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When intelligence hurts and ignorance is bliss: Global pandemic as an evolutionarily novel threat to happiness

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Abstract

Introduction: The savanna theory of happiness posits that it is not only the current consequences of a given situation that affect happiness but also its ancestral consequences, and that the effect of ancestral consequences on happiness is stronger among less intelligent individuals. But what about situations that did not exist in the ancestral environment and thus have no ancestral consequences? Global pandemic is one such situation that has no ancestral analog, and the theory predicts such evolutionarily novel threats to have a negative effect disproportionately on the life satisfaction of more intelligent individuals.

Methods: We analyzed prospectively longitudinal data from population samples from the National Child Development Study (Study 1) and the British Cohort Study (Study 2).

Results: Consistent with the theoretical prediction, while more intelligent individuals were generally more satisfied with their lives than less intelligent individuals were throughout adulthood (albeit not because they were more intelligent but because they earned more money, were more likely to be married, and healthier), more intelligent individuals were less satisfied with their lives during the COVID-19 global pandemic *because* they were more intelligent.

Conclusion: Higher intelligence may have a downside in the modern world, by allowing life satisfaction to be more vulnerable from being better able to comprehend the severity of problems that did not exist in the ancestral world.

KEYWORDS
coronavirus, epidemic, infectious diseases, subjective well-being

1 | INTRODUCTION

The savanna theory of happiness (Kanazawa & Li, 2018) is one of the few general theories of happiness that explains *why* some individuals are happier than others. The theory posits that, because of the evolutionary constraints on the human brain that bias it to view all stimuli as if they were still in the ancestral environment, it is not only the current consequences of a given situation but also its ancestral consequences that affect happiness (Buss, 2000). It

further proposes that, because general intelligence likely evolved to solve evolutionarily novel problems, the subjective well-being of less intelligent individuals is more likely to be affected by such ancestral consequences of a given situation—when they are no longer relevant in today's context—than is that of more intelligent individuals. The theory has received initial empirical support (Kanazawa & Li, 2015; Kanazawa et al., in press; Li & Kanazawa, 2016).

But what about current situations that have *no* ancestral consequences? What if the situation is entirely

evolutionarily novel and has no ancestral analogs? What does the savanna theory of happiness predict would happen to individual happiness in response to such entirely evolutionarily novel situations? In this paper, we use the COVID-19 global pandemic as an example of an entirely evolutionarily novel situation without any ancestral analogs and assess individual life satisfaction in response to it. The data in two separate studies show that, consistent with the evolutionary psychological logic in general, and the theoretical logic of the savanna theory of happiness in particular, life satisfaction of more intelligent individuals suffered more in 2020 than that of less intelligent individuals. In fact, less intelligent individuals became more satisfied with their lives, while more intelligent individuals became less satisfied with theirs. In contrast to the usual pattern, where more intelligent individuals are generally more satisfied with their modern lives than less intelligent individuals are with theirs (albeit not necessarily because they are more intelligent but because they earn more money, are more likely to be married, and are healthier), in 2020, more intelligent individuals became less satisfied with their lives than less intelligent individuals did *because* they were more intelligent.

2 | THE SAVANNA THEORY OF HAPPINESS

It is one of the fundamental assumptions of evolutionary psychology that the human brain is evolutionarily designed for and adapted to the conditions that prevailed during human evolutionary history, which may differ from the current conditions in which human actors find themselves today (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 et al., 2018), evolutionary psychologists assume that the human brain is biased to respond to the current environment as if it were still the ancestral environment, even if the adaptive consequences have completely changed.

At the same time, what we today call general intelligence—the ability to reason deductively or inductively, think abstractly, use analogies, synthesize information, and apply it to new domains (Gottfredson, 1997; Neisser et al., 1996)—may have originally evolved as a domain-specific psychological adaptation to solve evolutionarily novel adaptive problems that did not routinely present themselves to our ancestors during human evolutionary history (Kanazawa, 2004a). The logical conjunction of these observations suggests that the evolutionary constraints on the human brain may be stronger among less intelligent individuals than among more intelligent

individuals. Such evolutionary logic suggests that individuals with lower levels of general intelligence may have correspondingly greater difficulty with evolutionarily novel entities and situations than individuals with higher levels of general intelligence do. At the same time, general intelligence may not make any difference in the human brain's ability to comprehend and deal with evolutionarily familiar entities and situations that existed throughout human evolutionary history. Thus, the Savanna-IQ Interaction Hypothesis (Kanazawa, 2010a, 2010b) avers that more intelligent individuals are better able to comprehend entities and situations that did not exist in the ancestral environment.

The savanna theory of happiness (Kanazawa & Li, 2018) applies the evolutionary logic to the realm of happiness. Building on observations behind the Savanna Principle, the theory proposes that it is not only the current consequences of any situation that influences current levels of happiness but also its ancestral consequences—what the situation *would have meant* for our ancestors and their happiness in the ancestral environment. Because the human brain is biased to view the present environment as if it were still the ancestral environment and respond to it accordingly, the theory suggests that modern happiness may fluctuate at least partly as a function of the ancestral consequences of the current situation for individual happiness. Further, applying the logic behind the Savanna-IQ Interaction Hypothesis, the theory avers that, because the evolutionary constraints on the human brain are weaker for individuals with higher levels of general intelligence, subjective well-being of less intelligent individuals might be influenced by such ancestral consequences of the current situation to a greater extent than that of more intelligent individuals.

Evidence in support of the savanna theory of happiness has accumulated in recent years. The evidence comes from ancestral consequences of otherwise vastly varied conditions and situations, such as ethnic composition, population density, friendships, and sunlight.

2.1 | Ethnic composition

Our ancestors throughout human evolutionary history lived in ethnically homogeneous environments (Oppenheimer, 2003), and extended contact with others of different cultures, languages, appearances, and customs almost always signaled danger, because it normally happened under conditions of conquest, imprisonment, slavery, and abduction by hostile neighboring groups (Chagnon, 1992; Diamond, 2012). Consistent with this reasoning, data show that members of ethnic minorities in the United States are less happy than members of

ethnic majorities are, but the effect of ethnic composition on happiness is significantly greater among less intelligent individuals (Kanazawa & Li, 2015).

2.2 | Population density

Our ancestors lived in hunter-gatherer bands of roughly 150 related individuals in vast open savannas (Dunbar, 1993). When the group became too large, it split into two groups to maintain a manageable size, as social control became increasingly more difficult in larger groups (Chagnon, 1979). As a result, our ancestors experienced very low population density in their lives, and their brain may respond negatively to crowded conditions, as it might have signified impending breakdown of social order based on personal ties, as well as overwhelming social competition. Consistent with this reasoning, population density in the United States has a significantly negative association with happiness—ruralites are significantly happier than urbanites—but the association between population density and happiness is much stronger among individuals with lower levels of general intelligence (Li & Kanazawa, 2016).

2.3 | Friendships

Friendships and alliances were crucial for survival for our ancestors, a physically vulnerable species living in harsh environments. Ostracism from their group was tantamount to a death sentence, and, as a result, our ancestors valued friendships and close alliances for protection and survival. Consistent with this reasoning, the frequency of socialization with friends is significantly positively associated with happiness in a contemporary American sample, but the association is stronger among less intelligent individuals. In fact, the interaction with intelligence is so strong that, while less intelligent individuals become happier if they spend more time with friends, more intelligent individuals actually become less happy if they do so (Li & Kanazawa, 2016).

2.4 | Sunlight

Humans are a diurnal species that relies very heavily on vision for navigation, and, until the domestication of fire, sunlight and moonlight were the only natural sources of illumination for our ancestors. Hunter-gatherers cautiously avoid nocturnal activities because in darkness they may be vulnerable to physical danger presented by nocturnal predators. Past studies show that darkness increases fear

among experimental participants (Nasar & Jones, 1997; Schaller et al., 2003). Consistent with this logic and evidence, the annual number of sunlight hours has a significantly positive association with happiness, even net of all other climate variables, and the association is significantly stronger among less intelligent individuals (Kanazawa et al., in press).

There is thus emerging evidence that happiness depends not only on the current consequences of a given situation but its ancestral consequences as well. What would have made our ancestors happier during human evolutionary history still makes us happier today, and what would have made them less happy then still makes us less happy today. Further, the effect of such ancestral consequences of current situations on happiness is stronger among less intelligent individuals. The savanna theory of happiness, and all the empirical evidence in support of it, are testimony to the stone-age nature of the human brain stuck in the ancestral environment (Tooby & Cosmides, 1990).

But what about current situations that have no ancestral consequences because they did not exist in the ancestral environment? If a situation is entirely evolutionarily novel and has no ancestral equivalent, then by definition it has no ancestral consequences. What does the savanna theory of happiness predict about such evolutionarily novel situations? What effect, if any, are such evolutionarily novel situations without any ancestral consequences predicted to have for current happiness?

While the human brain should have difficulty truly comprehending such entirely evolutionarily novel situations, the Savanna-IQ Interaction Hypothesis (Kanazawa, 2010a, 2010b) proposes that more intelligent individuals should have comparatively less difficulty comprehending such situations than less intelligent individuals do. Thus individuals with higher levels of general intelligence should be better able to understand potential consequences—positive or negative—of a given situation for current happiness when the situation is entirely evolutionarily novel. The savanna theory of happiness and the Savanna-IQ Interaction Hypothesis would therefore predict that the happiness levels of more intelligent individuals are affected more by evolutionarily novel situations than are those of less intelligent individuals.

Table 1 summarizes the predictions of the savanna theory of happiness, in terms of the evolutionary origin and the relevance of the consequences of adaptive problems, and the predicted effects of general intelligence on humans' ability to comprehend the problem's consequences, on their ability to solve the problem, and on happiness. When the adaptive problem originates in the ancestral environment and has identical consequences in both the ancestral and modern environments (Cell 1A), such as the

TABLE 1 Classification of adaptive problems by their origin, relevance of their consequences, and the predicted effect of general intelligence

		Relevance of the consequences		
		A. Identical in ancestral and modern	B. Ancestral only	C. Modern only
Origin of the problem	1. Ancestral	Ability to comprehend consequences = 0	Ability to comprehend consequences = +	Ability to comprehend consequences = +
		Ability to solve problem = 0	Ability to solve problem = N/A (solution not required)	Ability to solve problem = +
		Happiness = 0	Happiness = +	Happiness = –
	2. Modern	N/A (Modern adaptive problems cannot have ancestral consequences)	N/A (Modern adaptive problems cannot have ancestral consequences)	Ability to comprehend consequences = +
				Ability to solve problem = +
				Happiness = –

problem of mating and reproduction (although there could always be modern elements to such ancestral adaptive problems, such as the use of computer dating and assisted reproductive technologies), more intelligent individuals are predicted to have no advantage over less intelligent individuals in their ability to recognize the consequences of the adaptive problem or to solve it (Kanazawa, 2004a), and intelligence is predicted to have no effect on happiness.

When the adaptive problems of ancestral origin have adaptive consequences in the ancestral environments only and not in the modern environments (Cell 1B), the theory predicts that more intelligent individuals are better able to comprehend the limited relevance of such problems in the modern environments, and that general intelligence is irrelevant for the ability to solve such problems, because the problems do not require a solution in the modern environment. However, because less intelligent individuals are less likely to recognize that such problems do not require solution, they are predicted to become less happy when confronted with such problems. The theory thus predicts a positive effect of general intelligence on happiness. The adaptive problems employed in all previous tests of the savanna theory of happiness—such as the problem of being an ethnic minority (Kanazawa & Li, 2015), high population density or absence of allies and friends (Li & Kanazawa, 2016), and darkness (Kanazawa et al., in press)—all come from this cell.

The situation is reversed when the adaptive problems of either ancestral (Cell 1C) or modern origins (Cell 2C) have relevant consequences only in the modern environments. Because more intelligent individuals are more likely to recognize the negative consequences of such evolutionarily novel adaptive problems in the current environment, they are predicted to become *less* happy, even while they are better able to solve such problems with their greater intelligence. Less intelligent individuals are less likely to

recognize the negative consequences of such evolutionarily novel problems in the current environment, so their happiness levels are predicted to be influenced to a lesser extent, hence the theory predicts a negative association between general intelligence and happiness. In other words, ignorance is bliss—even though more intelligent individuals are better able to solve evolutionarily novel problems, being aware of and having to deal with such problems is likely worse off for subjective well-being than not even realizing that there are problems in the first place. In this paper, we focus on one adaptive problem from Cell 2C.

What would be an example of such entirely evolutionarily novel situations? As it happens, we are currently in the middle of one such situation. We propose that global pandemics—such as the COVID-19 pandemic—may be one example of an entirely evolutionarily novel adaptive problem.

3 | EVOLUTIONARY NOVELTY OF GLOBAL PANDEMICS

At a trivial level, pandemics could not have existed in the ancestral environment, because epidemiologists define a pandemic as "an epidemic occurring worldwide or over a very wide area, *crossing international boundaries*, and usually affecting a large number of people (Porta, 2008, p. 179; emphasis added). Thus, by definition, there can be no pandemics without international borders. More importantly, however, no epidemic infectious diseases existed during evolutionary history, because their existence and sustenance require three conditions that all emerged only with the advent of agriculture about 10,000 years ago: large population/high population density, permanent settlement, and domesticated animals (Diamond, 1997, pp. 195–214, 2002).

3.1 | Large population/high population density

It is instructive to remind ourselves that the "dem" in both "pandemic" and "epidemic" derives from the Greek root "demos," meaning people (the same root as in "democracy"). Both pandemics and epidemics thus require (a large number of) people. Using measles as an example, Black (1966) estimated that a minimum population size of 500,000 would be necessary to sustain microbes for infectious diseases continuously. This minimum population size of half a million is far greater, by orders of magnitude, than the typical size of a hunter-gatherer band during human evolutionary history, estimated to be about 150 (Dunbar, 1993). This is why infectious epidemic diseases are known as "crowd diseases" (Diamond, 2002).

3.2 | Permanent settlement

Human waste is a rich source of microbes and worms that cause human infectious diseases. Being nomadic, hunter-gatherers leave their waste behind when they shift camp; they are therefore unlikely to be infected by the microbes and worms residing in it. In contrast, agriculturalists in permanent settlements live among their own sewage, and their waste is never too far from their neighbors' drinking water. While the hunter-gatherer rates of mobility vary with the resource availability of the local environment, hunter-gatherer bands typically move camp "about once a week" (Kelly, 1983, p. 290). One study of Tasmanian hunter-gatherers found that they typically moved every one or two days. "They daily removed to a fresh place, to avoid the offal and filth that accumulated about the little fires which they kindled daily" (Roth, 1890, p. 104). A recent study of hunter-gatherers in Malaysia found that the mean length of stay in a camp was 8.2 days (Venkataraman et al., 2017).

3.3 | Domesticated animals

Even though all the microbes that currently cause infectious diseases in humans are strictly limited to humans and only affect them, they all originally came from their domesticated animals. "For instance, measles and tuberculosis arose from diseases of cattle, influenza from a disease of pigs and ducks" (Diamond, 2002, p. 703). Domesticated animal origins of human infectious diseases explain why all microbes for infectious diseases are Eurasian in origin. All "big five" domesticated animals (cow, sheep, goat, pig, and horse) were Eurasian in origin,

and there were very few domesticable animals in Africa or the New World (Diamond, 1997, 2002).

It is therefore apparent that epidemic infectious diseases (let alone global pandemics) did not exist throughout human evolutionary history, because they all originated after the advent of agriculture, which then brought about the three necessary conditions for infectious diseases. "In fact, the first attested dates for many familiar infectious diseases are surprisingly recent: around 1600 BC for smallpox (as deduced from pockmarks on an Egyptian mummy), 400 BC for mumps, 200 BC for leprosy, AD 1840 for epidemic polio, and 1959 for AIDS" (Diamond, 1997, p. 205).

Some of the concrete consequences of the pandemic—such as increased mortality, pathogen prevalence, loss of contact with friends and family, and economic uncertainty—might be evolutionarily familiar. However, the ultimate cause from which such consequences emanate—a global pandemic—is evolutionarily novel, and the Savanna Principle predicts that the human brain has difficulty truly comprehending global pandemics like COVID-19—and, importantly, their far-reaching negative implications—because they are evolutionarily novel.

There is indeed some evidence that this might be the case. For example, life history theory posits that increased mortality in the environment alters reproductive strategies such that individuals tend to adopt faster life history strategies, start reproducing earlier, and desire to have more children in the face of increased mortality (Ellis et al., 2009; Figueredo et al., 2006). However, a recent study shows that young, nulliparous Serbians mostly did not alter their life history strategies after the start of the COVID-19 pandemic and national lockdown in Serbia (Međedović, in press). Further consistent with the prediction of the savanna theory of happiness, the extent to which they did respond to the pandemic was correlated with intelligence; young Serbians with higher levels of education (as a proxy for general intelligence) changed their reproductive plans more acutely in response to COVID-19 than their less educated counterparts did.

If epidemic infectious diseases like COVID-19 are evolutionarily novel, then the savanna theory of happiness and the Savanna-IQ Interaction Hypothesis suggest that the human brain would have difficulty comprehending them and their potential consequences for happiness, but that more intelligent individuals may be better able to comprehend them. Since the COVID-19 pandemic has many negative consequences that make us unhappy—such as the individual risks of mortality, morbidity, unemployment, loss of freedom, loss of physical contact with friends and family, loss of opportunities for entertainment, travel, and socialization, as well as the societal costs of business

closures, economic recession, disruption in schools, and government budget deficit—and very few positive consequences that make us happy, the theoretical logic suggests that subjective well-being of more intelligent individuals might suffer a greater decline in the face of a new global pandemic than that of less intelligent individuals do.[1]

We test this hypothesis with two separate prospectively longitudinal datasets with large, nationally representative samples that have been followed since birth in the United Kingdom: the National Child Development Study (Study 1) and the British Cohort Study (Study 2). This is the first time that the savanna theory of happiness is tested involving situations outside of Cell 1B in Table 1; it is also the first time that it is tested outside of the United States.

4 | STUDY 1: NATIONAL CHILD DEVELOPMENT STUDY

4.1 | Data

The National Child Development Study (NCDS) is a large, ongoing, and prospectively longitudinal study that has followed a *population* (not a sample) of British respondents since birth for over 60 years. The study included *all* babies ($n = 17,419$) born in Great Britain (England, Wales, and Scotland) for one week (03–09 March 1958). The respondents were subsequently reinterviewed in 1965 (Sweep 1 at age 7; $n = 15,496$), 1969 (Sweep 2 at age 11; $n = 18,285$), 1974 (Sweep 3 at age 16; $n = 14,469$), 1981 (Sweep 4 at age 23; $n = 12,537$), 1991 (Sweep 5 at age 33; $n = 11,469$), 1999–2000 (Sweep 6 at age 41–42; $n = 11,419$), 2004–2005 (Sweep 7 at age 46–47; $n = 9534$), 2008–2009 (Sweep 8 at age 50–51; $n = 9790$), and 2013 (Sweep 9 at age 55; $n = 9137$). There were more respondents in Sweep 2 than in the original sample (Sweep 0) because Sweep 2 sample included eligible children who were in the country in 1969 but not in 1958. In each sweep, personal interviews and questionnaires were administered to the respondents; to their mothers, teachers, and doctors during childhood; and to their partners and children in adulthood. Virtually all (97.8%) of the NCDS respondents were Caucasian. The Centre for Longitudinal Studies (CLS) of University College London now conducts NCDS (as well as BCS; see below) and the data are publicly and freely available to registered users of the UK Data Service (https://ukdataservice.ac.uk/).

In May 2020, after nearly two months of lockdown imposed nationwide by the British government, CLS contacted all of its respondents and invited them to participate in an online survey designed to collect insights into the lives of the NCDS respondents during the lockdown in many facets of their lives: physical and mental health and wellbeing, family and relationships, education, work, and finances. A majority (57.9%; $n = 5178$) of those contacted took part in the online survey. Virtually all of them (98.7%) were Caucasian. All NCDS participants were 62 years old in May 2020. Descriptive statistics (means and standard deviations) for all variables used in Study 1 are available in online Supporting Information (Table S1).

4.2 | Dependent variable: Life satisfaction

At every sweep after the respondent turned 33 (except for age 55), NCDS asked its respondents the identical question: "Here is a scale from 0 to 10, where '0' means that you are completely dissatisfied and '10' means that you are completely satisfied. Please enter the number which corresponds with how satisfied or dissatisfied you are with the way life has turned out so far." This is the standard measure of life satisfaction most commonly used in happiness research (Diener & Diener, 1996). NCDS asked the same question about life satisfaction in its May 2020 COVID-19 survey. We used ordinal regression to analyze this variable.

4.3 | Independent variable: General intelligence

The NCDS has probably the strongest measure of childhood general intelligence of all large-scale surveys. The respondents took multiple intelligence tests at ages 7, 11, and 16. At 7, the respondents took four cognitive tests: Copying Designs Test, Draw-a-Man Test, Southgate Group Reading Test, and Problem Arithmetic Test. At 11, they took five cognitive tests: Verbal General Ability Test, Nonverbal General Ability Test, Reading Comprehension Test, Mathematical Test, and Copying Designs Test. At 16, they took two cognitive tests: Reading Comprehension Test, and Mathematics Comprehension Test. We performed a factor analysis at each age to compute their general intelligence score for each age. All cognitive test scores at each age loaded only on one latent factor, with reasonably high factor loadings (age 7: Copying Designs = 0.671, Draw-a-Man = 0.696, Southgate Group Reading = 0.780, and Problem Arithmetic = 0.762; age 11: Verbal General Ability = 0.920, Nonverbal General Ability = 0.885, Reading Comprehension = 0.864, Mathematical = 0.903, and Copying Designs = 0.486; age 16: Reading Comprehension = 0.909, and Mathematics Comprehension = 0.909). The latent general intelligence scores at each age were then converted into the

standard IQ metric, with a mean of 100 and a standard deviation of 15. Then, we performed a second-order factor analysis with the IQ scores at three different ages to compute the overall childhood general intelligence score. The three IQ scores loaded only on one latest factor with very high factor loadings (Age 7 = 0.867; Age 11 = 0.947; Age 16 = 0.919). We used the childhood general intelligence score in the standard IQ metric as the main independent variable.

4.4 | Control variables

In our multiple regression analysis, we controlled for respondent's sex (0 = female, 1 = male), education (0 = no qualification; 1 = CSE 2-5/NVQ 1; 2 = O levels/NVQ 2; 3 = A levels/NVQ 3; 4 = higher qualification/NVQ 4; 5 = degree/NVQ 5–6), earnings (natural log of net annual earnings in 1 K GBP), whether currently married (0 = no, 1 = yes), and self-rated health (1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = excellent). Recall that both age and race are constants in NCDS.

4.5 | Results

Figure 1 Panels (a–d), present the bivariate association between childhood general intelligence (grouped in five "cognitive classes" only for the purpose of graphic presentation here) and life satisfaction at ages 33, 42, 47, and 51. They show that, throughout adulthood, there was a positive and, with the exception of age 47, largely monotonic association between childhood general intelligence and life satisfaction. More intelligent NCDS respondents were in general more satisfied with their lives. Table 2, Columns (1), (3), (5), and (7), confirm this. Childhood general intelligence was significantly positively associated with life satisfaction at every age (33: $b = 0.006$, $p < 0.001$; 42: $b = 0.003$, $p = 0.024$; 47: $b = 0.003$, $p = 0.044$; 51: $b = 0.007$, $p < 0.001$). Note that there are currently no widely accepted methods of computing standardized coefficients or effect sizes in ordinal regression (Hilbe, 2009).

However, Table 2, Columns (2), (4), (6), and (8), show that more intelligent individuals were more satisfied with their lives, *not* because they were intelligent per se, but because they earned more, were more likely to be currently married, and healthier. Once we controlled for sex, education, earnings, whether currently married, and self-rated health, childhood general intelligence was no longer significantly positively associated with life satisfaction (33: $b = -0.001$, $p = 0.667$; 42: $b = -0.004$, $p = 0.051$; 47: $b = -0.003$, $p = 0.176$; 51: $b = -0.005$, $p = 0.036$). At the same time, earnings, whether currently married, and self-rated health were all significantly positively associated with life satisfaction at every age.

All of this changed in May 2020, in the middle of the national lockdown in response to the global pandemic. Figure 1 Panel (e), shows that the bivariate association between childhood general intelligence and life satisfaction was largely monotonically negative. Figure 1 Panel (f), depicts the association between childhood general intelligence and the change in life satisfaction between age 51 (in 2009) and age 62 (in May 2020). It shows that, while individuals in the bottom two cognitive classes became more satisfied with their lives in May 2020, those in the top three cognitive classes became less so.

More importantly, multiple ordinal regression suggests that more intelligent individuals were less satisfied with their lives than less intelligent individuals were in May 2020 *because* they were more intelligent. Table 2, Columns (9–10), show that childhood general intelligence was significantly negatively associated with life satisfaction when entered alone ($b = -0.012$, $p < 0.001$) *and net of all the control variables* ($b = -0.010$, $p = 0.007$). Similarly, Table 2, Columns (11–12), show that childhood general intelligence was significantly negatively associated with the increase in life satisfaction from 2009 to May 2020 when entered alone ($b = -0.012$, $p < 0.001$) *and net of all the control variables* ($b = -0.008$, $p = 0.023$). Whether currently married and self-rated health continued to be positively associated with life satisfaction in May 2020, while earnings were no longer associated with it. Education was now significantly negatively associated with life satisfaction in May 2020.

4.6 | Discussion

The analysis of the NCDS data strongly supports the hypothesis derived from the savanna theory of happiness and the Savanna-IQ Interaction Hypothesis. Reversing the lifelong pattern where more intelligent individuals were more satisfied with their lives than less intelligent individuals were (although not necessarily because they were more intelligent but because they earned more money, were more likely to be currently married, and were healthier), during the evolutionarily novel global pandemic of COVID-19, more intelligent individuals were significantly less satisfied with their lives *because* they were more intelligent. Controlling for sex, education, earnings, current marital status, and health did not at all attenuate the negative association between childhood general intelligence and life satisfaction during the pandemic. While less intelligent individuals became more satisfied with their lives
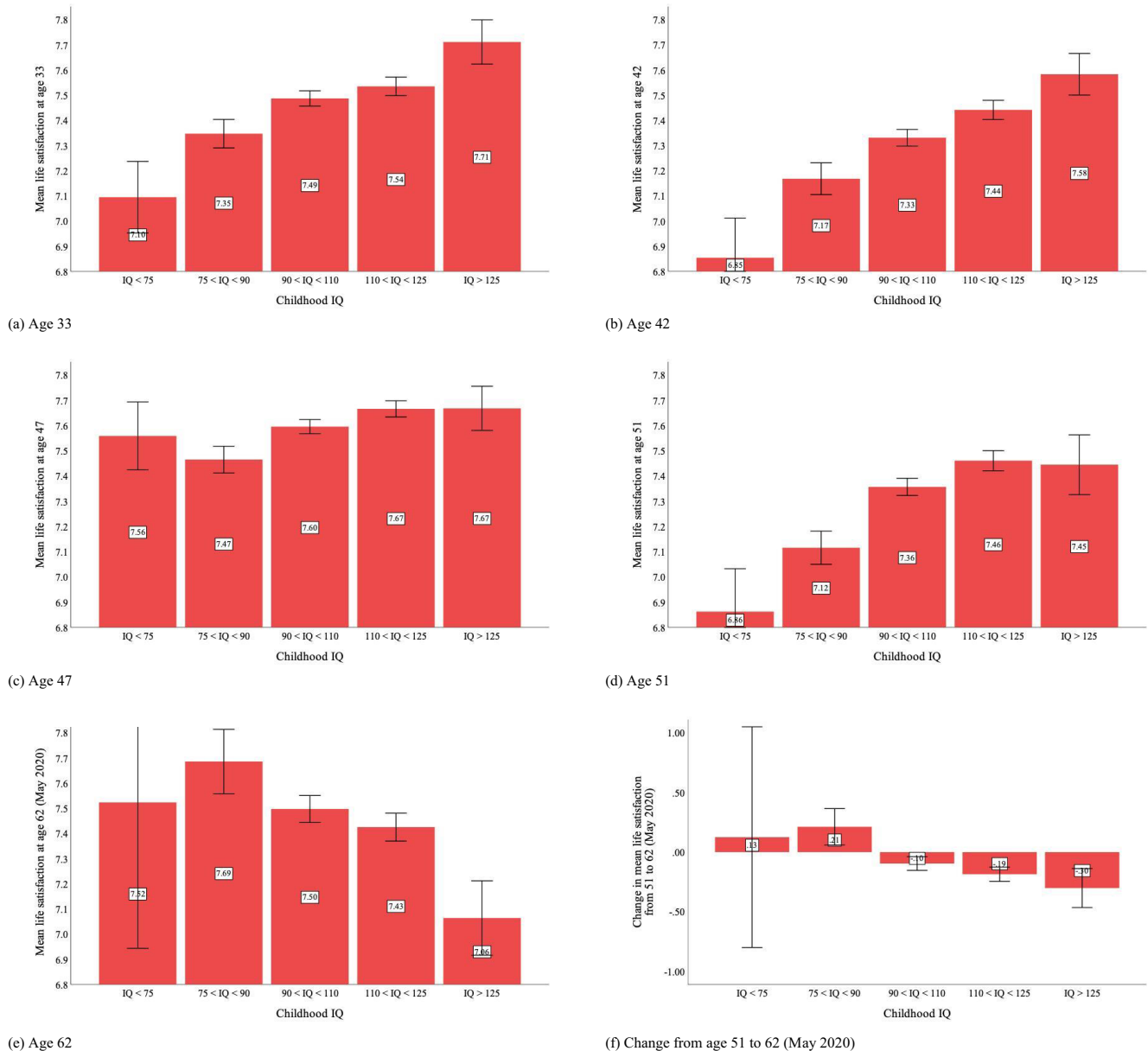
FIGURE 1 Association between childhood intelligence and life satisfaction. National Child Development Study. (a) Age 33, (b) Age 42, (c) Age 47, (d) Age 51, (e) Age 62, (f) Change from age 51 to 62 (May 2020)

during the pandemic, more intelligent individuals became less satisfied with theirs.

5 | STUDY 2: BRITISH COHORT STUDY

5.1 | Data

The British Cohort Study (BCS), originally developed as the British Birth Survey and as a sequel to the NCDS, included *all* babies (*n* = 17,196) born in Great Britain during the week of 05–11 April 1970. All surviving members

of the cohort who still resided in the United Kingdom (Great Britain plus Northern Ireland) were subsequently reinterviewed in 1975 (Sweep 1 at age 5: *n* = 13,135), 1980 (Sweep 2 at age 10; *n* = 14,875), 1986 (Sweep 3 at age 16; *n* = 11,615), 1996 (Sweep 4 at age 26; *n* = 9003), 2000 (Sweep 5 at age 30; *n* = 11,261), 2004 (Sweep 6 at age 34; *n* = 9665), 2008 (Sweep 7 at age 38; *n* = 8874), and 2012 (Sweep 8 at age 42; *n* = 9841). Similar to NCDS, personal interviews were conducted with and questionnaires were administered to the respondents at each sweep; their mothers, teachers, and doctors during childhood; and their spouses and children in adulthood. Virtually all (96.7%) of the BCS respondents were Caucasian.

TABLE 2 The association between childhood intelligence and life satisfaction throughout life. National Child Development Study

	Age 33		Age 42	
	(1)	(2)	(3)	(4)
Childhood IQ	0.006***	−0.001	0.003*	−0.004
	(0.002)	(0.002)	(0.002)	(0.002)
Sex		−0.282***		−0.230***
		(0.053)		(0.050)
Education		0.019		0.007
		(0.022)		(0.022)
Earnings		0.014**		0.017***
		(0.005)		(0.005)
Currently married		1.273***		0.924***
		(0.058)		(0.056)
Self-perceived health		0.631***		0.548***
		(0.038)		(0.034)
Nagelkerke pseudo R^2	0.003	0.152	0.001	0.108
−2 LogLikelihood	23,140.594***	18,074.405***	25,613.358*	20,126.422***
Number of cases	6311	5135	6660	5442
	Age 47		Age 51	
	(5)	(6)	(7)	(8)
Childhood IQ	0.003*	−0.003	0.007***	−0.005*
	(0.002)	(0.003)	(0.002)	(0.002)
Sex		−0.295***		−0.091
		(0.058)		(0.053)
Education		0.008		0.014
		(0.025)		(0.023)
Earnings		0.033***		0.035***
		(0.006)		(0.006)
Currently married		1.028***		0.962***
		(0.064)		(0.059)
Self-perceived health		0.590***		0.514***
		(0.033)		(0.027)
Nagelkerke pseudo R^2	0.001	0.157	003	0.165
−2 LogLikelihood	19,274.969*	13,420.120***	21,722.219***	16,616.671***
Number of cases	5725	4203	5756	4632
	Age 62 (May 2020)		Change	
	(9)	(10)	(11)	(12)
Childhood IQ	−0.012***	−0.010**	−0.012***	−0.008*
	(0.003)	(0.004)	(0.003)	(0.004)
Sex		0.191*		0.250**
		(0.075)		(0.076)
Education		−0.132***		−0.102**
		(0.033)		(0.033)

(Continues)

TABLE 2 (Continued)

	Age 62 (May 2020)		Change	
	(9)	**(10)**	**(11)**	**(12)**
Earnings		−0.008		−0.009
		(0.006)		(0.007)
Currently married		0.630***		−0.214*
		(0.088)		(0.090)
Self-perceived health		0.657***		0.202***
		(0.043)		(0.042)
Nagelkerke pseudo R^2	0.007	0.131	0.007	0.026
−2 LogLikelihood	11,695.225***	8667.526***	11,332.236***	9035.576***
Number of cases	3008	2307	2735	2198

Note: Main entries are unstandardized regression coefficients.

(Numbers in parentheses are standard errors).

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

The CLS conducted the identical online COVID-19 survey with the BCS respondents in May 2020. A somewhat smaller proportion of the BCS respondents who were contacted (40.4%; $n = 4223$) took part in the online survey. A slightly higher proportion (98.0%) of the May 2020 sample were Caucasian. All BCS participants were 49 years old in May 2020. Because BCS participants were a generation (13 years) younger than NCDS respondents when the pandemic hit in 2020, by comparing their respective responses to it, we will be able to separate the period effect (which the BCS and NCDS participants share) from the age effect (which they do not). Descriptive statistics (means and standard deviations) for all variables used in Study 2 are available in online Supporting Information (Table S2).

5.2 | Dependent variable: Life satisfaction

The measure of life satisfaction in BCS is identical to that in NCDS. It was measured at every sweep after the respondents turned 26, except for age 38. As with NCDS, in addition to the raw life satisfaction score at each sweep, we also computed the change score from age 42 to 49 during the May 2020 COVID-19 survey.

5.3 | Independent variable: General intelligence

BCS measures childhood general intelligence with four cognitive tests at age 16 (75-item vocabulary test, 100-item spelling test A, 100-item spelling test B, and 84-item general knowledge test). We performed a factor analysis to compute the general intelligence score. The four cognitive test scores loaded only on one latent factor, with high factor loadings (vocabulary = 0.561, spelling A = 0.860, spelling B = 0.858, general knowledge = 0.715). We converted the latent general intelligence score into the standard IQ metric and used it as the main independent variable.

5.4 | Control variables

Control variables that we used in Study 2 were identical to those we used in Study 1. Once again, both age and race are constants in BCS.

5.5 | Results

Table 3 presents the results of the ordinal regression analyses of the BCS data. The results are virtually identical to those from the NCDS.

As the odd-numbered columns show, at ages 26, 30, 34, and 42, more intelligent individuals were significantly more satisfied with their lives than less intelligent individuals were (26: $b = 0.006$, $p = 0.020$; 30: $b = 0.010$, $p < 0.001$; 34: $b = 0.008$, $p < 0.001$; 42: $b = 0.008$, $p = 0.001$). However, as the even-numbered columns show, this was not because they were more intelligent, but because they earned more money, were more likely to be married, and healthier (26: $b = −0.001$, $p = 0.655$; 30: $b = 0.002$, $p = 0.661$; 34: $b = 0.003$, $p = 0.315$; 42: $b = −0.003$, $p = 0.377$). Once again, all of this changed in May 2020. Table 3, Columns (9–10), show that more intelligent individuals were no longer more satisfied with their lives ($b = −0.005$, $p = 0.190$), and, net of control variables, they were significantly less satisfied ($b = −0.017$, $p = 0.001$). Table 3, Columns (11–12) show that, whether entered alone

TABLE 3 The association between childhood intelligence and life satisfaction throughout life. British Cohort Study

	Age 26		Age 30	
	(1)	(2)	(3)	(4)
Childhood IQ	0.006[*]	−0.002	0.010[***]	0.002
	(0.002)	(0.004)	(0.002)	(0.004)
Sex		−0.261[**]		−0.184[*]
		(0.086)		(0.090)
Education		0.035		0.030
		(0.032)		(0.019)
Earnings		0.404[***]		0.214[**]
		(0.068)		(0.068)
Currently married		1.001[***]		0.766[***]
		(0.093)		(0.086)
Self-perceived health		0.703[***]		0.752[***]
		(0.068)		(0.065)
Nagelkerke pseudo R^2	0.002	0.128	0.007	0.132
−2 LogLikelihood	9984.997[*]	7158.093[***]	10,916.255[***]	6321.593[***]
Number of cases	2599	1974	2968	1832
	Age 34		Age 42	
	(5)	(6)	(7)	(8)
Childhood IQ	0.008[***]	0.003	0.008[**]	−0.003
	(0.002)	(0.003)	(0.002)	(0.003)
Sex		−0.203[**]		−0.353[***]
		(0.078)		(0.087)
Education		0.031[*]		0.015
		(0.015)		(0.017)
Earnings		0.008		0.015
		(0.007)		(0.008)
Currently married		1.007[***]		0.977[***]
		(0.076)		(0.089)
Self-perceived health		0.479[***]		0.528[***]
		(0.043)		(0.042)
Nagelkerke pseudo R^2	0.004	0.134	0.004	0.158
−2 LogLikelihood	9749.772[**]	8428.595[***]	10,107.619[**]	7073.789[***]
Number of cases	2704	2425	2671	1949
	Age 49 (May 2020)		Change	
	(9)	(10)	(11)	(12)
Childhood IQ	−0.005	−0.017[**]	−0.014[***]	−0.014[**]
	(0.004)	(0.005)	(0.004)	(0.005)
Sex		−0.116		0.212
		(0.128)		(0.129)
Education		−0.010		−0.017
		(0.025)		(0.025)

(Continues)

TABLE 3 (Continued)

	Age 49 (May 2020)		Change	
	(9)	**(10)**	**(11)**	**(12)**
Earnings		−0.013		−0.008
		(0.012)		(0.012)
Currently married		0.130		−0.597***
		(0.125)		(0.126)
Self-perceived health		0.660***		0.184**
		(0.067)		(0.065)
Nagelkerke pseudo R^2	0.001	0.108	0.010	0.043
−2 LogLikelihood	5354.556	3619.730***	5070.799***	3891.748***
Number of cases	1382	956	1222	951

Note: Main entries are unstandardized regression coefficients.

(Numbers in parentheses are standard errors).

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

($b = -0.014$, $p < 0.001$) or with controls ($b = -0.014$, $p = 0.007$), childhood general intelligence was significantly negatively associated with the change in life satisfaction from age 42 to 49. More intelligent individuals became significantly less satisfied with their lives in May 2020.

Figure 2 Panels (a–e), show that, once again, there were mostly (though not entirely) monotonically positive associations between childhood general intelligence and life satisfaction at ages 26, 30, 34, and 42, but not at age 49 during COVID-19. The comparison of Figure 1 Panel (f) and Figure 2 Panel (f), shows the even more dramatic shift in life satisfaction among BCS respondents than among NCDS respondents. As with the NCDS respondents, BCS respondents below average in childhood general intelligence became more satisfied with their lives in May 2020 (albeit very slightly), while those of average and above-average intelligence became significantly (and massively) less satisfied with theirs.

5.6 | Discussion

The analysis of the BCS data once again strongly supported the hypothesis derived from the savanna theory of happiness and the Savanna-IQ Interaction Hypothesis. More intelligent individuals were more satisfied with their lives than less intelligent individuals were throughout their lives (albeit not necessarily because they were more intelligent but because they earned more money, were more likely to be currently married, and were healthier). In May 2020, however, more intelligent individuals were less satisfied with their lives *because* they were more intelligent. Individuals below average in general intelligence became more satisfied with their lives (albeit very slightly), whereas those of average and above-average intelligence

became less satisfied with theirs. The results from the BCS in Study 2 were virtually identical to those from the NCDS in Study 1.

6 | GENERAL DISCUSSION

Consistent with the prediction from the savanna theory of happiness and the Savanna-IQ Interaction Hypothesis, the analyses of the National Child Development Study in Study 1 and the British Cohort Study in Study 2 show that the life-long pattern whereby more intelligent individuals were more satisfied with their lives than less intelligent individuals were (albeit not because they were more intelligent but because they earned more money, were more likely to be currently married, and healthier) suddenly changed in 2020, and one potential cause for this change may be the global pandemic. Because global pandemics (and infectious diseases in general) are entirely evolutionarily novel, only more intelligent individuals may have been able to comprehend the negative consequences of the COVID-19 pandemic, and became less satisfied with their lives. Individuals with childhood IQ below 90 became more satisfied with their lives during the pandemic, while those with childhood IQ above 90 became less so, and the more intelligent they were, the more dissatisfied with their lives they became. Given that NCDS and BCS represent two independent population samples born 13 years apart, it is remarkable how virtually identical the results from the two studies are.

Our finding here is even more noteworthy, given that one of the major consequences of the pandemic has been the national lockdown and the consequent reduction in opportunities for socialization with friends. A previous study (Li & Kanazawa, 2016) showed that
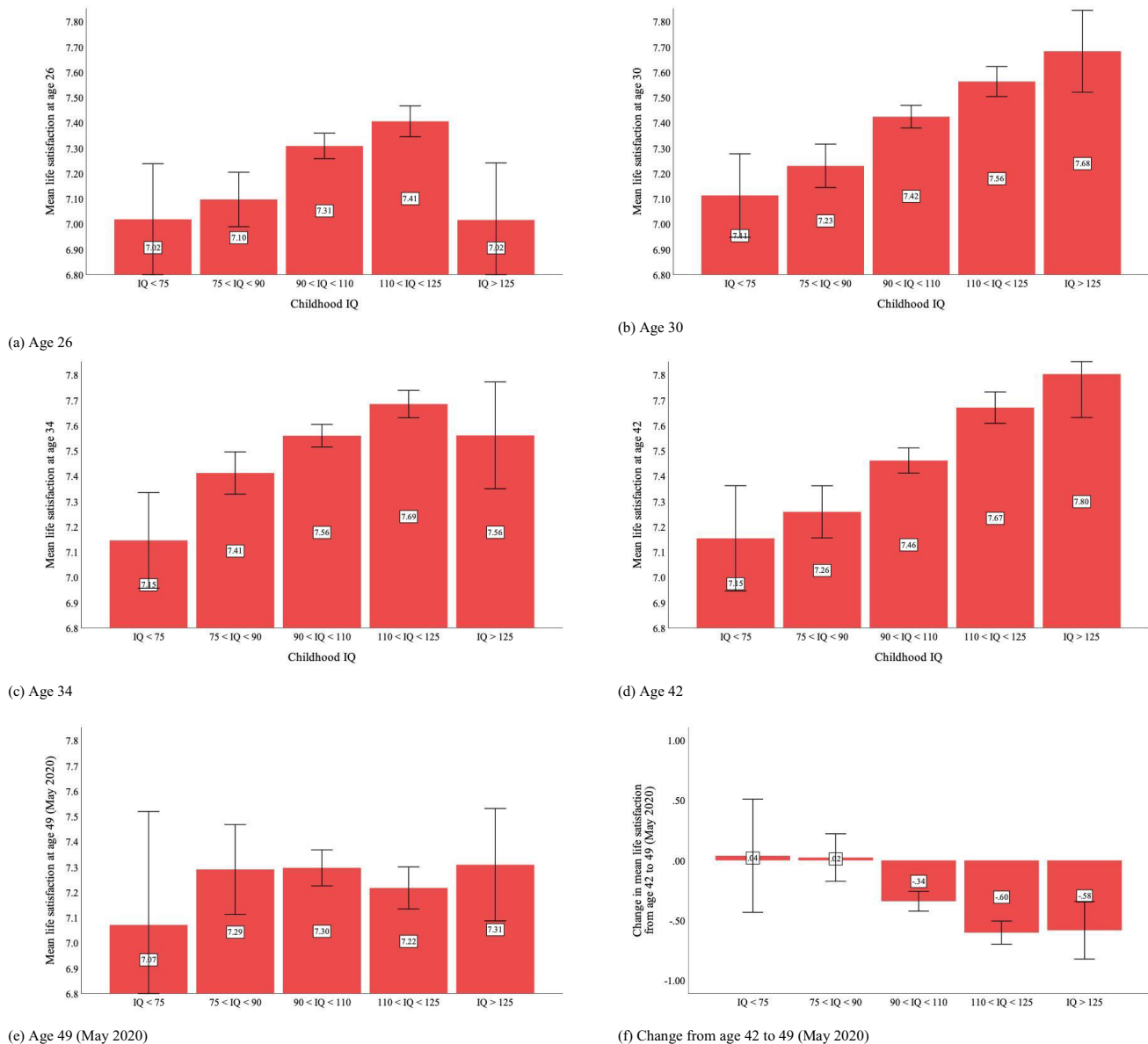
FIGURE 2 Association between childhood intelligence and life satisfaction. British Cohort Study. (a) Age 26, (b) Age 30, (c) Age 34, (d) Age 42, (e) Age 49 (May 2020), (f) Change from age 42 to 49 (May 2020)

less intelligent individuals become happier with more socialization with friends, whereas more intelligent individuals become less happy with it. Our results showed that less intelligent individuals became more satisfied with life, and more intelligent individuals became less satisfied, during the pandemic *despite* vastly reduced opportunities for socialization with friends. This could be because the evolutionarily novel means of virtual communication via Zoom, Facetime, and Skype, to which many individuals under lockdown were forced to resort for their main venue of socialization with friends and family, were comparatively more satisfactory to less intelligent individuals in the same way that the evolutionarily novel TV viewing

is more satisfactory to less intelligent individuals (Kanazawa, 2006).

One finding unpredicted by the savanna theory of happiness is the disappearance and even reversal of the sex effect on life satisfaction. Throughout adulthood, female respondents have been consistently more satisfied with their lives than their male counterparts, but during the May 2020 survey, the sex difference was reversed in NCDS and disappeared in BCS. Men were significantly more satisfied with their lives than women were during COVID-19 in Study 1, and women were no more satisfied in Study 2. One possible explanation is that the pandemic has negatively affected women disproportionately (United Nations, 2020). However, given

the long-term historical trend, documented at least in the United States, in which women have become gradually less happy over time while men's happiness level has remained constant (Kanazawa & Li, 2018, pp. 186–188; Stevenson & Wolfers, 2009), it is not clear whether the reversal/disappearance of the sex difference in life satisfaction that we observed in the UK above has anything to do with COVID-19 and the national lockdown or instead reflects the same historical trend observed in the US. There were no significant intelligence x sex interaction effects on life satisfaction during the pandemic either in NCDS or BCS.

6.1 | Alternative explanations

Even though the reversal of the lifelong positive association between intelligence and life satisfaction happened in the latest sweeps of NCDS and BCS, when the respondents were older than they had ever been, we can rule out the age effect, by comparing the NCDS and BCS respondents at comparable ages. Intelligence and life satisfaction was negatively associated among BCS respondents in 2020, when they were 49, but was positively associated among NCDS respondents both when they were 47 and when they were 51. The negative association between intelligence and life satisfaction among BCS respondents in 2020 was therefore unlikely to be attributable to their age, and likely to be due to the pandemic, as the NCDS respondents experienced the same negative association *at the same time but when they were 13 years older*.

While the savanna theory of happiness focuses on the evolutionary novelty of the COVID-19 global pandemic as the potential cause of the reversal of the usual pattern between general intelligence and life satisfaction, it is possible that other aspects of the global pandemic are responsible for it. By all accounts, the pandemic, and the associated lockdown implemented in many countries including the United Kingdom, have had negative effects disproportionately on individuals in working-class occupations, because they are least likely to be able to do their jobs remotely from home (Mongey et al., 2020). Such working-class individuals were therefore most likely to lose their jobs or have their pay cut dramatically due to the pandemic restrictions (Parker et al., 2020). More intelligent individuals are less likely to hold such working-class occupations (Dawis, 1994), yet our results show that childhood general intelligence has a significantly negative association with life satisfaction during COVID-19. Given that we also controlled for education and earnings in the analyses, the effects that we found were unlikely to have been due to more intelligent individuals having greater economic opportunity costs that accrue from being more educated or earning more. Thus the cause of the reversal of the usual pattern is unlikely to be economic. One possibility is that those below average in intelligence might be more likely than those who were more intelligent to hold unsatisfying and undesirable jobs, and *if* they were able to keep their jobs and pay and stay home on the UK government's extensive furlough scheme, they might have been happy not to spend time working in such jobs during the lockdown and to spend more time with their family.

Another possibility that might explain our results is that more intelligent (as well as more educated) individuals are more likely to have greater information about the negative consequences of the COVID-19 global pandemic, and it is their greater information that makes them less satisfied with their lives during the pandemic. The NCDS and BCS unfortunately did not measure the amount of information that their respondents had about COVID-19 in May 2020, nor did they measure how much news and information they consumed in general (before the pandemic). The closest proxy that we can find in the datasets is the frequency of internet use. Even though childhood general intelligence was significantly positively associated with the frequency of internet use among NCDS respondents four decades later at 55 ($r = 0.386$, $p < 0.001$), controlling for it in the multiple regression equations in Table 2, Columns (10) and (12), did not at all alter the significantly negative associations between childhood general intelligence and life satisfaction or its change (age 62: $b = -0.010$, SE = 0.004, $p = 0.007$; change: $b = -0.008$, SE = 0.004, $p = 0.029$). The frequency of internet use was not at all associated with either dependent measure (age 62: $b = -0.002$, SE = 0.048, $p = 0.964$; change: $b = -0.025$, SE = 0.049, $p = 0.609$). The results were once again identical with the BCS data. While childhood general intelligence was significantly positively associated with the frequency of internet use at age 34 ($r = 0.250$, $p < 0.001$), controlling for it in the multiple regression equations in Table 3, Columns (10) and (12), did not at all alter the significantly negative association between childhood general intelligence and life satisfaction or its change (age 49: $b = -0.017$, $p = 0.002$; change: $b = -0.013$, $p = 0.017$). The only difference was that, among the BCS respondents, the frequency of internet use was independently significantly negatively associated with life satisfaction and its change (age 49: $b = -0.092$, $p = 0.045$; change: $b = -0.116$, $p = 0.012$). Given that most individuals in 2020 got news and information from the internet, not from newspapers or even TV, it does not appear that the amount of information the respondents had about COVID-19 can explain the reversal of the pattern of association between childhood general intelligence and life satisfaction under the pandemic.

At the same time, general intelligence is known to be correlated with other stable individual differences, such as time horizon and life history strategy (Dunkel & Kruger, 2015; Mischel et al., 1989). More intelligent individuals are more likely to have longer time horizons and to defer gratification, and they are more likely to adopt slower life history strategies, than less intelligent individuals are. Can time perspective and/or life history strategy mediate the effect of general intelligence on life satisfaction during the pandemic? In the NCDS and BCS samples, if we controlled for the total amount of savings relative to earnings (as a proxy for time horizon/deferred gratification) and the total number of children (as a proxy for life history strategy), the negative effect of general intelligence on life satisfaction during the pandemic remained unaltered. If some aspect or correlate of general intelligence mediated its effect on life satisfaction in the face of the evolutionarily novel threat, it does not appear to be time horizon or life history strategy. However, more precise tests of mediation involving these and other potential facets of general intelligence will be necessary in future research in order to specify the precise role of general intelligence in life satisfaction.

6.2 | Limitations and future directions

A major limitation of the current studies is that the data are correlational (albeit prospectively longitudinal with two independent large population samples). However, given the nature of the investigation here, a randomized controlled experiment would be both infeasible and unethical. Obviously, one cannot infect a random half of the respondents with a deadly infectious disease, nor can one create a global pandemic in a random half of the world. However, the use of a vignette with both high mundane and experimental realism (Aronson & Carlsmith, 1968) in a controlled experiment might be possible. Another limitation is that, although the current studies utilized two independent samples from prospectively longitudinal, population data across several decades, the participants were nevertheless confined to one country. They were also almost entirely Caucasian. We therefore do not know whether our findings generalize to other populations. Future research may examine the extent to which our findings are robust across cultures and societies.

There are currently no accepted method of computing effect sizes or standardized regression coefficients in ordinal regression and other generalized linear models (Hilbe, 2009), partly because the effects of independent variables on the dependent variable in ordinal regression are proportional, not constant, as in linear regression. However, the mean differences in life satisfaction

presented in Figure 1 and Panels (e)–(f), allowed us to compute Cohen's d for Study 1 as an estimate for the effect of intelligence on life satisfaction during the pandemic. Given that the standard deviation of life satisfaction in May 2020 was 2.04, and that of the change from 2009 to 2020 was 2.06, the maximum difference between the second lowest cognitive class ($75 < IQ < 90$) and the highest cognitive class ($IQ > 125$) represented $d = 0.305$ in Panel (e) and $d = 0.250$ in Panel (f). Similarly, Figure 2 Panel (f), shows that the effect size for the change score for Study 2 was $d = 0.305$. All of these effect sizes would be between "small" and "medium" (Cohen, 1992). In addition, in order to facilitate comparison of our results to the standard effect size metric, we have reproduced our results from Tables 2 and 3 using OLS regressions in the online Supporting Information (in Tables S3 and S4). The results from OLS regression were mostly identical to those from ordinal regression. We hasten to add, however, that extreme caution is necessary in interpreting the results from the OLS regression, as our data do not meet many of the important assumptions of the OLS regression, in particular, the normal distribution of the dependent variable. As is well known, life satisfaction measures typically exhibit negative skews, as "most people are happy" (Diener & Diener, 1996).

Future studies may fruitfully investigate mediators. Even though we found that the negative association with life satisfaction was not due to education, earnings, current marital status, or health, as well as frequency of internet use, time horizon, or life history strategy, greater intelligence presumably allows individuals to perceive or experience some negative aspects of the pandemic that lead to the lower life satisfaction. Some such aspects may include reduced travel and business opportunities, greater concern for the world or other nations, and greater perception of negative downstream economic and social consequences. We would likewise expect that the negative association between intelligence and life satisfaction under the pandemic occurs despite individuals of greater intelligence being better able to handle the reductions in opportunities for socializing that have taken place (Li & Kanazawa, 2016).

While these studies are only the latest in a series of studies that provide empirical support for the savanna theory of happiness, this was the first time that a prediction for the effect of an entirely evolutionarily novel situation on happiness was tested (from Column C in Table 1). Future studies will need to replicate our findings here with respect to other entirely evolutionarily novel situations and ascertain whether they have disproportionate effects (whether positive or negative) on more intelligent individuals. In particular, it would be especially illuminating to explore the *positive* effect of an evolutionarily novel

situation on happiness and its interaction with general intelligence. Just as we have demonstrated above that an evolutionarily novel negative event (such as a global pandemic) makes more intelligent individuals disproportionately less happy, we predict that an evolutionarily novel positive event will make more intelligent individuals disproportionately happier.

The greatest test of our hypothesis derived from the savanna theory of happiness is to see whether the lifelong positive association between intelligence and life satisfaction will return after the pandemic is completely over. We will have to await the future sweeps of NCDS and BCS in several years' time to test this prediction.

6.3 | Conclusion

In summary, general intelligence may have evolved to deal with evolutionary novelty. As such, the happiness of individuals with higher intelligence may be less vulnerable in situations that would have signified trouble or danger in the evolutionary past but don't actually affect life in the modern world—being an ethnic minority, living in crowded conditions, spending little time with friends, or getting less sunshine. However, as the current findings suggest, higher intelligence may also have a downside in the modern world, by allowing life satisfaction to be more vulnerable from being better able to comprehend the severity of problems that did not exist in the ancestral world but are currently presenting themselves.

CONFLICT OF INTERESTS
The authors declare absolutely no conflict of interest, real or perceived.

ETHICS STATEMENT
The research uses no human or animal subjects.

AUTHOR CONTRIBUTIONS
SK, NPL, and JCY jointly formulated the ideas behind the paper. SK performed all the data analyses and wrote the first draft. SK, NPL, and JCY all contributed to multiple revisions.

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ENDNOTE
[1] The theory predicts that the lower level of happiness among more intelligent individuals stems from their ability to foresee

and anticipate negative consequences from evolutionarily novel problems, *not* from their actually experiencing such negative consequences. Indeed, if anything, their higher intelligence might be able to help them mitigate or avoid such negative consequences and experience them less frequently (see Table 1, Cell 2C). If this is the case, then it leads to the further prediction that more intelligent individuals will suffer from lower levels of happiness relative to less intelligent individuals particularly *at the onset* of an evolutionarily novel problem, before most people start experiencing actual negative consequences, when most such negative consequences are largely *anticipated* before they are actually *experienced*. We will leave empirical testing of this further hypothesis to future research.

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SUPPORTING INFORMATION

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