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Different Conceptualizations of Optimism/Pessimism and Their Relationship with Physical and Mental Health and Health-Related Behaviors

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Abstract

Background: There are practically no studies on the relationship between defensive pessimism and health. The objectives are (i) To examine the relationship between dispositional optimism and physical and mental health, and also between health behaviors, and (ii) To determine possible differences in physical and mental health, and health behaviors, exploring three different conceptualizations of optimism/pessimism.

Methods: The association between dispositional optimism (LOT-R), and physical and mental health (SF-36), and Health-Related Behaviors (HBC), were examined. We applied the OPQ to extract three groups from the total of participants, classified as dispositional-realistic pessimism, defensive pessimism, and dispositional-realistic optimism.

Results: Dispositional optimism was a predictor of all the components of mental and physical health, it predicted mental health more strongly, is also a predictor of preventive health behavior. In the comparison of the study groups, dispositional-realistic optimism had the highest score in the SF-36 and in the Preventive Health Behavior. In Substance Risk Taking, defensive pessimism and dispositional-realistic optimism have a protective connotation.

Conclusions: Dispositional optimism is a significant predictor of good mental and physical health outcomes. Dispositional-realistic optimists enjoy better health status and/or better quality of life in the different areas of mental and physical health, and perform more healthy behaviors. Of the study groups, on average, dispositional-realistic optimists were older.

Keywords

Defensive pessimism, Dispositional pessimism, Dispositional optimism, Mental health, Physical health, Health protective behaviors, Age differences

Introduction

Although most of the scientific evidence suggests that optimism is a desirable characteristic, there are as yet no generally accepted definitions of optimism and pessimism [1-3]. The most popular view is Scheier and Carver's [4] definition of optimism and pessimism as generalized positive and negative expectancies regarding future outcomes, as a general tendency to expect that one will experience positive versus negative events in the future. The widely used Life Orientation Test (LOT) [4] and Life Orientation Test-Revised (LOT-R) [5] are based on this definition, and more specifically on dispositional optimism, defined as a generalized positive expectation for the future [4,5]. Optimism is a variable that reflects individual differences in generalized favorable expectancies about one's future [6].

There have been many different meta-analyses of optimism. Andersson [7] analyzed 56 studies that used the LOT and found that dispositional optimism is significantly associated with measures of coping, symptom

reporting, negative effect, and depression, concluding that the most reliable association is between optimism and negative effect. Nes and Segerstrom [8] examined 50 studies that utilized the LOT and the LOT-R to analyze the relationship between dispositional optimism and coping, finding that dispositional optimism was positively associated with approach coping strategies aiming to eliminate, reduce, or manage stressors or emotions, and negatively associated with avoidance coping strategies seeking to ignore, avoid or withdraw from stressors or emotions. Rasmussen, Scheier and Greenhouse [9] offered a quantitative, meta-analytic review of the research exploring links between dispositional optimism and physical health, reviewing 83 studies for this purpose. These authors indicate that dispositional optimism is a significant predictor of variations in physical health and in biological markers of health, and even when taking traditional risk factors and relevant psychosocial factors into account, dispositional optimism provides added value.

A specific type of pessimism called defensive pessimism has also focused research on the differences between optimism and pessimism [10], defensive pessimism is different from dispositional pessimism. Defensive pessimism refers to a domain-specific cognitive strategy that involves thinking through worst-case outcomes of an upcoming achievement situation, even though they have been successful in the past [11-13]. This strategy allows for a sense of control and use of anxiety to motivate better performance, although initially the individual feels anxious and out of control. Cantor and Norem [14] indicate that the distinction between defensive pessimism and realistic pessimism is critical. Generally, across a variety of contexts, research has shown that defensive pessimists perform just as well as strategic optimists [10,12,14-16]. Defensive pessimism seems to be adaptive in some aspects [10]. Defensive pessimism is linked to more positive outcomes than dispositional pessimism [13]. Defensive pessimism is a strategy that shares some features of the pessimist's negative expectancy orientation without entailing the debilitating motivational consequences, on the other hand, dispositional pessimism is associated with self-defeating, socially isolating, and motivationally maladaptive coping strategies [17].

While there are few studies of defensive pessimism, there are practically no studies on the relationship between defensive pessimism and health. In general, there are still very few studies examining the relationship between pessimism and physical health [18]. In the conclusions of their meta-analytic review, Rasmussen, Scheier and Greenhouse [9] noted that attention still needs to be given to the relative toxicity of optimism versus pes-

simism. Very few studies have conducted analyses that enable the relative potency of these two components to be evaluated, and more studies are critically needed. The answer to the question of which component is more toxic has implications not only for our understanding of how expectancies influence health but also for the kinds of interventions that are created to help people maintain better health.

As possible responses to the question of why optimists have better health than pessimists, Carver and Scheier [3] pointed out two possibilities, a motivational one and a behavioral one. Part of remaining healthy consists of doing the right things and avoiding the wrong things. Optimists take a proactive approach to health promotion. They are less likely to smoke, more likely to exercise, follow healthier diets, and are more likely to improve their diets than are pessimists. These behavioral pathways are all consistent with the motivated goal pursuit that optimists display in other domains. Another reason for better health follows from the better profile of emotional responses to adversity displayed by optimists (less distress and more positive emotions). This pattern of overall emotional experiences, which is partly a consequence of optimists' coping reactions, no doubt leads to lower physiological strain over time, resulting in better health.

With respect to the pathway of motivational and behavioral performance, Rasmussen, Scheier and Greenhouse [9] concluded that very few studies have attempted to capture the underlying pathways by which optimism impacts disease and health. Studies are needed that assess optimism, the suspected underlying pathways, and relevant disease endpoints and health outcomes. Carver, Scheier and Segerstrom [6] found evidence that optimism is associated with taking proactive steps to protect one's health, whereas pessimism is associated with health-damaging behaviors, but research on optimism and health, with an emphasis on exploration of mechanisms of action should continue [3].

Considering some of these suggestions and proposals, in the current study, we suggest two general goals. Firstly, we want to examine the relationship between optimism and physical and mental health, and also between optimism and health behaviors. To verify these relationships, we measured optimism with the LOT-R, physical and mental health with the Health Survey SF-36 Questionnaire (SF-36) [19], and health behaviors with the Health Behavior Checklist (HBC) [20]. We considered a measure of health instead of asking participants about their individual health behaviors, because research indicates that, rather than being independent, health behaviors occur in clusters or dimensions [21,20]. Secondly, we want to determine possible differences in physical and mental

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health as well as in health behaviors, between optimists and pessimists, exploring three different conceptualizations of optimism/pessimism. For this purpose, we used the measures to analyze the first goal, and we applied the Optimism-Pessimism Questionnaire (OPQ) [10,12] to extract three groups from the total sample of participants, that we classified as dispositional-realistic pessimism, defensive pessimism, and dispositional-realistic optimism groups. Our aim was to determine whether they differ in various components of physical and mental health and in their health behaviors. The extraction of these three groups is described in the statistical analysis section. This is the first study that compares these three different types of optimism/pessimism to determine possible differences in several health indicators.

Method

Participants and procedure

Participants were 711 undergraduate Psychology students, 136 male and 575 female, with a mean age of 36.65 years (SD = 10.18), ranging between 18 and 73 years. These people were recruited in the National University of Distance Education (UNED), and volunteered to take part in this study. The participants were not rewarded for taking part in the study. Due to the characteristics of the National University of Distance Education (UNED), participants are representative of the general population, are people who study and work, have different professions, living in urban and rural environments, and have a very wide age range. This study took into account the Declaration of Helsinki and ethical guidelines.

Instruments

Optimism measures

Life Orientation Test-Revised (LOT-R) [5]: This scale was designed to assess generalized expectations of positive and negative outcomes. The LOT-R is a short instrument with 10 self-report items. Only 6 of the 10 items are used to derive an optimism score. The remaining 4 items are filler items. Of the 6 items, 3 are keyed positively, and 3 negatively. We used the adapted version for the Spanish population by Perczerk, et al. [22]. Participants were asked to rate their agreement with each item from 1 (*Strongly disagree*) to 5 (*Strongly agree*). The three negatively worded items were reversed scored and added to the three positively worded items to create summary optimism scores, so ratings can potentially range from 6 to 30, with higher scores indicating higher levels of dispositional optimism. The psychometric properties of the LOT-R have been well documented by the developers of the instrument [4,5]. A recent meta-analytical study on the internal consistency of the LOT-R yielded a mean alpha coefficient of 0.73 [23]. In the population

used in this study, the scores on this scale had Cronbach alpha coefficients of 0.87 (*M* = 22.24, *SD* = 4.77). In the population used in this study (*N* = 711), the scores on this scale had Cronbach alpha coefficients of 0.87 (*M* = 22.24, *SD* = 4.77).

Researchers sometimes split the Life Orientation Test-Revised into 2 subscales, one consisting of only positively valenced items and the other consisting of only negatively valenced items. We chose not to use subscales for theoretical and methodological reasons, optimism is most accurately captured by a scale that combines positively worded items that are endorsed and negatively worded items that are rejected [24]. Furthermore, it is increasingly apparent that this separation into subscales may be at odds with the goal of controlling for acquiescence response bias in the measurement of psychological constructs [25]. Carver, Scheier and Segerstrom [6] in a review, continued to recommended that the LOT-R be used as a unidimensional scale in primary analyses. Thus, following recent theorizing and work in this area, we used the 6-item composite, rather than creating two 3-item subscales [26-29].

Optimism-Pessimism Questionnaire (OPQ) [10,12]: This 9-item questionnaire was designed to assess defensive pessimism and optimism in academic situations. Items are rated on a Likert-type response scale ranging from 1 (*not at all true of me*) to 11 (*very true of me*). Using this scale, an optimism-pessimism score is computed by subtracting the sum of the endorsements of the four pessimistic items from the sum of the endorsement of the four optimistic items. Reliability and validity have been well documented by the developers of the instrument [10,12,14]. In the population used in this study, the scores on this scale had Cronbach alpha coefficients of 0.69 (*M* = 9.47, *SD* = 8.64). In this study, we only considered the reply to Item 3 of the questionnaire ("I've generally done pretty well in academic situations in the past"), which assesses past academic success, following the recommendations of the authors of the questionnaire, who indicate that this item is used to distinguish between defensive pessimism and realistic pessimism [10,12,14].

Health measures

Health Survey SF-36 Questionnaire (SF-36) [19]: We applied SF-36 the version 2 (SF-36v2) that asks participants about all the health dimensions of the past 4 weeks, except for the dimensions of physical functioning and general health. We used a Spanish version, which has shown good internal consistency, reliability, and validity [30,31]. This instrument was developed from the Medical Outcome Study (MOS) [19]. It is applicable to the general population as well as to clinical groups [32]. It is comprised of 36 items that report positive and negative states of physical health and emotional well-being. Items are rated on a Likert-type response scale that evaluates

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intensity or frequency, the number of response options ranges from three to six, depending on the item. Some items are scored in reverse, the score in reverse of the items is done to ensure that a higher value of the item indicates better health in all items and scales of the SF-36. Scale scores are a sum of all items in the specific scale and do not require further standardization or weighting, the score of each scale or dimension has been obtained from the algebraic sum of the final value of the items that compose it. Higher scores indicate a better state of health and/or a better quality of life in different areas. It identifies 8 dimensions of health: Physical Functioning, Role Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role Emotional, and Mental Health. Subsequently, Summary scores for a Physical Health Component (Physical Functioning, Role Physical, Bodily Pain, and General Health) and a Mental Health Component (Vitality, Social Functioning, Role Emotional, and Mental Health) can also be derived. The reliability and validity of the SF-36 have been well documented by the developers of the instrument [19,33].

In the population used in this study, the scores on this scale had the following Cronbach alpha coefficients: 0.86 for Physical Functioning ($M = 28.59$, $SD = 2.54$), 0.92 for Role Physical ($M = 17.74$, $SD = 3.20$), 0.76 for Bodily Pain ($M = 8.77$, $SD = 1.97$), 0.82 for General Health ($M = 20.03$, $SD = 3.60$), 0.84 for Vitality ($M = 14.24$, $SD = 3.12$), 0.84 for Social Functioning ($M = 8.73$, $SD = 1.74$), 0.90 for Role Emotional ($M = 13.24$, $SD = 2.42$), 0.84 for Mental Health ($M = 19.46$, $SD = 3.62$), 0.90 for the Physical Health Component scale ($M = 75.14$, $SD = 8.93$), and 0.92 for the Mental Health Component scale ($M = 55.66$, $SD = 9.25$).

Health Behavior Checklist (HBC) [20]: This 40-item scale was designed to assess health behaviors. Twenty-six of the items assess four factor-analytically derived health behaviors. The HBC measures four factors: Wellness Maintenance and Enhancement Behaviors, with 10 items (e.g., "I exercise to stay healthy"); Accident Control Behaviors, with 6 items (e.g., "I fix broken things around my house right away"); Traffic Risk Taking, with 7 items (e.g., "I speed while driving"); and Substance Risk Taking, which has 3 items (e.g., "I do not drink alcohol"). When scoring this last factor, all items are reversed. Participants indicate how well each item describes their typical behavior on a 5-point Likert scale ranging from 1 (*disagree strongly*) to 5 (*agree strongly*).

Health behaviors form two broader categories or dimensions: Preventive Health Behavior and Risk Taking Behavior. Preventive Health Behavior is the sum of the scores of Wellness Maintenance and Enhancement Behaviors and Accident Control Behaviors. Risk Taking Behavior is the sum of the scores of Traffic Risk Taking

and Substance Risk Taking. In the categories of Traffic Risk Taking, Substance Risk Taking, and the broad category of Risk Taking Behavior, a higher score indicates greater risk. The procedures used to develop the HBC, as well as the reliability and validity of the scale, are described in Vickers, Conway and Hervig [20]. There is also evidence of criterion-referenced validity in comparison with relevant measures [20,34].

We used our translated spanish version, which has shown good internal consistency [35]. In the population used in this study, the scores on this scale had Cronbach alpha coefficients of 0.73 for Wellness Maintenance and Enhancement Behaviors ($M = 28.58$, $SD = 7.22$), 0.63 for Accident Control Behaviors ($M = 16.83$, $SD = 4.77$), 0.65 for Traffic Risk Taking ($M = 17.04$, $SD = 4.69$), 0.53 for Substance Risk Taking ($M = 6.86$, $SD = 3.15$), 0.78 for Preventive Health Behavior ($M = 45.41$, $SD = 10.30$), and 0.62 for Risk Taking Behavior ($M = 23.90$, $SD = 6.07$).

Data analysis

To analyze the relationships between optimism and physical and mental health, and the relations between optimism and health behaviors, Pearson product moment correlations (two-tailed) and stepwise multiple regression analysis and linear regression analysis were carried out. We took into account the entire sample, 711 participants, and used the optimism score obtained in the LOT-R test.

Due to the wide age range of the population studied, 18 to 73 years of age, and to the fact that age may influence health components and health-related behaviors, we calculated Pearson product moment correlations (two-tailed) between age and the health components and health-related behaviors. We analyzed the relationships between optimism (LOT-R) and health components and health-related behaviors.

To explore the predictive value of age and optimism (LOT-R) as the independent variables, stepwise multiple regression analysis and linear regression analysis were performed, with the components of physical and mental health and the categories of health-related behaviors as the dependent variables.

To determine possible differences in physical and mental health and in health behaviors between optimists and pessimists, exploring three different conceptualizations of optimism/pessimism, the following steps were followed:

First, the LOT-R test scores obtained by the 711 participants were divided into three parts (tertiary split). Three groups of people were formed statistically depending on the score obtained in the LOT-R test. The first group comprised people with a score of less than 21

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Table 1: Pearson correlations between age and optimism (LOT-R), and health components and behaviors (SF-36 and HBC).

Health Survey SF-36 Questionnaire (SF-36)

	Physical Functioning	Role Physical	Bodily Pain	General Health	Vitality	Social Functioning	Role Emotional	Mental Health	Physical Health Component[a]	Mental Health Component[b]
Age	-0.188** (p = 0.000)	0.000 (p = 0.994)	-0.003 (p = 0.943)	0.040 (p = 0.289)	0.114** (p = 0.003)	0.19 (p = 0.613)	0.153*** (p = 0.000)	0.130*** (p = 0.001)	-0.039 (p = 0.309)	0.133*** (p = 0.000)
Optimism (LOT-R)	0.106** (p = 0.005)	0.132*** (p = 0.000)	0.119* (p = 0.002)	0.359*** (p = 0.000)	0.420*** (p = 0.000)	0.266*** (p = 0.000)	0.341*** (p = 0.000)	0.515*** (p = 0.000)	0.249*** (p = 0.000)	0.484*** (p = 0.000)

Health Behavior Checklist (HBC)

	Wellness Maintenance and Enhancement Behaviors	Accident Control Behaviors	Preventive Health Behavior[c]	Traffic Risk Taking	Substance Risk Taking	Risk Taking Behavior[d]
Age	0.220*** (p = 0.000)	0.214*** (p = 0.000)	0.254*** (p = 0.000)	-0.157*** (p = 0.000)	-0.031 (p = 0.420)	-0.137*** (p = 0.000)
Optimism (LOT-R)	0.152*** (p = 0.000)	0.085* (p = 0.025)	0.146*** (p = 0.000)	-0.016 (p = 0.668)	-0.050 (p = 0.183)	-0.039 (p = 0.306)

N = 711; *** p ≤ 0.001 (two tailed); ** p ≤ 0.01 (two tailed); * p ≤ 0.05 (two tailed).

Note: [a]Physical Health Component is the sum of Physical Functioning, Role Physical, Bodily Pain and General Health.

[b]Mental Health Component is the sum of Vitality, Social Functioning, Role Emotional and Mental Health.

[c]Preventive Health Behavior is the sum of Wellness Maintenance and Enhancement Behaviors and Accident Control Behaviors.

[d]Risk Taking Behavior is the sum of Traffic Risk Taking and Substance Risk Taking.

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(bottom third), the second group was formed of people with scores between 21 and 25 (middle third), and the third group was made up of people with a score greater than 25 (top third). We excluded the individuals who fell in the middle third of the distribution, because they may be heterogeneous.

Secondly, as a function of the goals of the study, the participants selected in the previous step were assigned to groups based on the scores they had obtained in the LOT-R and in Item 3 of the OPQ.

The groups were formed in the following way

Dispositional-realistic pessimism: Participants who fell into the bottom third of the distribution of the LOT-R scores (scale score less than 21), and scored less than 9 on Item 3 of the OPQ. This group comprised a total of 54 people, 12 male (22.2%) and 42 female (77.8%), with a mean age of 32.87 years (SD = 9.73), and age range between 18 and 58 years.

Defensive pessimism: Participants who fell into the bottom third of the distribution of the LOT-R scores (scale score less than 21), and with a score equal to or greater than 9 on Item 3 of the OPQ. This group included 151 people, 27 male (17.9%) and 124 female (82.1%), with a mean age of 33.27 years (SD = 10.18), and age range between 20 and 69 years.

Dispositional-realistic optimism: Participants who scored in the top third of the distribution of the LOT-R scores (scale score higher than 25), and with a score equal to or greater than 9 on Item 3 of the OPQ. This group comprised 147 people, 25 male (17%) and 122 female (83%), with a mean age of 39.6 years (SD = 10.07), and age range between 20 and 73 years.

Thirdly, Multivariate Analysis of Variance (MANOVA), Multivariate Analysis of Covariance (MANCOVA), and Univariate Analysis of Variance (ANOVA) were performed, with the three groups as independent variable and with the components of physical and mental health and the categories of health-related behaviors as the dependent variables.

All reported p values are two sided and p values of less than 0.05 were considered to indicate statistical significance. Data were analyzed with IBM SPSS (version 24) software for Windows.

Results

Relationship between age and dispositional optimism with mental and physical health components, and health-related behaviors:

There was a significant relationship between age and dispositional optimism (LOT-R), $r = 0.250$, $p = 0.000$.

Other relationships are shown in (Table 1). Age presented significant relationships with various components of mental health: Vitality, Role Emotional, Mental Health and with the Mental Health Component. In contrast, within the components of physical health, age only presented a significant but negative relationship with Physical Functioning.

Regarding the categories of health-related behaviors, age showed a significant and positive relationship with Wellness Maintenance and Enhancement Behaviors, Accident Control Behaviors, and Preventive Health Behavior (the sum of Wellness Maintenance and Enhancement Behaviors and Accident Control Behaviors); and a significant but negative relationship with Traffic Risk Taking and Risk Taking Behavior (the sum of Traffic Risk Taking and Substance Risk Taking), but age had no relationship with Substance Risk Taking.

Optimism (LOT-R) presented significant and positive relationships with all the components of mental and physical health. Within the categories of health-related behaviors, it had a significant and positive relationship with Wellness Maintenance and Enhancement Behaviors and Accident Control Behaviors, as well as with Preventive Health Behaviors.

Regression with age and dispositional optimism as predictors, and as criterial variables each one of the physical and mental health components and categories of health-related behaviors:

Prior to the stepwise multiple regression analysis and linear regression analysis, the relationships between independent (age, optimism) and the dependent variables (SF-36, HBC) were examined. Independent variables significantly associated with the dependent variables were considered candidate predictors and were entered into the regression analysis. The results are presented in (Table 2). In general, optimism predicted mental health more strongly than physical health.

Regarding the broad health component, Mental Health Component, optimism was the significant predictor ($R^2 = 0.234$), accounting for 23.4% of its variance, $F(1, 709) = 212.316$, $p < 0.001$. Within the specific components of mental health, the most relevant results were in Mental Health, Vitality and Role Emotional. Optimism significantly predicted Mental Health ($R^2 = 0.265$), accounting for 26.5% of its variance, $F(1, 709) = 250.108$, $p < 0.001$. Optimism also significantly predicted the component of Vitality ($R^2 = 0.178$), accounting for 17.8% of its variance, $F(1, 709) = 150.661$, $p < 0.001$. In the component of Role Emotional, the model contained the two predictors, optimism ($R^2 = 0.116$) and age ($R^2 = 0.005$), which conjointly accounted for 12.1% of the vari-

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Table 2: Regression analysis.

Dependent variables: Components of the Health Survey SF-36 Questionnaire (SF-36)

Independent variables: Age and Optimism (LOT-R)

Model	R	R^2	R^2 adjusted	R^2 change	F(df)	ß	ß standarized	t
Dependent variable: Physical Functioning Model 1: Age	0.188	0.035	0.034	0.035	25.458 (1.709)***	-0.047	-0.188	-5.046***
Model 2: Age Optimism (LOT-R)	0.245	0.06	0.057	0.025	22.145 (2.708)***	-0.057 0.087	-0.228 0.162	-6.001*** 4.266***
Dependent variable: Role Physical Model 1: Optimism (LOT-R)	0.132	0.017	0.016	0.017	12.263 (1.709)***	0.089	0.132	3.502***
Dependent variable: Bodily Pain Model 1: Optimism (LOT-R)	0.117	0.014	0.012	0.014	9.610 (1.709)**	0.049	0.117	3.100**
Dependent variable: General Health Model 1: Optimism (LOT-R)	0.358	0.128	0.127	0.128	101.768 (1.709)***	0.272	0.358	10.088***
Dependent variable: Vitality Model 1: Optimism (LOT-R)	0.422	0.178	0.177	0.178	150.661 (1.709)***	0.278	0.422	12.274***
Dependent variable: Social Functioning Model 1: Optimism (LOT-R)	0.267	0.071	0.07	0.071	53.305 (1.709)***	0.098	0.267	7.301***
Dependent variable: Role Emotional Model 1: Optimism (LOT-R)	0.341	0.116	0.115	0.116	91.472 (1.709)***	0.175	0.341	9.564***
Model 2: Optimism (LOT-R) Age	0.349	0.121	0.119	0.005	47.902 (2.708)***	0.165 0.017	0.323 0.073	8.800*** 1.986*
Dependent variable: Mental Health Model 1: Optimism (LOT-R)	0.515	0.265	0.264	0.265	250.108 (1.709)***	0.394	0.515	15.815***
Dependent variable: Physical Health Component Model 1: Optimism (LOT-R)	0.247	0.061	0.06	0.061	45.177 (1.709)***	0.466	0.247	6.721***
Dependent variable: Mental Health Component Model 1: Optimism (LOT-R)	0.484	0.234	0.233	0.234	212.316 (1.709)***	0.945	0.484	14.571***

Dependent variables: Categories of the Health Behavior Checklist (HBC)

Independent variables: Age and Optimism (LOT-R)

Model	R	R^2	R^2 adjusted	R^2 change	F(df)	ß	ß standarized	t
Dependent variable: Wellness Maintenance and Enhancement Behaviors Model 1: Age	0.220	0.048	0.047	0.048	35.334 (1.709)***	0.156	0.220	5.944***
Model 2: Age Optimism (LOT-R)	0.241	0.058	0.055	0.009	21.279 (2.708)***	0.139 0.152	0.195 0.1	5.137*** 2.631**
Dependent variable: Accident Control Behaviors Model 1: Age	0.214	0.046	0.044	0.046	33.357 (1.709)***	0.100	0.214	5.776***
Dependent variable: Preventive Health Behavior Model 1: Age	0.254	0.064	0.063	0.064	47.809 (1.709)***	0.257	0.254	6.914***
Model 2: Age Optimism (LOT-R)	0.267	0.071	0.068	0.007	26.511 (2.708)***	0.236 0.182	0.233 0.084	6.172*** 2.223*
Dependent variable: Traffic Risk Taking Model 1: Age	0.157	0.025	0.023	0.025	17.545 (1.709)***	-0.073	-0.157	-4.189***
Dependent variable: Risk Taking Behavior Model 1: Age	0.137	0.019	0.017	0.019	13.360 (1.709)***	-0.082	-0.137	-3.655***
Total Sample N = 855; ***p ≤ 0.001; **p ≤ 0.01; *p ≤ 0.05.								

ance of this component ($R^2 = 0.121$), although optimism (11.6%) explained more variance than age (0.5%), $F(2, 708) = 47.902$, $p < 0.001$.

Regarding the Physical Health Component, the sig-nificant predictor was optimism ($R^2 = 0.061$), accounting for 6.1% of the variance of the Physical Health Component, $F(1, 709) = 45.177$, $p < 0.001$. Within the specific components of physical health, the most relevant result

Table 3: Groups, Means, Standard Deviations of the Study Variables.

	Dispositional-realistic pessimism		Defensive pessimism		Dispositional-realistic optimism	
	N = 54		N = 151		N = 147	
Scale (number of items)	M	SD	M	SD	M	SD
Optimism LOT-R [6]	16.67	2.99	16.13	3.20	27.69	1.31
Physical Functioning [10]	28.35	2.37	28.33	2.90	28.93	2.50
Role Physical [4]	16.78	4.15	17.20	3.78	18.20	2.98
Bodily Pain [2]	8.00	2.24	8.60	2.17	8.93	1.90
General Health [5]	18.06	3.61	18.68	4.21	21.64	2.82
Vitality [4]	12.46	2.97	12.60	3.34	15.70	2.64
Social Functioning [2]	7.63	2.09	8.26	2.08	9.15	1.44
Role Emotional [3]	11.80	3.18	12.24	2.95	14.29	1.43
Mental Health [5]	16.98	3.74	16.99	4.03	21.66	2.10
Physical Health Component [21]	71.19	9.43	72.84	10.48	77.70	7.79
Mental Health Component [14]	48.87	9.86	50.05	10.60	60.80	5.63
Wellness Maintenance and Enhancement Behaviors [10]	27.93	6.87	26.28	6.91	29.63	7.70
Accident Control Behaviors [6]	16.41	4.73	15.79	4.41	17.47	5.08
Traffic Risk Taking [7]	17.30	4.95	17.00	4.79	16.90	4.83
Substance Risk Taking [3]	8.24	3.37	6.79	3.14	6.47	3.02
Preventive Health Behavior [16]	44.33	9.27	42.07	9.63	47.10	11.08
Risk Taking Behavior [10]	25.54	6.38	23.79	6.37	23.37	6.00
Age	32.87	9.73	33.27	10.18	39.60	10.07

was in General Health, where the significant predictor again was optimism (R^2 = 0.128), accounting for 12.8% of the variance, $F(1, 709)$ = 101.768, $p < 0.001$.

Regarding categories of health-related behaviors, age predicted more health-related behaviors than optimism. In the categories in which optimism emerged as predictor, it did so in conjunction with age. Age (R^2 = 0.048) and optimism (R^2 = 0.009) together accounted for 5.8% of the variance of Wellness Maintenance and Enhancement Behaviors (R^2 = 0.058), but age (4.8%) explained more variance than optimism (0.9%), $F(2, 708)$ = 21.279, $p < 0.001$. In Preventive Health Behavior (the sum of Wellness Maintenance and Enhancement Behaviors and Accident Control Behaviors), age (R^2 = 0.064) and optimism (R^2 = 0.007) together accounted for 7.1% of the variance (R^2 = 0.071), with age (6.4%) explaining more variance than optimism (0.7%), $F(2, 708)$ = 26.511, $p < 0.001$.

Differences between three different conceptualizations of optimism/pessimism in physical and mental health and health-related behaviors:

Table 3 presents the descriptive statistics, means, and standard deviations, of the three groups formed in this study: Dispositional-realistic pessimism, defensive pessimism, and dispositional-realistic optimism.

Two independent MANOVAs were performed. The three target groups were the independent variable in both MANOVAs, and the dependent variable was the eight different dimensions of the SF-36 in one case and, in the other case, the four factors and two categories of the HBC.

The results of the MANOVA with the SF-36 dimensions as the dependent variable indicated a significant main effect for the variable groups, Wilks' λ = 0.611, $F(18, 682)$ = 10.576, p = 0.000, η^2_p = 0.218.

The results of the MANOVA with the HBC factors and categories as dependent variable revealed a significant main effect for the variable groups, Wilks' λ = 0.917, $F(8, 682)$ = 3.826, p = 0.000, η^2_p = 0.042.

Two MANCOVAs were conducted to analyze the effect of the covariate age on the dependent variables of health and health behaviors.

The results of the MANCOVA, considering the groups as independent variable, age as covariate, and the dimensions of the SF-36 as the dependent variable showed a significant main effect for the variable groups, Wilks' λ = 0.626, $F(18, 680)$ = 9.982, p = 0.000, η^2_p = 0.209. The effect of the covariate age was significant, Wilks' λ = 0.904, $F(9, 340)$ = 4.034, p = 0.000, η^2_p = 0.096, indicating that age is linearly related to the dependent variable mental and physical health.

The results of the MANCOVA, considering the groups as an independent variable, age as covariate, and the factors and categories of the HBC as the dependent variable showed a significant main effect for the variable groups, Wilks' $\lambda = 0.933$, $F(8, 690) = 3.056$, $p = 0.002$, $\eta^2_p = 0.034$. The effect of the covariate age was significant, Wilks' $\lambda = 0.935$, $F(4, 345) = 5.947$, $p = 0.000$, $\eta^2_p = 0.065$, indicating that age is linearly related to the dependent variable health behaviors.

Due to the results obtained with the two MANOVAs, we conducted ANOVAs for each of the dependent variables and dimensions of health and health behaviors. We examined the assumption of homoscedasticity or equality of variance with Levene's test because each group had a different sample size, finding that they were not homogeneous. When the hypothesis of variance equality was rejected, we applied the tests of Brown-Forsythe and Welch. In all the cases where variances were not homogeneous, the conclusion of the hypothesis testing of equality of means never changed with the common ANOVA test and the robust alternatives. However, (Table 4) also presents the results of these analyses in the variables where Levene's test previously showed significant differences in variances, non-homogeneous variances.

Also, due to the results obtained with the MANCOVAs, Univariate Analyses of Covariance (ANCOVAS) for each of the dependent variables, with age as a covariate, were carried out. Table 4 presents the results of the ANOVAS and ANCOVAS. Adequate interpretation of the results of an ANCOVA requires using as the relevant ANOVA results as a reference point.

In the Health Components of the SF-36, a relationship between the covariate age and a scale emerged. There were no significant group differences in Physical Functioning in the ANOVA, but in the ANCOVA, when entering age as a covariate, age presented a significant difference, indicating that it is linearly related to Physical Functioning. No significant group effects were found in the ANOVA, but in the ANCOVA, there was a group effect in the dependent variable Physical Functioning. This can be interpreted in the sense that the independent variable groups, although not related to the dependent variable considered globally, correlates with the part of the dependent variable that is not explained by or attributable to the covariate age.

In the other components of the SF-36, there were significant group differences (ANOVA) which, as seen in (Table 4), are not due to the effect of age (ANCOVA).

In categories of the HBC, several relationships between the covariate age and various scales emerged. Age was linearly related to the dependent variables Wellness Maintenance and Enhancement Behaviors, Accident Control Behaviors, Preventive Health Behavior, and Traffic Risk Taking. In the ANOVA, there was a significant group difference in the variable Accident Control Behaviors. When entering age as covariate in the AN-COVA, age was linearly related to Accident Control Behaviors, but in this case, there were no significant group differences in Accident Control Behaviors. A significant effect in the ANOVA was no longer significant in the ANCOVA when introducing age as covariate. This can be interpreted in the sense that the effect detected in the ANOVA should be attributed to the covariate age included in the analysis, and not to the independent variable groups.

In other cases where the covariate age had significant effects, Wellness Maintenance and Enhancement Behaviors, Preventive Health Behavior, and Traffic Risk Taking, and the ANOVA and the ANCOVA provided the same results (our case), this means that, despite the correlation of age with the dependent variable, and despite removing the effect attributable to age from the variation of the dependent variable, the effect of the independent variable groups remained unchanged. This means that the relationship between the covariate age and the dependent variable did not affect the relationship between the variable groups and the dependent variable.

There were significant group differences (ANOVA and ANCOVA) in the categories of Wellness Maintenance and Enhancement Behaviors, Preventive Health Behavior, and Substance Risk Taking. There were no significant differences due to age (ANCOVA) in Substance Risk Taking.

Post-hoc analyses were also performed. When the variances were equal, the Tukey test with a level of $p < 0.05$ was used to determine statistical significance. When the variances were not equal, the Games-Howell test with a level of $p < 0.05$ was used. The post-hoc results with both tests were similar, as seen in (Table 5). We present the results of the post-hoc analyses, taking into account the data obtained with ANOVAs and ANCOVAs. For example, in the variable Accident Control Behaviors, a significant difference emerged in the post-hoc analyses between the Defensive pessimism and Dispositional optimism groups, but this difference was rejected because, in the ANCOVA, it was verified that the effect of this difference was due to age and not to group differences.

When examining the results of the ANOVAs and ANCOVAs, we found significant group differences in the two broad general measures of the SF-36, Physical Health Component and Mental Health Component. In both of them, the Dispositional-realistic optimism group obtained higher scores. In the Physical Health Compo-

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Table 5: Post-hoc analyses of the ANOVAS taking in to account the results of the ANCOVAS.

Components of the Health Survey SF-36 Questionnaire (SF-36)

Dependent variables	Test	Groups		Mean difference	p
Role Physical	Games-Howell	Defensive pessimism	Dispositional-realistic optimism	-0.999*	0.032
Bodily Pain	Tukey	Dispositional-realistic pessimism	Dispositional-realistic optimism	-0.932*	0.014
General Health	Games-Howell	Dispositional-realistic pessimism	Dispositional-realistic optimism	-3.584***	0.000
	Games-Howell	Defensive pessimism	Dispositional-realistic optimism	-2.957***	0.000
Vitality	Games-Howell	Dispositional-realistic pessimism	Dispositional-realistic optimism	-3.238***	0.000
	Games-Howell	Defensive pessimism	Dispositional-realistic optimism	-3.105***	0.000
Social Functioning	Games-Howell	Dispositional-realistic pessimism	Dispositional-realistic optimism	-1.520***	0.000
	Games-Howell	Defensive pessimism	Dispositional-realistic optimism	-0.891***	0.000
Role Emotional	Games-Howell	Dispositional-realistic pessimism	Dispositional-realistic optimism	-2.489***	0.000
	Games-Howell	Defensive pessimism	Dispositional-realistic optimism	-2.047***	0.000
Mental Health	Games-Howell	Dispositional-realistic pessimism	Dispositional-realistic optimism	-4.678***	0.000
	Games-Howell	Defensive pessimism	Dispositional-realistic optimism	-4.673***	0.000
Physical Health Component	Games-Howell	Dispositional-realistic pessimism	Dispositional-realistic optimism	-6.515***	0.000
	Games-Howell	Defensive pessimism	Dispositional-realistic optimism	-4.860***	0.000
Mental Health Component	Games-Howell	Dispositional-realistic pessimism	Dispositional-realistic optimism	-11.926***	0.000
	Games-Howell	Defensive pessimism	Dispositional-realistic optimism	-10.743***	0.000

Categories of the Health Behavior Checklist (HBC)

Dependent variables	Test	Groups		Mean difference	p
Wellness Maintenance and Enhancement Behaviors	Tukey	Defensive pessimism	Dispositional-realistic optimism	-3.348***	0.000
Preventive Health Behavior	Games-Howell	Defensive pessimism	Dispositional-realistic optimism	-5.029***	0.000
Substance Risk Taking	Tukey	Dispositional-realistic pessimism	Defensive pessimism	1.446*	0.011
	Tukey	Dispositional-realistic pessimism	Dispositional-realistic optimism	1.771**	0.001

***$p \leq 0.001$; **$p \leq 0.01$; *$p \leq 0.05$.

nent, the Dispositional-realistic optimism group had a mean of 77.70 ($SD = 7.79$), significantly higher than that of the other groups, Dispositional-realistic pessimism ($M = 71.19$, $SD = 9.43$) and Defensive pessimism ($M = 72.84$, $SD = 10.48$), with no significant differences between the latter two.

In the Mental Health Component, the Dispositional-realistic optimism group had a mean of 60.80 ($SD = 5.63$), significantly higher than the score of the other two groups, Dispositional-realistic pessimism ($M = 48.87$, $SD = 9.86$) and Defensive pessimism ($M = 50.05$, $SD = 10.60$), with no significant differences between the latter two.

Regarding the specific dimensions of physical health

assessed with this questionnaire, there were significant group differences in all the dimensions, except for Physical Functioning. In the dimensions of Role Physical and General Health, there were significant differences between the Dispositional-realistic optimism and Defensive pessimism groups. In the dimensions of Bodily Pain and General Health, there were difference between the Dispositional-realistic optimism and Dispositional-realistic pessimism groups. In all these dimensions, the Dispositional-realistic optimism group obtained the highest mean score.

With respect to the specific dimensions of mental health, there were significant group differences in all the dimensions, Vitality, Social Functioning, Role Emotion-

al, and Mental Health, with the Dispositional-realistic optimism group obtaining the highest means in all cases. There were no significant differences between the Dispositional-realistic pessimism and Defensive pessimism groups.

In relation to the four factors and two categories of the HBC, there were significant group differences only in one category, Preventive Health Behavior, with the Dispositional-realistic optimism group obtaining a significantly higher mean ($M = 47.10$, $SD = 11.08$) than the Defensive pessimism group ($M = 42.07$, $SD = 9.63$). Within this category, the Dispositional-realistic optimism group obtained significantly higher scores in the factor Wellness Maintenance and Enhancement Behaviors, than the Defensive pessimism group. In this category and factor, a higher score indicates more preventive behaviors.

In the factor Substance Risk Taking, significant group differences were found between the Dispositional-realistic pessimism group (with the highest score) and the other two groups, Defensive pessimism and Dispositional-realistic optimism, with no significant differences between the latter two. Higher scores on this factor indicate greater risk.

Age differences among three different conceptualizations of optimism/pessimism

The results of the ANOVA with age as the dependent variable and groups as the independent variable yielded a significant group difference in age, Levene's test 0.001, $p = 0.999$, $F(2, 349) = 17.509$, $p = 0.000$, $\eta^2_p = 0.091$. The post-hoc tests confirmed the existence of two subgroups or homogeneous subsets based on the means, one formed by the Dispositional-realistic pessimists and the Defensive pessimists and the other made up of the Dispositional-realistic optimists. Dispositional-realistic optimists had a higher mean age ($M = 39.6$, $SD = 10.07$) than the other two groups, Dispositional-realistic pessimists ($M = 32.87$, $SD = 9.73$) and Defensive pessimists ($M = 33.27$, $SD = 10.18$). There was no significant group difference in age between the latter two groups.

Discussion and Conclusions

The results show that dispositional optimism had meaningful relationships with all the scales of mental and physical health, indicating that optimists are healthier. The regression analysis revealed that dispositional optimism predicted mental health more strongly than it did physical health. The results also showed that it predicts all the assessed components of mental and physical health. Within the specific mental health components, the most relevant results of dispositional optimism as a predictor were found in Mental Health, Vitality, and Role Emotional where, in addition to optimism, age also

emerged as a predictor. Within the specific components of physical health, the most important result of optimism was found in General Health.

The results of this study support previous research finding that dispositional optimism is a significant predictor of good mental and physical health outcomes. The data obtained in this study on the association between dispositional optimism and physical health are similar to those obtained by Steptoe, et al. [36], who applied the same measures of optimism and health, finding that optimism was positively associated with physical health status, but they did not analyze the part of the scale that assesses mental health, so we cannot compare our results with theirs. Achat, et al. [37], in the analysis of the Normative Aging Study, reported independent associations between optimism and the General Health Perceptions, Vitality, Mental Health, and Bodily Pain Scales of the SF-36, but not with Physical Functioning, Social Functioning, or role limitations due to physical or emotional problems. Smith, Young and Lee [38], using data from 9501 Australian women, aged 73 to 78, found that optimism and health-related hardiness explained a significant proportion of variance in all subscales of the SF-36, optimism was associated with better general health, mental health, physical functioning, social functioning, vitality, emotional and physical role performance, but not with bodily pain.

Regarding preventive health behaviors-one of the behavioral pathways through which dispositional optimism seems to achieve better health outcomes [3,6]- our results show that, together with age, optimism is a predictor of the factor Wellness Maintenance and Enhancement Behaviors, and of the category Preventive Health Behavior. This dimension assesses healthy behaviors such as exercising, limiting consumption of certain foods like coffee, sugar, and fats, weight control, going to the doctor regularly for check-ups, etc. These results are in the line of those obtained by other authors, who indicate that optimists appear to take action to minimize health risks [6]. For example Steptoe, et al. [36], in elderly individuals, found that optimism was associated with not smoking, moderate alcohol consumption, brisk walking, and vigorous physical activities (women only), independently of sociodemographic factors and clinical condition. Kelloniemi, Ek and Laitinen [39], in a cross-sectional study of 8690 Finnish adults aged 31-years-old, found that optimism was positively associated with eating more fresh vegetables, salads, berries, fruit, foods rich in fiber, and low-fat cheese and milk, and it was inversely associated with current smoking. The authors conclude that the lack of optimism is associated with a cluster of unhealthy dietary and general habits. Giltay, et al. [40] found that dispositional optimism in older men is associated with

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healthy lifestyle and dietary habits, while Hingle, et al. [41] report a relationship between optimism and dietary quality score in postmenopausal women at baseline and over 1 year later. Therefore, it seems that dispositional optimists take a proactive approach to health promotion. They are less likely to smoke, more likely to exercise, have healthier diets, and are more likely to improve their diets than are pessimists [3]. Ramsay, et al. [42], adopting Fredrickson's broaden-and-build perspective, examined the relationships between dispositional optimism, self-rated health, resilience, exercise, and quality of life in 365 Chinese university students, and their results showed a positive relationship between optimism and physical and mental quality of life; These authors suggest that dispositional optimism exerts its positive effects because it facilitates the acquisition of cognitive resources, and these resources promote involvement in healthy behaviors that predict physical health.

The second goal of this work was to determine possible differences in physical and mental health and in health behaviors between optimists and pessimists, exploring three different conceptualizations of optimism/ pessimism-dispositional-realistic pessimism, defensive pessimism, and dispositional-realistic optimism. The dispositional-realistic pessimism and dispositional-realistic optimism groups are not equivalent to dispositional pessimism and dispositional optimism because, due to the way we selected the people who made up these groups-according to the scores on the LOT-R scale and in Item 3 of the OPQ scale-two categories of realistic optimism and realistic pessimism were formed.

The Dispositional-realistic optimism group obtained the highest score in the Health Components of the SF-36, showing significant differences with the other two groups, Dispositional-realistic pessimism and Defensive pessimism, in the Physical Health Component and in the Mental Health Component.

Within both types of health, the dimensions of mental health reflected more significant group differences than those of physical health.

In the dimensions that make up the Physical Health Component, significant differences between two groups emerge in General Health, but only with Defensive pessimism in Role Physical, and with Dispositional-realistic pessimism in Bodily Pain. There were no group differences in Physical Functioning.

In the dimensions that make up the Mental Health Component, the Dispositional-realistic optimism group obtained the highest scores and differed significantly from the other two groups in all the dimensions of this component, Vitality, Social Functioning, Role Emotional, and Mental Health.

There were no significant group differences in any of the health scales between the Dispositional-realistic pessimism and Defensive pessimism groups.

The results lead us to conclude that dispositional-realistic optimists have a better state of health and/or a better quality of life in the different areas of mental and physical health assessed with the SF-36. We cannot compare the results obtained in this study with the results of other studies because the groups used in this work have not been analyzed in any other research. However, our results support the general notion that, as compared to pessimists, optimists have better mental and physical health. There are several explanations for this positive relationship. For example, Scheier and Carver [43] proposed that the causal link between optimism and physical health or well-being may be due to the use of more effective coping strategies by optimists when dealing with stress. Coping style may mediate the relationship between pessimism and physical function [18]. Carver, Scheier and Segerstrom [6] indicate that the optimism may provide cognitive, coping, and contextual resources that promote better mental health. Indeed, the pattern of associations of optimism with various behavioral and cognitive tendencies may give us broader hints about the nature of optimal living. Optimists may be less reactive than pessimists to the life stresses, so their lower physiological stress responses may (over many years) result in less physical wear and tear on the body. The end result may be better physical health and even greater longevity. Another reason for better health follows from the better profile of emotional responses to adversity displayed by optimists (less distress and more positive emotions). This pattern of overall emotional experiences-which follows in part from optimists' coping reactions-doubtless leads to lower physiological strain over time, resulting in better health [3].

In relation to preventive health behaviors, differences among the three groups emerged in the category of Preventive Health Behavior. The Dispositional-realistic optimism group obtained the highest score and differed from the Defensive pessimism group, which obtained the lowest score. Within this category, the two groups differed in the factor Wellness Maintenance and Enhancement Behaviors, with the Dispositional-realistic optimism group also obtaining the highest score, indicating that they perform more healthy behaviors.

With respect to the Risk Taking Behavior category, group differences are not found in the global category, but instead in a factor belonging to this category, Substance Risk Taking. Significant group differences emerged between the Dispositional-realistic pessimism group, with the highest score, and the other two groups, Defensive pessimism and Dispositional-realistic optimism, with

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no significant differences between the latter two. In this factor, defensive pessimism and dispositional-realistic optimism have a protective connotation, as a high score on this scale indicates risk behaviors such as drinking alcohol, consuming harmful substances, and smoking. The results obtained indicate that the Dispositional-realistic optimism group performed more preventive behaviors in both categories.

Finally, although it was not a goal of this work, the positive relationship between age and dispositional optimism should be noted: Older people are more optimistic. The results also indicate that older people carry out more preventive behaviors for health. Also, in the groups formed for this work, we found significant age differences: The people in the Dispositional-realistic optimism group were, on average, older than the other two groups.

Given that the investigations on age differences in dispositional optimism has yielded mixed findings, some studies revealed an age-related increase in dispositional optimism, but others did not, You, Fung and Isaacowitz [44] performed a cross-cultural study finding that older Americans displayed a higher level of dispositional optimism than did younger Americans, whereas older Chinese showed a lower level of dispositional optimism than did their younger counterparts. These authors indicate that these inconsistent findings on dispositional optimism might, at least in part, be the result of sociocultural contexts.

Several limitations of this study must be mentioned. In their meta-analytic review, Rasmussen, Scheier and Greenhouse [9] found that the mean effect sizes for studies using subjective measures to assess health outcomes were significantly higher than the mean effect sizes for studies using objective measures. Our study was conducted with self-report measures, so it is likely that may have inflated the associations between optimism and physical and mental health. It is also possible that social desirability may have influenced responding to the questionnaires in order to be perceived favorably. Another limitation is the cross-sectional design of our study, so the assumption of causality should be considered with caution, and a follow-up longitudinal study would be valuable to address this limitation. Therefore, future research using prospective designs is needed to confirm our findings or to more clearly establish the direction of effects.

Despite these limitations, this study provides evidence of the relationship between optimism and health. Optimism is a significant predictor of mental and physical health, and also of healthy behaviors.

In addition, this study provides preliminary evidence of the group differences in physical and mental health, and in healthy behaviors, presenting three different conceptualizations of optimism/pessimism. It is important to continue to perform studies indicating the differences among different kinds of optimism and pessimism, given that the results show that neither all optimists nor all pessimists enjoy the same physical and mental health.

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