than more intelligent individuals did. In contrast, in a county with high population density (937 persons/km2, one standard deviation above the mean), more intelligent individuals had higher mean life satisfaction than less intelligent individuals did.

Figure 9.3 Interaction effect between county population density and intelligence on life satisfaction.



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Given that our data are correlational and population density and life satisfaction were measured at the same time, we cannot rule out an opposite causal order to what we hypothesize in the savanna theory of happiness, where people who experience higher life satisfaction are more likely to move to rural areas. This does not appear to be the case. While life satisfaction at Wave III was significantly positively associated with the distance Add Health respondents moved between Waves I and III, the distance moved was more strongly positively associated with Wave III population density. In other words, longer-distance movers were more likely to move to urban areas, not rural areas, and they became more satisfied with their life despite their long-distance move (to urban areas), not because of it. As a result, controlling for the distance moved strengthens the negative association between population density and life satisfaction, not weakens or eliminates it, at all levels except for state, where the association remains unchanged. (p. 180)

Interestingly, Add Health respondents' intelligence was significantly negatively associated with the natural log of population density. It means that more intelligent individuals did not selectively migrate to urban areas, and less intelligent individuals did not selectively migrate to rural areas, in order to take advantage of their respective levels of intelligence to become more satisfied with life. We believe there are two potential (and non-mutually exclusive) reasons for this. First, individuals in general may not be (either consciously or unconsciously) aware of the negative effect of population density on happiness and its divergent effects by intelligence. Second, individuals may not have complete freedom to move where they want in order to pursue life satisfaction, especially at such a young age. They may be constrained by the requirements of their education, employment, and family.

Habitat Preference

Orians' (1980, 1986) savanna hypothesis—not to be confused with the Savanna Principle (Kanazawa, 2004b)—posits that humans have an innate preference for certain landscape and environment. They prefer open spaces with trees and rich vegetation, which can provide food resources and allow them to look out for potential predators

without being seen by them. In other words, humans have a natural, evolutionarily given preference for savanna-like habitat.

(p. 181)

Orians' savanna hypothesis has been widely supported by numerous studies and surveys with subjects and respondents from a wide variety of cultures and societies (Balling & Falk, 1982; Orians & Heerwagen, 1992; Ulrich, 1986). For example, hospital patients recover from surgery more quickly and with fewer complications if their hospital room windows face natural habitat than if they face a brick wall (Ulrich, 1984). And a mere presence of flowers—which in the African savanna signal the arrival of spring and more abundant food supply—in a hospital room improves the patients' rate of recovery and psychological mood (Watson & Burlingame, 1960).

Orians' savanna hypothesis is perfectly consistent with our savanna theory of happiness, and the human preference for savanna-like habitat follows equally from both theories. In addition, the human preference for low population density and rural areas discussed above may be one manifestation of the savanna hypothesis in the contemporary United States. Rural America affords more savanna-like landscapes than urban America.

Friendships

One of the most important determinants of happiness is the quality of social relationships, particularly friendships (Diener & Seligman, 2004, pp. 18–20; Dolan, Peasgood, & White, 2008, pp. 106–108). The more friends one has, and the more time one spends with them, the happier one tends to be on average, although recent studies suggest that the quality of friendships is more important for happiness than their quantity (Demir, Orthel, & Andelin, 2013; Demir, Orthel-Clark, Özdemir, & Özdemir, 2015). The association between satisfaction with friendships and happiness is particularly stronger in more individualistic cultures (Diener & Diener, 1995; Li & Cheng, 2015). While the strong impact of friendships on subjective well-being may make intuitive sense, why are friends important for happiness theoretically?

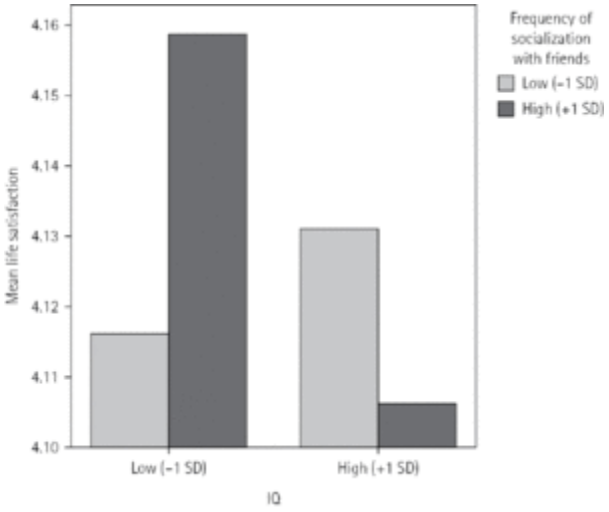
Perhaps the strong effect of friendships on life satisfaction is too obvious to explain; to our knowledge, only one scholar has offered a systematic explanation for why friendships increase happiness. Melikşah Demir and colleagues (Demir, 2015; Demir & Davidson, 2013; Demir & Özdemir, 2010; Demir, Özen, Doğan, 2012; Demir, Özen, Doğan, Bilyk, & Tyrell, 2011) argue that friendships increase happiness because they satisfy some basic psychological needs, such as relatedness, the knowledge that one matters to others, and the desire to share and amplify good news and events (captured in the Swedish proverb "Shared joy is a double joy, shared sorrow is half a sorrow"). Demir's explanation, however, raises even more fundamental questions: Why do humans have these basic psychological needs in the first place? And why can they be satisfied only (or primarily) by friends?

The savanna theory of happiness can provide one potential answer to such fundamental questions. As noted above, our ancestors lived as hunter-gatherers in small bands of about 150 individuals (Dunbar, 1992, 1993). In such settings, having frequent contact with lifelong friends and allies was likely necessary for survival and reproduction for (p. 182) both sexes, as evidenced by studies of both contemporary hunter-gatherers (Apicella, Marlowe, Fowler, & Christakis, 2012; Hruschka, 2010; Lewis, Al-Shawaf, Russell, & Buss, 2015) and our primate cousins (Smuts, 1985; de Waal, 1982). For instance, cooperative alliances may have allowed men to overcome critical challenges posed by hunting and warfare (Bowles, 2009; Geary, Byrd-Craven, Haord, Vigil, & Numtee, 2003), and close relationships among unrelated women may have facilitated joint childcare and allomothering (Hrdy, 2009). Likewise, reciprocal food-sharing among group members occurs commonly in modern-day hunter-gatherers and may have allowed our ancestors to survive despite success or failure in hunting and gathering on any given day (Hill & Hurtado, 1996).

The evolutionary significance of friendships and alliances is suggested by numerous studies indicating that ostracism is invariably painful and distressful across various contexts and sources (Williams, Forgas, & von Hippel, 2005). In one experiment, participants earned money to be excluded in a game and lost money to be included. Despite earning more money, those who were ostracized still experienced pain (van Beest & Williams, 2006). Indeed, fMRI studies show that being ostracized activates the same region of the brain that lights up when individuals experience physical pain (Eisenberger, Lieberman, & Williams, 2003). Given the available evidence, it is reasonable to assume that humans evolved to detect ostracism (Gruter & Masters, 1986) largely because friendship ties and alliances were very important for the survival and reproductive success of our ancestors (Lewis et al., 2015).

In contrast, survival and reproduction today depend increasingly more on one's ability to navigate myriad evolutionarily novel entities such as the internet, governments, banks, corporations, trusts, and the legal system. Instead of relying on reciprocal cooperation with friends and allies for basic needs, modern-day individuals deal with strangers or faceless entities and have no way of identifying those involved in the procurement and processing of necessities such as food (Pollan, 2006). It is entirely possible for individuals in modern society to survive and reproduce successfully without having any friends; friendships are not as critically necessary today for day-to-day living as they were in the ancestral environment. Hruschka (2010) notes, in a book entirely devoted to the importance of friendship, that "while friends make us happy and help us in small ways, it is not entirely clear that they are important in the high-stakes game of survival and reproduction" (p. 2). In 1998, 9% of respondents in the General Social Survey in a representative sample of noninstitutionalized American adults responded that they did not have any good friends to whom they felt close (Smith, Marsden, & Hout, 2015, p. 639).

Figure 9.4 Interaction effect between frequency of socialization with friends and intelligence on life satisfaction.



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The savanna theory of happiness therefore suggests that the human brain may have implicit difficulty comprehending and dealing with life without frequent contact with close friends and allies, and such difficulty

may decrease individuals' happiness. Further, such an effect of friendships on happiness may be particularly stronger among less intelligent individuals, who are likely less able to adapt to evolutionarily novel circumstances such as a dearth of close friends. Thus, we expect friendships to have a positive effect on happiness and further (and more importantly) that such an effect will be stronger among less intelligent individuals. (p. 183)

The analysis of the Add Health data confirmed both of these predictions (Li & Kanazawa, 2016). Once current marital status was controlled, frequency of socialization with friends had a significantly positive association with life satisfaction, and this did not change even when we further controlled for age, sex, ethnicity, and education. Consistent with the prediction, the positive association between frequency of socialization with friends and life satisfaction was significantly stronger among less intelligent individuals than among more intelligent individuals. The interaction term between intelligence and frequency of socialization with friends was significantly negative.

Figure 9.4 presents the statistical interaction graphically. Among less intelligent individuals (with a mean IQ of 81.39), frequency of socialization with friends had a significantly positive effect on life satisfaction. Those who socialized with friends more frequently (6.71, nearly every day) had a significantly higher life satisfaction (M = 4.1586) than those who socialized with friends less frequently (1.95, less than twice a week) (M = 4.1163). In contrast, among more intelligent individuals (with a mean IQ of 115.57), those who socialized with friends more frequently were actually less satisfied with life (M = 4.1063) than those who socialized with friends less frequently (M = 4.1311). The statistical interaction was so strong that more intelligent individuals were actually less satisfied with life if they socialized with their friends more frequently.

(p. 184)

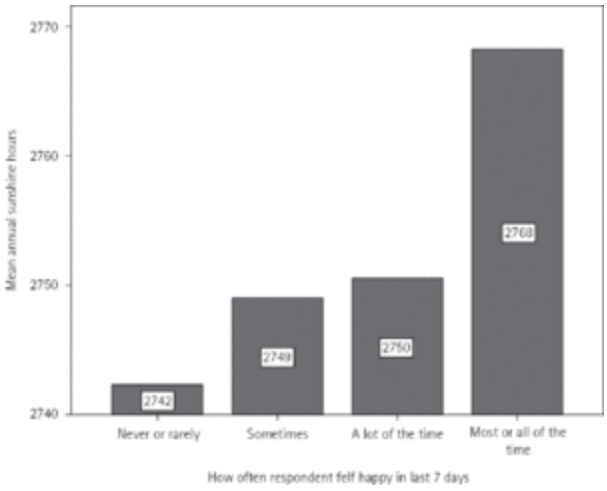
Given that our data are correlational and frequency of socialization with friends and life satisfaction were measured at the same time, we cannot rule out an opposite causal order to what we hypothesize, where happier people choose to socialize with their friends more frequently. We are sure there are some mutual influences between life satisfaction and frequency of socialization with friends, but there are a few considerations suggesting that the results largely reflect our hypothesized causality. For instance, Baker, Cahalin, Gerst, and Burr (2005) showed that the positive effect of seeing family and friends on subjective well-being remained even after controlling for the earlier level of life satisfaction in a previous wave of a longitudinal survey. Similarly, in our data, frequency of socialization with friends was still significantly associated with life satisfaction even after happiness at Waves I and II, in addition to current marital status, was controlled.

Interestingly, Add Health respondents' intelligence was significantly positively associated with the frequency of socialization with friends; more intelligent individuals socialized with their friends more frequently. The association between intelligence and frequency of socialization with friends was stronger among currently unmarried individuals than among currently married individuals. It means that more intelligent individuals did not voluntarily decrease their frequency of socialization with friends, and less intelligent individuals did not voluntarily increase it, in order to take advantage of their respective levels of intelligence to increase their life satisfaction. Once again, we believe there are two potential (and non-mutually exclusive) reasons for this. First, individuals in general may not be (either consciously or unconsciously) aware of the divergent effect of socialization with friends on happiness by intelligence. Second, individuals may not have complete control over how frequently to socialize with their friends (or how many friends to have). Friendship is a two-way street, and friends must mutually seek each other to establish friendship and socialize together—something that may be increasingly difficult to do in transient modern environments. More intelligent individuals may simply have more friends to begin with.

Seasonal Affective Disorder (SAD)

While there are some individual differences in the circadian rhythm, where some individuals are more nocturnal than others (Kanazawa & Perina, 2009), humans are basically a diurnal (as opposed to nocturnal) species. Humans rely very heavily on vision for navigation but, unlike genuinely nocturnal species, cannot see in the dark or under little lighting. Our ancestors did not have artificial means of illumination during the night until the domestication of fire; even then, it did not compare to sunlight in its power of illumination. Any human in the ancestral environment up and about during the night would have been at risk of predation by nocturnal predators. Ethnographic evidence uniformly suggests that our ancestors rose shortly before sunrise and went to sleep shortly after sunset, in order to avoid extended nocturnal activities that might jeopardize their safety (Chagnon, 1992; Cronk, 2004; Hill & Hurtado, 1996; Lee, 1979; Levinson, 1991–1995; Whitten, 1976). (p. 185)

Figure 9.5 Association between happiness and annual sunshine hours.



Given the inherent danger that darkness presented during human evolutionary history, in contrast to the safety that bright daylight afforded a diurnal species that relied heavily on vision, it is reasonable to speculate that prolonged periods of darkness might have made our ancestors nervous, cautious, afraid, and therefore unhappy. This may be the evolutionary origin of the seasonal affective disorder (SAD). Medical researchers have known for three decades that a lack of daylight leads some individuals to experience chronic depression (Rosenthal et al., 1984). Individuals normally experience SAD during the winter months, when there are fewer daylight hours, especially in higher latitudes like Nordic countries, and, as a result, the most effective treatment of SAD is to expose the patients to many hours of artificial light (Partonen & Lönnqvist, 1998; Winkler, Pjrek, Iwaki, & Kasper, 2006). Such extended exposure to bright light simulates daylight, which signified relative safety to our ancestors, compared to the danger inherent in darkness. Positive evolutionary consequences of prolonged and abundant daylight provided in the light therapy apparently reduces chronic depression and SAD and restores higher levels of happiness.

The association between sunshine and happiness is apparent even in a representative (nonclinical) sample of Americans. Wave IV of Add Health measures the respondents' happiness with the question: "During the past seven days, how often did you feel happy?" As Figure 9.5 shows, there is a clear and monotonic association between happiness and the amount of sunshine individuals receive. Add Health respondents who are (p. 186) "never or rarely" happy in the past seven days on average receive 2,742 hours of sunshine a year in their city of

residence. Those who are "sometimes" happy in the past seven days receive 2,749 hours, those who are happy "a lot of the time" receive 2,750 hours, and those who are happy "most or all of the time" receive 2,768 hours ($F(3, 15621) = 3.263$, $p < .05$). Americans who live in sunnier locations do appear to be happy more frequently.

If the relative lack of daylight hours and implied danger of darkness during ancestral times are the reason that some individuals experience SAD, then the savanna theory of happiness would predict that less intelligent individuals are more likely to suffer from SAD than more intelligent individuals. This indeed appears to be the case. A couple of studies (Rajajärvi et al., 2010; Sullivan & Payne, 2007) show that individuals suffering from SAD score lower on standardized IQ tests than controls and unaffected relatives. The authors of both of these studies unquestioningly assume that SAD leads to cognitive impairment. However, because the data in both studies are correlational—SAD symptoms and IQ were measured at the same time—their findings are equally compatible with the interpretation that less intelligent individuals are more likely to suffer from SAD than more intelligent individuals. Only prospectively longitudinal studies and controlled experiments can adjudicate between these two causal explanations for the negative association between IQ and SAD.

Even though a relative lack of daylight may reduce happiness and increase depression and SAD, this component of happiness is unlikely to be a major determinant of global life satisfaction. Most international comparisons show that citizens of Scandinavian and Nordic countries, where sunlight hours are both in short supply and highly variable throughout the year (Pearce & Smith, 2000), have the highest average levels of happiness. For example, in one study of 55 nations (Diener, Diener, & Diener, 1995), Iceland ranks first, Sweden second, Denmark fourth, Norway 12th, and Finland 13th. Veehoven's data on 149 nations show similar ranking (Denmark second, Iceland third, Finland fifth, Norway seventh, and Sweden 10th). The high ranks of Scandinavian and Nordic countries in international comparisons of average happiness are likely attributable to genetic factors (De Neve, Christakis, Fowler, & Frey, 2012; Proto & Oswald, 2014; Rice & Steele, 2004) or ethnic homogeneity (Kanazawa & Li, 2015), which appear to drown the negative influence of the lack of daylight and resulting depression and SAD.

The Paradox of Declining Female Happiness

Stevenson and Wolfers (2009) document the "paradox of declining female happiness." Despite the extraordinary progress women have made in social, political, and economic arenas in the United States during the past several decades, American women have become less happy. Using the General Social Survey data from 1972 to 2006, Stevenson and Wolfers show that the average level of happiness for women has steadily declined during the 35-year period, whereas men's level of happiness has remained largely constant. As a result, even though American women have historically been happier than American men, now (in 2006) men are slightly happier than women in the United (p. 187) States. What explains "the paradox of declining female happiness" in the past several decades in the face of enormous progress women have made socially, politically and economically?

While there may be many potential reasons for the declining levels of happiness among American women, such as the increasing divorce rates since 1972, the savanna theory of happiness can offer one potential explanation. One of the manifestations of the extraordinary progress that women have made is that many of them now have demanding careers and professions. While few married women with children had their own jobs and careers in the 1950s and 1960s, an increasing number of women have maintained their careers even after marriage and parenthood in the last half-century.

One of the necessary consequences of married women with children taking on demanding jobs and careers is that they can spend much less time with their children during the week. Throughout human evolutionary history and until the last half-century, childcare was almost exclusively a female task, and mothers spent their entire time with their children (Hrdy, 1999). While ancestral men with children went on long hunting trips that took them away

from their band (and family and children) for days at a time, it was very rare for women with children to spend extended periods of time away from their children. Further, given human infants' high levels of defenselessness and dependence on constant maternal care, small children away from their mothers for hours would be in grave danger of predation, injury, or even death. In order to prevent this, human mothers are evolutionarily designed to be constantly mindful of where their children are, to make sure that they are safe, and to be alarmed and anxious if they were out of sight for an extended period of time (Savage & Kanazawa, 2004). At the same time, the savanna theory of happiness can also explain why children who have extensive exposure to daycare and other nonmaternal care tend to grow up to have emotional and behavioral problems, especially when their daycare experience begins during the first year of life (Belsky & Eggebeen, 1991). Given that mothers were the primary carers of children throughout human evolutionary history, men were far less likely to be worried when they were physically away from children for a long period of time.

Women's social, political, and economic advancement in the last half-century, which necessarily took them away from their children for most of the day, while their children were cared for by professional nannies and daycare center staff, is therefore expected to reduce women's happiness because of what such separation would have meant in the ancestral environment (the immediate possibility of injury and death for the children). In the current environment, children are usually perfectly safe when they are in the care of genetically unrelated paid carers. However, the evolutionary constraints on women's brains might implicitly perceive the situation as a potential danger to their children, and their psychological well-being may decrease as a result. Because ancestral men spent less time on childcare, men's brains would be less likely to perceive extended physical separation from their children as potential threat and danger to their children. This may be the evolutionary origins of the declining female happiness in the United States in the past half-century.

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The savanna theory of happiness would further predict that more intelligent mothers are less likely to perceive routine separation from their children during the day as a threat and, as a result, may be more likely to delegate their childcare to paid professional staff. At the same time, more intelligent mothers, who typically have greater earnings and more flexible work schedule and environment, may depend on higher-quality daycare or on less daycare altogether. More intelligent mothers are therefore expected to experience less decline in their happiness by doing so than less intelligent mothers. This prediction awaits empirical confirmation. At any rate, the savanna theory of happiness can provide one potential explanation for the "paradox of declining female happiness" documented by Stevenson and Wolfers (2009).

Conclusion

In this chapter, we discussed a new evolutionary psychological theory of individual differences in happiness—why some individuals are happier than others. The savanna theory of happiness posits that because of the evolutionary constraints on the human brain, happiness is affected by not only the current consequences of what a given situation means now but also the ancestral consequences of what it would have meant during evolutionary history. The theory further posits that because general intelligence evolved to solve evolutionarily novel problems, the effect of such ancestral consequences on happiness is greater among less intelligent individuals than among more intelligent individuals.

Several pieces of evidence support the savanna theory of happiness. Being an ethnic minority, living in urban areas, and having few friends all negatively impact happiness at least in part because of what such conditions would have meant in the ancestral environment. Further, the savanna theory of happiness can offer a novel explanation for SAD and the paradox of declining female happiness in the United States in the past half-century.

As we mentioned elsewhere (Kanazawa & Li, 2015), the savanna theory of happiness is an explanatory theory in basic science, which aims to identify some of the causal factors in happiness and life satisfaction and account for some individual differences in them. It is emphatically not a prescription for life. As basic scientists, we do not give advice to people on how to live their lives or seek happiness. In particular, we are decidedly not advocating that individuals move to neighborhoods and cities where they are ethnic majorities or to countries and regions closer to the equator that have longer and more consistent hours of daylight. We are decidedly not encouraging less intelligent individuals to move to rural areas or socialize with their friends more. Nor are we encouraging more intelligent individuals to move to urban areas or socialize with their friends less. Nevertheless, the theory and findings discussed herein likely have various implications for improving happiness that applied researchers and practitioners may wish to take note and explore.

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To our knowledge, the savanna theory of happiness is the first systematic theory (evolutionary or otherwise) that explains why some individuals are happier than others. We welcome other researchers to build on the emerging body of work that we have described above or to propose their own competing theories and empirically test them against ours. Scientific efforts to understand the evolutionary origins of, and individual differences in, happiness have just begun.

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Notes:

(1.) This section draws from Kanazawa and Li (2015).

(2.) Preliminary analysis showed that earnings had no association with life satisfaction among Add Health respondents, perhaps because of their relative youth (mean age = 22.0) and little variance in earnings. This was consistent with earlier studies, which showed that variance in earnings generally increased with age (Beach, Finnie, & Gray, 2010; Caswell & Kluge, 2015; Lam & Levison, 1992).

(3.) This and the following sections draw from Li and Kanazawa (2016).

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