Character strengths and health-related quality of life in a large international sample: A cross-sectional analysis

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A B S T R A C T

We examine associations between 24 character strengths (CS) and 15 health-related outcomes. We hypothesize that CS are favorably associated with positive health-related quality of life (HRQoL) outcomes, health behaviors, purpose in life, and lead to lower disease risk. Data from a large sample of approximately 60,000 respondents from 159 countries were used. CS yielding the most significant favorable associations across HRQoL outcomes were zest, self-regulation, hope, and gratitude. Concerning health behaviors, the primary character strengths were zest and self-regulation, while for a sense of purpose in life, these were hope, spirituality, and zest. The most consistently unfavorable association with the outcomes was observed for the strength of appreciation of beauty. Some negative associations may result from suboptimal use of CS.

1. Introduction

Character strengths are positive personality traits essential to one's identity, contribute to the greater good, and generate positive well-being and health outcomes for oneself and others (Niemiec, 2020; Park & Peterson, 2009; Peterson & Seligman, 2004; VanderWeele, 2017a; Weziak-Bialowolska, Bialowolski, VanderWeele, & McNeely, 2021; Niemiec, 2018). Existing literature has indicated character strength as being positively associated with increased happiness and life satisfaction (Schutte & Malouff, 2019), a greater sense of meaning in life (Weziak-Bialowolska and Bialowolski, 2022b), lower risks of unfavorable mental health outcomes including depression (Weziak-Bialowolska, Bialowolski, & Niemiec, 2021; Weziak-Bialowolska et al., 2022), improved self-reported physical and mental health (Hausler et al., 2017; Proyer et al., 2013; Weziak-Bialowolska, Bialowolski, VanderWeele, et al., 2021), lower limitations in daily life functioning (Weziak-Bialowolska et al., 2021), and improved human flourishing (Niemiec, 2014, 2020; Schutte & Malouff, 2019). Additionally, valuing character strengths translates into improved subsequent well-being (Weziak-Bialowolska

et al., 2023).

Several mechanisms have been suggested to explain the impact of character strengths on health. It has been suggested that kindness, generosity, and altruistic behaviors enhance positive and pleasurable emotions contributing to greater emotional well-being. These strengths also improve social cooperation, which in turn helps to adapt to environmental changes as indicated by evolutionary theories. Consequently, altruistic behaviors are conducive to physical health improvement at the individual level (including lower risk of cardiovascular disease and increased longevity) while simultaneously contributing to the survival of humankind (Aknin et al., 2013; Lyubomirsky et al., 2005). Furthermore, neuroimaging data indicate that the same part of the human brain is activated (the ventromedial prefrontal cortex) in the process of moral decision-making and the activation and regulation of emotions related to moral judgments (Garrigan, Adlam, & Langdon, 2016). This indirectly suggests that mental health is connected to how one responds to moral dilemmas. Lastly, time perspective and delayed gratification, which play important roles in self-regulation and prudence character strengths, have been argued to enhance positive health behaviors (Daugherty &

Brase, 2010). For example, it has been suggested that if one can abstain from pleasurable but harmful addictions in stressful situations, such as smoking or compulsive eating, they can expect healthier outcomes in the future (e.g., lower risk of lung cancer, diabetes, or obesity) (Daugherty & Brase, 2010).

The positive role of character strengths has been corroborated in several settings. Evidence from the workplace setting is the most robust in terms of the number of studies (VIA Institute, 2022). For example, the infusion of character strengths with mindfulness practices—referred to as mindfulness-based strengths practice—was associated with greater task performance, and improved eudaimonic and hedonic well-being (Monzani et al., 2021; Pang & Ruch, 2019). Additionally, applying signature character strengths at work was advantageous for greater well-being and mental health (Hausler et al., 2017). It was also associated with improved working conditions and better work-related outcomes, such as job satisfaction, work engagement, social connectedness at work, and increased personal growth initiatives (Ghielen et al., 2018; Harzer & Ruch, 2013).

2. Character strengths and health

Character strengths have a range of interactions with physical health (Leventhal et al., 2016), disease/illness management (Graziosi, Yaden, Clifton, Mikanik, & Niemiec, 2020), healthy lifestyle (Proyer et al., 2013), healthy living (Stuntz, 2019), healthcare providers (Hausler et al., 2017), and improved healthcare settings (Höge et al., 2020). Their importance has also been documented in specific populations. For example, positive associations between character strengths and improved quality of life have been found in people with chronic diseases such as cardiovascular disease (Huffman et al., 2016), multiple sclerosis (Smedema, 2020), fibromyalgia, and depression (Hirsch et al., 2020). Previous evidence corroborates the positive role of character strengths in chronic pain management (Graziosi et al., 2020), reducing depression (Yan et al., 2020), and COVID-19 anxiety (Umucu et al., 2021) among patients with chronic diseases.

More than 700 studies on character strengths have linked them with myriad positive outcomes (VIA Institute, 2022). However, studies focusing specifically on physical health and healthy behaviors have limited scope and sample size. Therefore, this study aims to advance the science of character strengths and health, as well as health behaviors, in two important ways. These are to include infrequently analyzed areas of health and gather data from a large sample (approximately 60,000 respondents from more than 150 countries). In addition to examining ill-being indicators (e.g., feeling sad or depressed or a number of days of limited ability) and positive health behaviors (e.g., exercising), we targeted several healthy lifestyle behaviors using the five pillars of health framework (Niemiec, 2019b). These pillars included a healthy diet (eating/drinking), sleep habits, exercise, social activity, and self-care. The goal is to examine associations between character strengths and (1) health-related quality of life as well as (2) health behaviors conceptualized through the five pillars of health (Niemiec, 2019b). We hypothesized that character strengths (measured by the Values In Action Inventory of Strengths [VIA-IS]) would be favorably associated with better health, lower risk of disease, and more positive health behaviors, including healthy diet, sleep, exercise, social activity, and self-care, even after adjusting for potential confounders.

3. Materials and methods

3.1. Data

We used data collected through an online survey available on the VIA Institute on Character website (https://www.viacharacter.org). Data were collected between September 13th and 24th, 2021. A total of 59,985 respondents from more than 159 countries (62 countries with at least 30 respondents and 38 countries with at least 100 respondents)

Table 1
Distribution of participant characteristics (N = 56,998).

Participant Characteristic	%
Sociodemographic factors	
Gender – Female	65.8
Age group	
18–24	45.2
25–34	21.9
35–44	16.0
45–54	10.8
55–64	4.9
65–74	1.0
75+	0.2
Education	
None	0.5
First stage of basic education	2.6
Second stage of basic education	22.2
Post-secondary non-tertiary education or professional degree	28.0
First stage of tertiary education	27.7
Second stage of tertiary education	16.3
Doctorate or postdoctoral degree	2.7
Employment status	
Employed full-time	54.3
Active military	1.5
Disabled or unable to work	0.7
Retired	1.1
Unemployed	9.7
Homemaker	1.6
Student	26.4
Other	4.7
Annual household income	
Less than $20,000	29.5
$20,000 to $34,999	13.6
$35,000 to $49,999	10.4
$50,000 to $74,999	12.9
$75,000 to $99,999	10.1
$100,000 or more	23.5
Location (10 most prevalent)	
USA	31.7
Australia	5.1
Canada	4.1
Mexico	4.1
United Kingdom	2.9
Brazil	2.1
India	1.9
Philippines	1.7
Finland	1.2
France	1.2
Alcohol consumption (per week)	
None	55.7
Up to 5 drinks	29.0
6–10 drinks	9.4
11–20 drinks	4.2
21–30 drinks	1.1
more than 30 drinks	0.5
Smoking (yes)	11.2
Number of days with muscle strengthening activities that work all major muscle groups	
0 days	24.6
1 day	8.6
2 days	12.9
3 days	15.4
4 days	11.5
5 days	13.0
6 days	6.0
7 days	7.9
Engaging in moderate-to-vigorous aerobic activities (e.g., jogging or running) that last at least 150 min per week (yes)	45.4

participated in the study. Participants first completed the VIA-IS-P, a 96-item instrument containing positively keyed items offered freely on the VIA Institute website. Next, participants were given a short description of the research, and informed that the data would be confidential and for research purposes only. Participants were then given the opportunity to either opt out or answer questions related to various health outcomes and behaviors. Optional demographic items were also included. The

Table 2
Distribution of character strengths, health-related quality of life, health behaviors, and purpose in life among participants (N = 56,998).

Characteristic	Mean (SD)	%
Character Strengths (1–5)		
Honesty	4.06 (0.64)	
Kindness	4.00 (0.66)	
Fairness	3.94 (0.75)	
Judgment	3.86 (0.62)	
Curiosity	3.85 (0.70)	
Social intelligence	3.82 (0.69)	
Appreciation of beauty	3.81 (0.76)	
Perspective	3.80 (0.72)	
Love of learning	3.77 (0.74)	
Humor	3.77 (0.84)	
Teamwork	3.76 (0.70)	
Hope	3.73 (0.76)	
Love	3.64 (0.95)	
Forgiveness	3.63 (0.76)	
Gratitude	3.62 (0.77)	
Humility	3.62 (0.69)	
Prudence	3.60 (0.82)	
Creativity	3.59 (0.76)	
Leadership	3.52 (0.86)	
Bravery	3.43 (0.76)	
Spirituality	3.39 (0.97)	
Zest	3.33 (0.84)	
Perseverance	3.28 (0.84)	
Self-regulation	3.27 (0.85)	
CDC Health Related Quality of Life (last 30 days; 0–30)		number of days >=14
Number of days when a person felt that their mental health was not good	8.37 (8.71)	25.0
Number of days when a person felt that their physical health was not good	4.01 (6.73)	9.1
Number of days when a person felt that poor physical or mental health prevented them from doing their usual activities, such as self-care, work, or recreation	4.76 (7.09)	12.5
Number of days when a person did not get enough rest or sleep	9.95 (9.30)	31.4
Number of days when a person felt sad, blue, or depressed	9.08 (9.37)	27.3
Number of days when a person felt worried, tense, or anxious	6.43 (8.06)	17.8
Number of days when a person felt very healthy and full of energy	13.21 (9.35)	47.3
Health Behaviors		
Number of days with muscle-strengthening activities that work all major muscle groups (0–7)	2.84 (2.26)	At least 2 days 66.8 45.4

Table 2 (*continued*)

Characteristic	Mean (SD)	%
Engaging in moderate-to-vigorous aerobic activities (e.g., jogging or running) which last at least 150 min per week (yes vs no)		
Healthy diet (1 = poorest eating/drinking habits and 10 = best eating/drinking habits)	6.41 (1.92)	
Healthy social activity in life (1 = poorest social health and 10 = best social health)	6.53 (2.30)	
Healthy self-care in life (1 = poorest self-care and 10 = best self-care)	6.10 (2.24)	
Excessive alcohol consumption (per week)		10.3
Smoking (yes)		11.2
Purpose in life (4–28)	20.40 (5.08)	

SD=standard deviation.

participants could opt out at any time. Following this, the participants received standard results from the VIA Inventory, including their rank order of character strengths with definitions.

The analytical sample was restricted to individuals who (i) were at least 18 years old, (ii) completed the VIA-IS-P, and (iii) provided data on additional questions related to health outcomes, pillars of health, and demographics. This resulted in a final sample size of 56,998. The data are available from the corresponding author upon request. Table 1 presents the participants' descriptive characteristics.

3.2. Measures

3.2.1. Character strengths

The VIA-IS-P, where "P" refers to positively keyed, was used to examine 24 character strengths in the VIA classification (McGrath, 2019; Peterson & Seligman, 2004). The VIA-IS-P is derived from the VIA-IS-R, where "R" refers to revised. It is a self-reported instrument comprising 96 positively keyed items (four items per character strength). The instrument has higher validity and reliability than earlier versions (McGrath, 2019). Answers are provided on a 5-point Likert scale ranging from 1 (very much unlike me) to 5 (very much like me). "*Very much like me*" is associated with greater character strength. The sample items are "*I never quit a task before it is done*" for perseverance, "*I love to learn new things*" for love of learning, and "*my friends say that I have lots of new and different ideas*" for creativity. The score on the 4-item subscale was averaged for each character strength.

The VIA-IS instruments have been thoroughly examined and validated across various populations showing sufficient reliability [Cronbach's alpha of 0.70 or greater (Peterson & Seligman, 2004), satisfactory factorial validity (McGrath, 2015a), and convergence in the endorsement of various character strengths (McGrath, 2015a)]. The VIA-IS-R (192 items) is the strongest instrument for assessing VIA classification due to its length (8-item subscales). However, the VIA-IS-P is preferred when the goal is to balance test length with psychometrics. The mean correlation across the 24 scales between VIA and IS-R and VIA-IS-P was 0.92 (McGrath, 2019). The mean reliability across the 24 scales of the VIA-IS-P was 0.77. When the strength behaviors criteria were assessed, the mean correlation across the 24 VIA-IS-P strengths with the behavior criterion was 0.53 (McGrath, 2019). Some concerns have been raised regarding the categorization of 24 character strengths into six culturally defined virtues (McGrath, 2015b). As this study focuses on character strengths and not virtues, the issue of defining virtues does not affect the instrument's reliability.

3.2.2. Health-related quality of life

Health-related quality of life was measured using the CDC Health-Related Quality of Life Measures CDC HRQOL-14 (Moriarty et al., 2003)]. The instrument consists of a set of questions focusing on the number of days a person experienced (positive and negative) quality of

life indicators over the past 30 days. Examples of questions are as follows: "*During the past 30 days, for about how many days have you felt you did NOT get ENOUGH REST or SLEEP*" (this is also an indicator of the healthy sleep pillar of health)*; "During the past 30 days, for approximately how many days did poor physical health or poor mental health keep you from performing your typical activities, such as taking care of yourself, work, or leisure?*"; and "*During the past 30 days, for about how many days have you felt worried, tense, or anxious?*". The respondents were asked to indicate the number of days between 0 and 30. Seven questions were used in the analysis (Table 2). For analysis, each question was recoded into a binary variable using a cut-off point of 14 or more (0 = 0–13 days and 1 = 14+ days) based on Slabaugh et al. (2017). However, to examine the robustness of the results of this methodological choice, all models with CDC HRQOL-14 outcomes were reanalyzed using a continuous version of these variables (results are presented in Table S2 in Supplementary Material).

CDC HRQOL-14 has shown good measurement properties in several populations, languages, and settings. The brief version of the four core questions is often used in surveys, surveillance systems, prevention research, and population health report cards in the United States (Moriarty et al., 2003).

3.2.3. Health behaviors

Seven health behaviors (five beneficial and two harmful) were examined. The first two are related to sports activities and reflect the healthy activity/exercise pillar of health. Following the recommendations of the WHO (2020) and the American Heart Association (2018), we examined the following indicators: engagement in (1) moderate-to-vigorous aerobic activities (e.g., jogging or running) lasting at least 150 min per week (yes or no) and (2) at least two days per week of muscle-strengthening activities that engage all major muscle groups (i.e., legs, hips, back, abdomen, chest, shoulders, and arms). We devised the following three items to address the remaining pillars of health:

(1) Healthy diet (eating/drinking): "*Healthy eating/drinking is generally viewed as eating a diet with a lot of fruits, vegetables, and foods with plenty of essential nutrients. It involves managing the intake of unhealthy foods (such as sweets, trans fats, high-calorie drinks, and eating at fast-food restaurants), the quantity consumed each day (not too much, not too little), and drinking sufficient water. On a scale of 1–10, with 1 being the poorest eating/drinking habits and 10 being the best eating/drinking habits, what number would you give yourself on average each day over the last three months?*".

(2) Healthy social activity: "*Healthy social activity is generally viewed as having daily social interactions with family, friends, or neighbors/the community that are meaningful and mutually beneficial (there is an overall positive engagement in the conversation or activity). This involves having fun, connecting with others, and feeling a sense of belonging. On a scale of 1–10, with 1 being the poorest social health and 10 being the best social health, what number would you give yourself on average each day over the last 30 days?*

(3) Healthy self-care: "*Healthy self-care in life is generally viewed as engaging in regular practices or activities that help you feel refreshed, focused, calm/peaceful, connected, more aware, or more in control of stress/tension. Some examples include mindfulness, actively using your character strengths, engaging with your hobbies/interests, experiencing nature, relaxation strategies, mind–body strategies, yoga, giving yourself quiet time, journaling, peaceful reflection, prayer, spiritual rituals, and loving-kindness practice. On a scale of 1–10, with 1 being the poorest self-care and 10 being the best self-care, what number would you give yourself on average each day over the last three months?*".

We also examined two harmful health behaviors—weekly alcohol consumption and smoking (yes or no). Harmful alcohol consumption was defined by dietary guidelines (U.S. Department of Agriculture & U. S. Department of Health and Human Services, 2020). The response format of the survey question was as follows: *up to 5 drinks, 6–10 drinks, 11–20 drinks, 21–30 drinks,* and *more than 30 drinks.* More than five drinks per week for women and more than 10 drinks per week for males

were considered harmful. Harmful alcohol consumption reflected the (un)healthy eating/drinking pillar of health, whereas smoking was used as an indicator of the (un)healthy self-care pillar of health.

Lastly, *purpose in life* was examined as an important psychological indicator of quality of life and well-being. To this end, the Purpose in Life Test-Short Form (Schulenberg et al., 2011) was applied. This measure consists of four items and is a short version of the 20-item Purpose in Life test (Crumbaugh & Henrion, 1988). It comprises items that inquire directly about meaning/purpose in life, such as: (1) "In life, I have:" 1, no goals or aims, up to 7—clear goals and aims; (2) "My existence is:" 1—utterly meaningless and without purpose, up to 7—purposeful and meaningful; (3) "in achieving life goals I have:" 1—made no progress whatever, up to 7—progressed to complete fulfillment; and (4) "I have discovered:" 1—no mission or purpose in life, up to 7—a satisfying life purpose. All responses used 7-point scales. The aggregate score for purpose in life was calculated by adding the scores for each of the four items for a total ranging from 4 to 28. The scale was psychometrically validated and showed satisfactory reliability (Cronbach's alpha=0.85) and factorial and predictive validity (Schulenberg et al., 2011).

The correlation matrix for the main study variables is presented in Table S1 in the Supplementary Material.

3.2.4. Covariates

Regarding sociodemographic variables, we controlled for gender (male vs female), age (18–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75+), education (no education, first stage of basic education, second stage of basic education, post-secondary non-tertiary education or professional degree, first stage of tertiary education, second stage of tertiary education, doctorate or post-doctorate degree), employment status (full-time employment, active military, disabled or unable to work, retired, unemployed, homemaker, student, other), and annual household income (less than $20,000; $20,000 to $34,999; $35,000 to $49,999; $50,000 to $74,999; $75,000 to $99,999; $100,000 or more) and country of residence.

3.3. Statistical analysis

All statistical analyses were performed using Stata/SE 17.0 for Mac. The associations between 15 outcomes and 24 character strengths were modeled using generalized linear models with clustering by country using the robust cluster estimator available in Stata. Subsequently, 15 models were estimated. In each model, 24 character strengths were examined simultaneously. Continuous variables were standardized (mean=0, standard deviation=1). Standardized regression estimates were reported for continuous outcomes and risk ratios were reported for dichotomous outcomes.

As character strengths are correlated despite being distinct constructs, the variance inflation factor (VIF) for each regression was computed to examine the issue of multicollinearity. The VIF facilitates the assessment of the degree of multicollinearity among independent variables. In our case, all VIFs were below 10 for all character strength variables, as recommended by Hair et al. (2014). The highest VIF (for zest) was well below three. This implies that multicollinearity was not an issue in the analyses and should not have negatively impacted the results. All missing covariates and outcome variables were imputed using chained equations (character strength variables did not comprise any missing observations as the study design required respondents to answer each of the character strengths questions). Ten sets of imputed data were generated (White et al., 2011) and multiple imputation estimates, pooled using Rubin's rule (Rubin, 1987), were presented.

Given the sample size of 59,985 participants, our study may be overpowered, leading to small estimates of associations being detected as statistically significant. In such situation, it is advised to report and interpret the effect sizes (Ferguson, 2009), which we did. We refrained, however, from classifying the effects according to Cohen's (1992)

Table 3
Associations between character strengths and health-related quality of life (N = 56,998): Cross-sectional data. Estimates for the increase of 1 SD in the character strength indicator.

Character Strength	Poor mental health		Poor physical health		Limited ability to do usual activities		Insufficient rest or sleep		Sad, blue, or depressed		Worried, tense, or anxious		Very healthy and full of energy	
	RR (95 % CI)	p-value	RR (95 % CI)	p-value	RR (95 % CI)	p-value	RR (95 % CI)	p-value	RR (95 % CI)	p-value	RR (95 % CI)	p-value	RR (95 % CI)	p-value
Appreciation of beauty	1.118 (1.106; 1.130)	<0.001	1.058 (1.021; 1.096)	0.002	1.124 (1.093; 1.156)	<0.001	1.022 (1.011; 1.033)	<0.001	1.112 (1.094; 1.131)	<0.001	1.160 (1.147; 1.174)	<0.001	0.945 (0.934; 0.956)	<0.001
Bravery	1.041 (1.025; 1.057)	<0.001	1.071 (1.037; 1.107)	<0.001	1.071 (1.042; 1.101)	<0.001	1.024 (1.006; 1.042)	0.009	1.015 (1.007; 1.023)	<0.001	1.074 (1.057; 1.091)	<0.001	0.982 (0.967; 0.997)	0.018
Creativity	1.068 (1.051; 1.084)	<0.001	1.114 (1.088; 1.142)	<0.001	1.15 (1.121; 1.18)	<0.001	1.041 (1.029; 1.053)	<0.001	1.049 (1.036; 1.062)	<0.001	1.091 (1.075; 1.107)	<0.001	0.947 (0.937; 0.957)	<0.001
Curiosity	0.943 (0.928; 0.959)	<0.001	0.929 (0.906; 0.953)	<0.001	0.924 (0.906; 0.943)	<0.001	1.013 (0.997; 1.030)	0.120	0.969 (0.955; 0.983)	<0.001	0.922 (0.900; 0.945)	<0.001	1.042 (1.032; 1.053)	<0.001
Fairness	1.019 (1.007; 1.032)	0.003	0.987 (0.963; 1.013)	0.328	1 (0.976; 1.023)	0.968	1.014 (1.002; 1.026)	0.026	1.023 (1.005; 1.041)	0.012	1.025 (1.009; 1.041)	0.002	1.005 (0.996; 1.014)	0.284
Forgiveness	0.942 (0.932; 0.953)	<0.001	0.933 (0.911; 0.955)	<0.001	0.969 (0.946; 0.994)	0.014	0.949 (0.939; 0.960)	<0.001	0.928 (0.911; 0.944)	<0.001	0.940 (0.926; 0.954)	<0.001	1.009 (1.000; 1.018)	0.040
Gratitude	0.880 (0.860; 0.901)	<0.001	0.947 (0.915; 0.979)	0.002	0.895 (0.866; 0.924)	<0.001	0.975 (0.958; 0.992)	0.004	0.944 (0.917; 0.972)	<0.001	0.873 (0.854; 0.891)	<0.001	1.068 (1.047; 1.089)	<0.001
Honesty	0.982 (0.965; 0.999)	0.036	0.961 (0.94; 0.982)	<0.001	0.92 (0.889; 0.953)	<0.001	0.995 (0.980; 1.011)	0.560	0.986 (0.963; 1.009)	0.231	0.965 (0.949; 0.981)	<0.001	1.019 (1.010; 1.029)	<0.001
Hope	0.785 (0.772; 0.799)	<0.001	0.868 (0.847; 0.89)	<0.001	0.792 (0.775; 0.808)	<0.001	0.887 (0.873; 0.901)	<0.001	0.796 (0.783; 0.808)	<0.001	0.730 (0.716; 0.745)	<0.001	1.164 (1.149; 1.179)	<0.001
Humility	1.004 (0.988; 1.020)	0.631	0.97 (0.945; 0.996)	0.022	1.043 (1.016; 1.07)	0.002	1.005 (0.987; 1.024)	0.592	0.980 (0.967; 0.994)	0.004	1.039 (1.011; 1.067)	0.006	0.98 (0.969; 0.992)	0.001
Humor	1.000 (0.983; 1.017)	0.973	1.001 (0.956; 1.049)	0.956	0.993 (0.972; 1.015)	0.546	1.039 (1.030; 1.047)	<0.001	1.009 (0.995; 1.024)	0.193	1.011 (0.992; 1.030)	0.273	0.997 (0.989; 1.006)	0.549
Judgment	1.064 (1.044; 1.083)	<0.001	1.053 (1.013; 1.094)	0.009	1.093 (1.07; 1.117)	<0.001	1.061 (1.034; 1.088)	<0.001	1.068 (1.044; 1.093)	<0.001	1.080 (1.061; 1.099)	<0.001	0.947 (0.940; 0.954)	<0.001
Kindness	1.127 (1.111; 1.143)	<0.001	1.073 (1.043; 1.105)	<0.001	1.106 (1.076; 1.136)	<0.001	1.119 (1.101; 1.136)	<0.001	1.135 (1.117; 1.152)	<0.001	1.134 (1.115; 1.153)	<0.001	0.968 (0.956; 0.980)	<0.001
Love	0.992 (0.980; 1.005)	0.239	1.015 (0.987; 1.045)	0.297	0.981 (0.964; 0.999)	0.036	0.979 (0.961; 0.997)	0.022	0.993 (0.983; 1.003)	0.196	0.994 (0.978; 1.010)	0.466	0.993 (0.982; 1.003)	0.174
Love of learning	1.014 (1.003; 1.026)	0.016	1.02 (0.998; 1.042)	0.074	1.003 (0.978; 1.029)	0.805	1.006 (0.991; 1.022)	0.411	1.030 (1.015; 1.045)	<0.001	1.012 (0.998; 1.026)	0.105	0.971 (0.963; 0.979)	<0.001
Leadership	1.011 (0.992; 1.031)	0.254	1.025 (0.973; 1.079)	0.351	1.023 (0.998; 1.049)	0.074	1.045 (1.017; 1.073)	0.001	1.011 (0.994; 1.028)	0.224	1.022 (1.005; 1.039)	0.009	0.989 (0.980; 0.998)	0.021
Perseverance	0.951 (0.939; 0.963)	<0.001	0.998 (0.96; 1.037)	0.922	0.899 (0.871; 0.928)	<0.001	0.97 (0.951; 0.989)	0.002	0.941 (0.931; 0.952)	<0.001	0.954 (0.939; 0.969)	<0.001	1.043 (1.031; 1.056)	<0.001
Perspective	0.989 (0.974; 1.004)	0.157	0.967 (0.933; 1.001)	0.058	0.971 (0.944; 0.998)	0.034	0.979 (0.962; 0.995)	0.012	0.982 (0.969; 0.994)	0.005	0.981 (0.964; 0.999)	0.037	0.998 (0.980; 1.017)	0.867
Prudence	0.966 (0.946; 0.987)	0.001	0.954 (0.917; 0.992)	0.019	0.957 (0.934; 0.98)	<0.001	0.949 (0.934; 0.963)	<0.001	0.998 (0.985; 1.010)	0.706	0.930 (0.912; 0.947)	<0.001	0.980 (0.970; 0.991)	<0.001
Self-regulation	0.950 (0.935; 0.966)	<0.001	0.956 (0.922; 0.991)	0.015	0.906 (0.878; 0.935)	<0.001	0.938 (0.925; 0.952)	<0.001	0.955 (0.940; 0.969)	<0.001	0.966 (0.949; 0.983)	<0.001	1.078 (1.061; 1.096)	<0.001
Social intelligence	1.044 (1.033; 1.056)	<0.001	1.013 (0.977; 1.051)	0.470	1.060 (1.028; 1.092)	<0.001	1.027 (1.006; 1.048)	0.011	1.055 (1.042; 1.068)	<0.001	1.051 (1.032; 1.071)	<0.001	0.991 (0.982; 1.001)	0.077
Spirituality	1.091 (1.047; 1.136)	<0.001	1.126 (1.068; 1.186)	<0.001	1.138 (1.097; 1.181)	<0.001	1.042 (1.029; 1.055)	<0.001	1.073 (1.020; 1.128)	0.007	1.107 (1.060; 1.157)	<0.001	0.971 (0.950; 0.991)	0.006
Teamwork	0.994 (0.974; 1.015)	0.590	0.992 (0.967; 1.018)	0.550	0.989 (0.954; 1.025)	0.553	0.987 (0.971; 1.004)	0.127	0.966 (0.940; 0.992)	0.010	0.985 (0.964; 1.005)	0.146	1.005 (0.992; 1.019)	0.430
Zest	0.742 (0.722; 0.762)	<0.001	0.794 (0.762; 0.827)	<0.001	0.729 (0.692; 0.769)	<0.001	0.776 (0.757; 0.797)	<0.001	0.767 (0.751; 0.784)	<0.001	0.700 (0.674; 0.728)	<0.001	1.397 (1.378; 1.417)	<0.001

RR=risk ratio, CI=confidence interval. Character strength variables were standardized (mean = 0, standard deviation = 1). Controlling for: gender, age group, education, employment status, household income, and location; All missing covariate and outcome variables were imputed using chained equations (10 sets of imputed data were generated) (White et al. 2011). Multiple imputation estimates were pooled using the Rubin's rule (Rubin 1987).

guidelines (i.e., low, medium, high) as they are subjective, very stringent, and do not fit well to the average effect sizes published in research in social sciences, including psychology as reported by other scholars (Bosco et al., 2015; Ferguson, 2009; Lovakov & Agadullina, 2021). Additionally, the generalizability of these benchmarks was also questioned by Cohen himself (Funder & Ozer, 2019). Instead, we focused on identifying the strongest associations as well as discerning patterns of associations as suggested by the principles of the outcome-wide approach (VanderWeele, 2017b; VanderWeele, Mathur, & Chen, 2020).

The robustness of the results was addressed by reanalyzing the models. We (1) treated the CDC HRQOL-14 outcomes as continuous variables (results are presented in Table S2 in Supplementary Material), and (2) used an extended set of controls (Tables S3-S6 in Supplementary Material). Specifically, in regressions of health-related quality of life outcomes and purpose in life, we additionally controlled for health behaviors such as alcohol consumption, smoking, and sports activities. In the regressions for the purpose of life and health behaviors, we also controlled for indicators of poor physical and mental health days.

4. Results

4.1. Descriptive analysis

The participant characteristics are presented in Table 2, and the correlation matrix for the main study variables is presented in Table S1 in the Supplementary Material.

In the analytical sample, honesty was, on average, the top-ranked character strength. It was the only character strength with an average score exceeding 4.0 on a scale of 1–5. Kindness, fairness, and judgment also scored relatively high, with average scores of 4.0, 3.94, and 3.86, respectively. At the other end of the spectrum, character strengths are linked to the ability to set objectives and manage their completion. The lowest-scoring character strengths were self-regulation, perseverance, and zest, with average scores of 3.27, 3.28, and 3.33, respectively.

4.2. Character strengths and health-related quality of life

For the character strengths of appreciation of beauty, bravery, creativity, curiosity, forgiveness, gratitude, hope, judgement, kindness, self-regulation, spirituality, and zest associations with all health-related quality of life measures were noted (Table 3). The highest effect sizes were seen in zest (21–30 % decreased risk of unfavorable health-related quality of life outcomes and a 40 % increased risk of feeling very healthy and full of energy), hope (12–27 % decreased risk of unfavorable health-related quality of life outcomes and a 16 % increased risk of feeling very healthy and full of energy), appreciation of beauty (up to 16 % increased risk of unfavorable health-related quality of life outcomes), and kindness (up to 13 % increased risk of unfavorable health-related quality of life outcomes). The former two were favorably associated, and the latter two were negatively associated.

Regarding other character strengths, associations with health-related quality of life outcomes were noted, but the observed pattern was unclear. Nevertheless, their associations with poor physical health risks were the least frequent and substantially weaker regarding effect size. Instead, emotion-related quality of life outcomes (i.e., feeling sad, blue, or depressed; feeling worried, tense, or anxious; and feeling very healthy and full of energy) were concurrently associated with a higher number of health outcomes. Appreciation of beauty, bravery, creativity, fairness, judgement, kindness, love of learning, leadership, social intelligence, and spirituality were unfavorably associated with various health outcomes. Conversely, curiosity, forgiveness, gratitude, honesty, hope, love, perseverance, perspective, prudence, self-regulation, and zest were favorably associated with health outcomes. Two character strengths were found to be concurrently associated with only one health-related quality of life outcome. Humor was associated with an increased probability of insufficient rest or sleep and teamwork - with a decreased risk of feeling sad, blue, and depressed.

4.3. Character strengths and purpose in life

Twenty-one of the 24 character strengths were associated with concurrent purpose in life (Table 4). These associations were positive for bravery, curiosity, gratitude, honesty, hope, love, love of learning, leadership, perspective, prudence, self-regulation, spirituality, and zest. The highest effect sizes were for hope (beta = 0.254), spirituality (beta = 0.154), zest (beta = 0.122), perseverance (beta = 0.095), and curiosity (beta = 0.093). Negative associations were substantially fewer in number. They concerned appreciation of beauty, forgiveness, humility, humor, judgment, and kindness. They also had decisively smaller effect sizes, with the greatest relation to appreciation of beauty (beta = -0.084) and judgement (beta = -0.068).

4.4. Character strengths and positive health behaviors

In the analysis of associations between character strengths and positive health behaviors (Table 5), the largest effect sizes were observed for curiosity, self-regulation, and zest (6–19 % increased risk of engaging in sports activities and modest effect sizes for the remaining outcomes; beta: 0.07–0.16 for the remaining outcomes). The remaining associations, despite being significant at the level of 0.05, were weaker. Nevertheless, curiosity, gratitude, self-regulation, and zest were unambiguously favorably correlated with positive health outcomes. Judgment and creativity were found to be unequivocally negatively correlated. The directionality of associations of other character strengths was rather mixed, with spirituality, love of learning, and kindness being mostly negatively associated and appreciation of beauty, humor, leadership, perspective, and social intelligence being associated mostly positively.

4.5. Character strengths and harmful health behaviors

Twenty character strengths were associated with either smoking or excessive alcohol consumption, and eight with both (Table 6). Of these eight, love of learning, prudence, and self-regulation were associated with a reduced risk of concurrent smoking and drinking (with effect sizes ranging from 10 to 25 % reduction in the risk). Appreciation of beauty, humor, perseverance, and social intelligence were associated with an increase of 4–14 % concurrent risk of both smoking and excessive drinking. Creativity was correlated with a 10 % increased risk of smoking and an 8 % reduced risk of excessive drinking. No associations with smoking and excessive alcohol consumption were found for forgiveness, hope, love, or teamwork.

Curiosity, gratitude, and honesty were associated with a 9 % reduced risk of smoking, while bravery and perspective were associated with an increased risk of smoking (26 % and 8 %, respectively). Neither was associated with an excessive alcohol consumption. Fairness, humility, kindness, and spirituality were associated with a decreased risk of excessive drinking (5–20 %) but were not associated with smoking. However, leadership and zest were associated with an increased risk of excessive drinking (6–10 %) and were not associated with smoking.

4.6. Robustness analysis

A very similar pattern of associations was observed when the health-related quality of life outcomes from the CDC HRQOL-14 were entered into the analysis as continuous variables (Table S2 in Supplementary Material) and when an extended set of control variables (Tables S3-S6 in Supplementary Material) was used.

5. Discussion

We examined the associations between important health-related quality of life outcomes, healthy lifestyle behaviors, and character

Table 4

Associations between character strengths and purpose in life (N = 56,998): Cross-sectional data. Estimates for the increase of 1 SD in the of character strength indicator.

Character Strength	Purpose in life	
	Beta (95% CI)	p-value
Appreciation of beauty	-0.084 (-0.092; -0.076)	<0.001
Bravery	0.020 (0.002; 0.037)	0.030
Creativity	-0.020 (-0.031; -0.008)	0.001
Curiosity	0.095 (0.083; 0.108)	<0.001
Fairness	0.007 (-0.004; 0.017)	0.200
Forgiveness	-0.028 (-0.037; -0.019)	<0.001
Gratitude	0.074 (0.062; 0.086)	<0.001
Honesty	0.030 (0.022; 0.039)	<0.001
Hope	0.254 (0.246; 0.263)	<0.001
Humility	-0.036 (-0.043; -0.028)	<0.001
Humor	-0.019 (-0.03; -0.008)	0.001
Judgment	-0.068 (-0.075; -0.060)	<0.001
Kindness	-0.035 (-0.047; -0.024)	<0.001
Love	0.058 (0.050; 0.065)	<0.001
Love of learning	0.022 (0.010; 0.034)	<0.001
Leadership	0.029 (0.019; 0.039)	<0.001
Perseverance	0.095 (0.084; 0.105)	<0.001
Perspective	0.031 (0.017; 0.045)	<0.001
Prudence	0.041 (0.031; 0.05)	<0.001
Self-regulation	0.039 (0.030; 0.049)	<0.001
Social intelligence	-0.006 (-0.02; 0.008)	0.375
Spirituality	0.154 (0.136; 0.172)	<0.001
Teamwork	-0.001 (-0.007; 0.006)	0.839
Zest	0.122 (0.11; 0.135)	<0.001

CI=confidence interval. Continuous outcome variables and character strength variables were standardized (mean = 0, standard deviation = 1). Controlling for: gender, age group, education, employment status, household income, and location; All missing covariate and outcome variables were imputed using chained equations (10 sets of imputed data were generated) (White et al. 2011). Multiple imputation estimates were pooled using the Rubin's rule (Rubin 1987).

strengths. We found that zest was the character strength most commonly linked with the examined outcomes. This was followed by hope and self-regulation. For hope the effects sizes were most pronounced in associations with health-related quality of life outcomes and purpose in life. For self-regulation, the effects sizes were most pronounced in associations with both positive and harmful health behaviors. Strong associations were also found between gratitude and health-related quality of life outcomes and harmful health behaviors. This implies that maintaining a well-rounded healthy lifestyle coincides with energy and enthusiasm for life and health (zest), an attitude of discipline and resistance to temptations (self-regulation), feeling and expressing a sense of thankfulness in life and to others (gratitude), and optimistic

thinking and confidence that goals can be reached (hope). These might be viewed as *primary* character strengths for health outcomes and behaviors.

The zest character strength refers to vitality, vigor, and being energized and eager to engage in work and life (Peterson et al., 2009). Zest has several robust connections with physical and mental health in existing literature. Similar to our findings, zest has been associated with a reduced risk of depression (e.g., Lam, 2021). Furthermore, vigor—a quality of zest—has been associated with a decreased risk of mortality and developing diabetes (Shirom, Toker, Jacobson, & Balicer, 2010). Our results are also in line with Proyer et al. (2013), who found that zest was one of the two main character strengths most related to perceived health, cardiorespiratory fitness, strength building, and active living. Regarding positive health behaviors, our findings corroborate existing research that reported an association between zest, healthy eating, diet quality (Jackson & DiPlacido, 2020), and healthy social behaviors such as sharing positive experiences with others (Lambert et al., 2011).

In earlier studies, the character strength of hope showed myriad substantial connections with health outcomes. This future-oriented strength has been consistently shown to be one of the most robust character strengths connected with well-being (e.g., Peterson et al., 2007). Furthermore, studies have indicated the health benefits of hope, such as in children suffering from physical illnesses (Shoshani et al., 2016). Another dimension of hope is optimism (Peterson & Seligman, 2004), which has many health benefits, including reduced risk of cardiovascular events (Boehm & Kubzansky, 2012).

Regarding the character strength of self-regulation—the exertion of willpower for healthier behaviors, self-discipline, and habits when facing challenges—we found multiple connections between this strength and various health outcomes. Its predictive role for physical health (Moffitt et al., 2011), social health [regulating "social dos and don'ts" (Cortes et al., 2014)], and various healthy behaviors such as adhering to chronic disease medications (Wilson et al., 2020) have also been demonstrated. This is in line with Proyer et al. (2013), who reported that self-regulation had the highest number of positive associations with health behaviors. Our findings also corroborated previously reported links between this character strength and exercise, reduced smoking, and limited alcohol consumption (De Boer et al., 2011).

Our findings provide further evidence of gratitude's important role in well-being and mental and physical health. Specifically, prior, experimental evidence suggests that it may favorably contribute to psychological well-being (including life satisfaction, happiness, optimism, positive affect, depression symptoms, and negative affect) and adherence to health behaviors. This character strength has also been shown to alter biomarkers of the risk of cardiovascular diseases, such as endothelial dysfunction and prognostic inflammatory markers (Cousin et al., 2021; Trudel-Fitzgerald et al., 2019).

In this study, the most consistent, unfavorable association between health outcomes and health behaviors was observed for the strength of appreciation of beauty. Creativity and judgment are also strengths with consistent negative associations with health-related quality of life outcomes and health behaviors. Others (e.g., fairness, kindness, leadership, and spirituality) were unfavorably associated with selected, though still numerous, outcomes.

The appreciation of beauty reflects the ability to notice, contemplate, and appreciate beauty (Martínez-Martí et al., 2018). Theoretical considerations from philosophical research indicate positive associations between appreciation of beauty and well-being, and positive emotions (Martínez-Martí et al., 2016). They are corroborated by empirical evidence that indicates a positive correlation between appreciation of beauty and balanced positive and negative affect (Martínez-Martí et al., 2018), agreeableness, perspective-taking, trust, generosity, and increased helping behavior (Martínez-Martí et al., 2016). In addition, appreciation of beauty has been linked to several emotions that involve observing others or nature external to oneself. Such emotions include awe, admiration, wonder, and elevation (Algoe & Haidt, 2009; Peterson

Table 5
Associations between character strengths and positive health behaviors (N = 56,998). Cross-sectional data. Estimates for the increase of 1 SD in the character strength indicator.

Character Strength	Muscle-strengthening activities		Moderate-to-vigorous aerobic activities		Healthy diet		Healthy social activities		Healthy self-care	
	RR (95 % CI)	p-value	RR (95 % CI)	p-value	Beta (95 % CI)	p-value	Beta (95 % CI)	p-value	Beta (95 % CI)	p-value
Appreciation of beauty	1.012 (1.001; 1.022)	0.027	0.991 (0.979; 1.003)	0.131	0.052 (0.042; 0.063)	<0.001	−0.074 (−0.081; −0.068)	<0.001	0.009 (−0.006; 0.023)	0.235
Bravery	1.006 (0.999; 1.014)	0.079	1.022 (1.011; 1.034)	<0.001	0.005 (−0.005; 0.015)	0.350	−0.0100 (−0.019; −0.001)	0.030	−0.006 (−0.016; 0.004)	0.232
Creativity	0.974 (0.964; 0.983)	<0.001	0.943 (0.933; 0.954)	<0.001	−0.027 (−0.036; −0.018)	<0.001	−0.085 (−0.095; −0.074)	<0.001	−0.024 (−0.033; −0.016)	<0.001
Curiosity	1.060 (1.052; 1.068)	<0.001	1.105 (1.094; 1.116)	<0.001	0.069 (0.057; 0.081)	<0.001	0.128 (0.117; 0.139)	<0.001	0.082 (0.073; 0.091)	<0.001
Fairness	0.985 (0.978; 0.991)	<0.001	0.990 (0.977; 1.003)	0.131	<0.001 (−0.014; 0.014)	0.997	−0.012 (−0.022; −0.002)	0.021	−0.007 (−0.016; 0.002)	0.108
Forgiveness	1.003 (0.996; 1.009)	0.397	0.993 (0.978; 1.008)	0.335	0.008 (−0.001; 0.018)	0.082	0.006 (−0.009; 0.021)	0.446	0.011 (0.002; 0.019)	0.014
Gratitude	1.020 (1.013; 1.026)	<0.001	1.038 (1.026; 1.050)	<0.001	0.028 (0.012; 0.044)	0.001	0.074 (0.061; 0.086)	<0.001	0.090 (0.077; 0.103)	<0.001
Honesty	0.998 (0.991; 1.006)	0.672	0.991 (0.976; 1.005)	0.212	0.037 (0.028; 0.045)	<0.001	0.020 (0.011; 0.028)	<0.001	0.023 (0.012; 0.033)	<0.001
Hope	1.009 (0.999; 1.019)	0.072	0.987 (0.969; 1.005)	0.144	0.041 (0.029; 0.054)	<0.001	0.079 (0.068; 0.089)	<0.001	0.125 (0.115; 0.135)	<0.001
Humility	1.007 (1.000; 1.014)	0.063	1.015 (1.005; 1.025)	0.002	0.004 (−0.008; 0.015)	0.540	−0.045 (−0.054; −0.037)	<0.001	−0.017 (−0.030; −0.004)	0.011
Humor	1.002 (0.995; 1.010)	0.496	1.001 (0.987; 1.015)	0.918	−0.043 (−0.051; −0.034)	<0.001	0.051 (0.039; 0.062)	<0.001	0.015 (0.006; 0.024)	0.002
Judgment	0.963 (0.957; 0.969)	<0.001	0.948 (0.939; 0.958)	<0.001	−0.037 (−0.044; −0.030)	<0.001	−0.042 (−0.053; −0.032)	<0.001	−0.048 (−0.058; −0.037)	<0.001
Kindness	0.982 (0.973; 0.992)	<0.001	0.970 (0.959; 0.982)	<0.001	−0.054 (−0.065; −0.042)	<0.001	0.025 (0.008; 0.042)	0.005	−0.051 (−0.061; −0.041)	<0.001
Love	0.982 (0.976; 0.987)	<0.001	0.977 (0.961; 0.993)	0.005	−0.004 (−0.012; 0.003)	0.280	0.078 (0.069; 0.086)	<0.001	0.027 (0.018; 0.036)	<0.001
Love of learning	0.969 (0.959; 0.979)	<0.001	0.976 (0.959; 0.993)	0.005	0.021 (0.007; 0.034)	0.003	−0.071 (−0.078; −0.064)	<0.001	−0.012 (−0.022; −0.003)	0.013
Leadership	1.031 (1.025; 1.038)	<0.001	1.057 (1.048; 1.067)	<0.001	0.004 (−0.004; 0.013)	0.312	0.049 (0.036; 0.062)	<0.001	−0.018 (−0.036; 0.000)	0.050
Perseverance	1.030 (1.015; 1.046)	<0.001	1.057 (1.036; 1.078)	<0.001	0.011 (−0.003; 0.025)	0.127	0.009 (−0.002; 0.020)	0.122	0.022 (0.013; 0.030)	<0.001
Perspective	0.993 (0.986; 1.001)	0.100	0.973 (0.957; 0.990)	0.002	0.024 (0.012; 0.035)	<0.001	0.036 (0.027; 0.046)	<0.001	0.029 (0.016; 0.043)	<0.001
Prudence	0.987 (0.981; 0.993)	<0.001	0.968 (0.953; 0.983)	<0.001	0.007 (−0.001; 0.016)	0.086	−0.016 (−0.029; −0.004)	0.012	0.020 (0.004; 0.035)	0.011
Self-regulation	1.069 (1.06; 1.078)	<0.001	1.125 (1.110; 1.139)	<0.001	0.161 (0.150; 0.173)	<0.001	0.007 (−0.008; 0.021)	0.380	0.086 (0.077; 0.094)	<0.001
Social intelligence	1.014 (1.008; 1.021)	<0.001	1.013 (0.997; 1.029)	0.117	0.005 (−0.002; 0.012)	0.176	0.044 (0.034; 0.054)	<0.001	−0.012 (−0.025; 0.000)	0.048
Spirituality	0.985 (0.976; 0.995)	0.002	0.952 (0.937; 0.967)	<0.001	−0.074 (−0.086; −0.062)	<0.001	−0.032 (−0.051; −0.013)	0.001	0.021 (0.012; 0.029)	<0.001
Teamwork	0.994 (0.987; 1.002)	0.164	0.983 (0.969; 0.997)	0.019	−0.002 (−0.012; 0.008)	0.654	0.074 (0.067; 0.082)	<0.001	−0.015 (−0.027; −0.004)	0.011
Zest	1.087 (1.077; 1.096)	<0.001	1.186 (1.165; 1.207)	<0.001	0.090 (0.070; 0.109)	<0.001	0.129 (0.118; 0.140)	<0.001	0.125 (0.104; 0.146)	<0.001

RR=risk ratio, CI=confidence interval. Continuous outcome variables and character strength variables were standardized (mean = 0, standard deviation = 1). Controlling for: gender, age group, education, employment status, household income, number of days of poor mental health, number of days of poor physical health, and location; All missing covariate and outcome variables were imputed using chained equations (10 sets of imputed data were generated) (White et al. 2011). Multiple imputation estimates were pooled using the Rubin's rule (Rubin 1987).

& Seligman, 2004). Our results do not align with this prior evidence. One interpretation of this negative finding is that appreciation of beauty is particularly externally focused. Therefore, people with this character strength may demonstrate a greater risk of not addressing internally issues such as physical and mental health and other health behaviors. We wonder if the external focus of this strength in action (in terms of how it is measured on the VIA Inventory of Strengths)—despite the powerful emotion it elicits—creates an external-internal imbalance with self-care. Another interpretation is that character strengths can have a negative impact if they are drawn upon too often. This is explained by emerging evidence on character strength overuse, underuse, and optimal use (Niemiec, 2019a), which suggests that each character strength is located on a continuum ranging from too little to too much. As the individual brings forth too much or too little of a strength in a particular situation, it can have a negative impact on oneself or others.

We offer an interpretation of the overuse of character strengths in two of these negative findings. First, judgment involves displaying critical and detailed thinking and analysis. Overuse of this strength can be viewed as being rigid, cynical, narrow-minded, and self-absorbed (Niemiec, 2019a). Judgment, although an important strength when used in a balanced way, can lead to a person being harsh and excessively critical (i.e., judgmental) toward themselves and others. This overuse may contribute to negativity towards oneself and one's habits. A person might become trapped in negative vicious cycles of thinking and feeling that characterize several mental disorders. Second, kindness involves going out of one's way to be caring, compassionate, or giving to others. Overusing kindness can make one feel overextended, drained, and compassion fatigued. Despite being well-intentioned, kindness may become imbalanced through an excessive focus on others. This has the danger of limiting self-compassion and health behaviors toward oneself, such as self-care, quality sleep, healthy eating, and exercise. Our research is consistent with these hypotheses and corroborates recent findings indicating that judgment and kindness display the most significant negative associations with inner peace (Wood et al., 2022). It is also possible that the reverse causal link drives this association. Character strengths such as kindness or spirituality may develop along with unfavorable health conditions. A person suffering from illness may develop these strengths to compensate for deterioration in their health.

Regarding the associations between character strengths and a sense of purpose, four strengths demonstrated powerful links with purpose in life. These were hope, spirituality, zest, and curiosity (in descending order of the effect size). This not only corroborated previous findings on correlates of purpose in life (Wagner, Gander, Proyer, & Ruch, 2020; Weziak-Bialowolska et al., 2023) but also added to existing evidence on predictors of purpose in life (e.g., Chen, Kim, Shields, & VanderWeele, 2020; Weziak-Bialowolska & Bialowolski, 2022a). Conceptually, hope is future-oriented and has a positive orientation toward it. Hence, hope aligns conceptually with purpose in life, which is also future-oriented. Previous research on purpose and meaning in life reported similar findings (Stoyles et al., 2015). Research has also found that hope and spirituality are among the top three correlates of meaning in life (Peterson et al., 2007) and that hope mediates the relationship between purpose or meaning in life and subjective well-being (Bronk et al., 2009; Yalçın & Malkoç, 2015). Spirituality involves connecting outside oneself and has been shown to correlate positively with meaning in life (Ivtzan et al., 2013). In addition, some researchers view purpose as a dimension or element of spirituality and transcendence (Peterson & Seligman, 2004). Therefore, the highest associations of hope (a strength of the virtue of transcendence in the VIA classification) and the sense of spirituality align here. Purpose in life naturally aligns with zest and the inherent enthusiasm, passion for goals, and energy that this strength involves. In this regard, our findings on positive associations between zest and purpose in life corroborate this theoretical consideration and prior empirical evidence (Glasberg et al., 2014).

5.1. Limitations

Our study had several limitations. First, we used cross-sectional data, which allowed us to examine only concurrent associations. Therefore, our analyses did not provide evidence of causal mechanisms triggered by interventions involving character strengths. This caveat should be considered when interpreting the results. Despite this drawback, our sample size included almost 60,000 respondents from 159 countries. This provides some reassurance that, although not causal, the results are ubiquitous. Second, the study was designed as a convenience sample. This implies that self-selection bias could be present and distort the results, as respondents who were already interested in their character strengths were more inclined to participate. However, the study did not focus on the relative prevalence of character strengths but rather on the associations between character strengths and health-related outcomes. This implies that the bias would only surface if the probability of participation in the study were linked to the role that character strengths play in health outcomes. Nevertheless, the generalizability of our findings is limited to the study population. Another issue relates to the wording of the three questions on health behaviors: healthy diet, healthy social activity, and healthy self-care. As these questions are complex and resemble double-barreled questions, this might have influenced the accuracy of the responses. Despite this limitation in examining each health behavior, this study is meant to catalyze deeper and more nuanced explorations of each pillar of health in future studies. Next, only insufficient sleep was measured for the healthy sleep domain. As we recognize that good health is more than the absence of a negative effect (Seligman, 2008), future studies should consider applying a positive measurement of sleep quality and quantity. Lastly, we examined 24 character strengths simultaneously as the independent variables in the singular regression analyses. In such cases, the risk of multicollinearity arises and could potentially inflate standard errors, leading to high uncertainty regarding the true value of the regression coefficient. To circumvent this issue, we tested for multicollinearity. The results based on the variance inflation factor assure that this issue did not affect the results.

6. Conclusions

In this study, we examined the concurrent associations between 24 character strengths and five pillars of health: healthy diet, exercising/sport activity, sleep, socializing, and self-care. We also broadened the analysis to include other health variables involving a rich set of outcomes reflecting health-related quality of life and psychological well-being. We found that the majority of character strengths were favorably associated with mental and physical health, health behaviors, and higher purpose in life. Some negative associations identified in the study may result from the suboptimal use (e.g., overuse or underuse) of character strengths.

CRediT authorship contribution statement

Dorota Weziak-Bialowolska: Conceptualization, Data curation, Formal analysis, Methodology, Writing - original draft, Writing - review & editing. **Piotr Bialowolski:** Data curation, Methodology, Writing - review & editing. **Ryan M. Niemiec:** Conceptualization, Data curation, Methodology, Project administration, Writing - original draft, Writing - review & editing.

Table 6

Associations between character strengths and harmful health behaviors (N = 56,998): Cross-sectional data. Estimates for the increase of 1 SD in the character strength indicator.

Character Strength	Smoking		Excessive drinking	
	RR (95 % CI)	p-value	RR (95 % CI)	p-value
Appreciation of beauty	1.095 (1.055; 1.136)	<0.001	1.086 (1.035; 1.139)	0.001
Bravery	1.255 (1.202; 1.310)	<0.001	1.027 (0.973; 1.084)	0.335
Creativity	1.103 (1.074; 1.133)	<0.001	0.921 (0.886; 0.958)	<0.001
Curiosity	0.920 (0.877; 0.965)	0.001	1.014 (0.968; 1.062)	0.551
Fairness	0.974 (0.948; 1.001)	0.056	0.954 (0.924; 0.985)	0.004
Forgiveness	1.015 (0.991; 1.039)	0.236	1.034 (0.994; 1.076)	0.096
Gratitude	0.890 (0.863; 0.917)	<0.001	1.002 (0.978; 1.027)	0.848
Honesty	0.889 (0.868; 0.910)	<0.001	1.019 (0.985; 1.053)	0.271
Hope	1.026 (0.973; 1.082)	0.344	1.029 (0.998; 1.061)	0.069
Humility	0.996 (0.967; 1.026)	0.798	0.937 (0.901; 0.973)	0.001
Humor	1.043 (1.016; 1.070)	0.002	1.082 (1.045; 1.120)	<0.001
Judgment	1.081 (1.052; 1.111)	<0.001	0.999 (0.965; 1.033)	0.934
Kindness	0.976 (0.946; 1.007)	0.128	0.941 (0.914; 0.969)	<0.001
Love	1.019 (0.990; 1.049)	0.198	0.977 (0.948; 1.007)	0.126
Love of learning	0.880 (0.857; 0.905)	<0.001	0.899 (0.857; 0.944)	<0.001
Leadership	0.982 (0.959; 1.005)	0.132	1.063 (1.011; 1.118)	0.017
Perseverance	1.143 (1.112; 1.175)	<0.001	1.123 (1.087; 1.160)	<0.001
Perspective	1.077 (1.034; 1.121)	<0.001	1.064 (1.017; 1.114)	0.007
Prudence	0.840 (0.809; 0.871)	<0.001	0.895 (0.855; 0.936)	<0.001
Self-regulation	0.748 (0.721; 0.775)	<0.001	0.782 (0.758; 0.807)	<0.001
Social intelligence	1.119 (1.089; 1.150)	<0.001	1.124 (1.079; 1.172)	<0.001
Spirituality	1.022 (0.978; 1.068)	0.338	0.790 (0.765; 0.817)	<0.001
Teamwork	0.995 (0.970; 1.022)	0.734	0.988 (0.961; 1.016)	0.396
Zest	0.962 (0.924; 1.002)	0.066	1.098 (1.053; 1.145)	<0.001

RR=risk ratio, CI=confidence interval. Character strength variables were standardized (mean = 0, standard deviation = 1). Controlling for: gender, age group, education, employment status, household income, and location; All missing covariate and outcome variables were imputed using chained equations (10 sets of imputed data were generated) (White et al. 2011). Multiple imputation estimates were pooled using the Rubin's rule (Rubin 1987).

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Dorota Weziak-Bialowolska's work has been funded by the Norwegian Financial Mechanism 2014-2021 (UMO-2020/37/K/HS6/02772). Piotr Bialowolski declare no potential conflict of interest. Ryan Niemiec is employed in VIA Institute on Character – the institution that collected the data used in the study.

Data availability

Data will be made available on reasonable request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jrp.2022.104338.

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