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ORIGINAL RESEARCH

The Relation of Ideology of Positive Thinking with the Perception of Cancer Risk and Ways of Treating It in Medellin, Colombia

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Purpose: This study has the following objectives: i) to construct an instrument to measure positive thinking ideology (PTI) regarding cancer, and to evaluate its psychometric properties, ii) to describe the effects of PTI on cancer risk and its treatment, and iii) to identify the associated factors with PTI in the study group.

Methods: A cross-sectional study was conducted with 611 people from the Medellin, Colombia. Participants were selected through stratified sampling with proportional assignment. A survey with three constructs was applied: the role of negative emotions in cancer etiology, cancer as a redeeming event, and the effects of PTI in cancer treatment.

Results: In negative emotions construct 47% considered that holding anger, resentment, and hatred represent a moderate or high risk of generating cancer. In redeeming power construct 46.5% found that cancer is a battle that the best warriors win. Concerning the treatment, 77.3% considered that facing the disease with a fighting spirit had a moderate to high positive effect in response to the treatment. The associated factors with PTI were reading self-help books and education level.

Conclusion: The results show that PTI affects perceptions about the cancer, its etiology and treatment. This effect is greater in undereducated people and in self-help book readers. The instrument showed excellent reliability, internal consistency, discriminating power, content, and construct validity properties.

Keywords: the ideology of positive thinking, cancer, perception of cancer risk, structural equation modeling, psychometrics

Introduction

Positive thinking ideology (PTI) emerged in the United States in the XIX century, became popular in the XX century, and became omnipresent in XXI century.[1,2] Its definition is polysemic and the strategies that operationalize this concept or construct are heterogeneous.[3] However, according to academic literature, four features characterizing PTI: i) practices or discourses that demand positive thinking, repressing or avoiding negative thoughts, ii) a belief that emotions can be categorized into positive and negative, each one affecting physical health, iii) a belief in terms of law of attraction, wherein thoughts act as a magnet attracting and materializing whatever is thought about, and iv) a tendency to think that everyone is responsible for what happens to them, including their health, prosperity, success as well as their illness, poverty, or failures, regardless of the socioeconomic, cultural, or material contexts in which their lives unfold.[1,2]

The concept of ideology is useful for characterizing this popular thought in the contemporary world. Georges Canguilhem defined it as an epistemological notion "with a polysemic function applied to the systems of representations that are expressed in the language of politics, morality, religion, metaphysics"[4] Certainly, ideologies are human creations of important social value. They are fundamental, as Teun Van Dijk states because in addition to protecting group interests, they have the cognitive role of organizing the attitudes, knowledge, beliefs, and practices of groups.[5]

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Thus, positive thinking as an ideological process is part of a global industry worth millions dollars through self-help literature, motivational speakers, consultants, coaching specialists and, in the academic field, positive psychology.[6,7] It is estimated that the industry spends 10 million dollars each year just in books and seminars.[7]

PTI have spread to the field of health, with a particular interest in cancer because of its wide audience. Currently, cancer is the most visible disease in the cultural scene. In 2020, 19.3 million new cases were diagnosed, and approximately 10 million deaths resulted from cancer. By 2040, the global burden is expected to be 28.4 million cases, a 47% increase from 2020.[8] Economically, in the United States, the burden of cancer is estimated to account for 1.8% of the gross domestic product.[9]

In this context, cancer has become a lucrative business for authors of self-help books with volumes indicating treatment and prevention of the disease. The prevention and treatment of cancer described in these books is consistent with the characteristics of PTI. For example, Hay,[10] author of the worldwide bestseller "You Can Heal Your Life", which has sold more than 35 million copies worldwide,[11] considered the driving force behind the personal growth movement, states that the probable cause of cancer is holding on to "resentment", "to hate." According to her, the treatment comprises "abandoning the mental model that has created the disease." Similarly, Goodman[12] reveals that cancer arises as a result of toxic attitudes and emotional pain, and Oncologist Boukaram[13] writes about anticancer power of emotions.

Similarly, in self-help books, cancer is described as an expression of positive meanings, a turning point, a sort of rite of passage, a disease with redemptive power, an almost desirable event in life, and an awakening of consciousness. An example of this is found in the book "The first year of the rest of my life" in which several testimonies about this topic are collected, including the following from cyclist Lance Armstrong: "Cancer is the best thing that ever happened to me"[14] The description of ideas proposed in the self-help literature is indicating the omnipresent combination of cancer and PTI about three constructs: i) role of negative emotions in the etiology of cancer, ii) cancer as an event with redemptive power and iii) relation of PTI with cancer treatment.

The aforementioned becomes more important when the medical anthropology indicates that the beliefs and practices about health and disease are expressions of society's culture. In XXI century, this would correspond to a society that makes a cult of the psyche and ubiquity of the PTI. This ideology is present in the ways of explaining the etiology of cancer and ways to deal with it. Different researchers of social studies and psycho-oncology have been interested in this topic. In a qualitative study conducted in the United States on cancer survivors, the authors identified the importance of categories related to mentality and positive transformations in people with the disease.[15] Another study conducted on Norwegian women with breast cancer found a category related to positive thinking and the importance of distancing from negative thoughts to cope with the disease.[16] In addition to patients, other researchers have approached this topic from the perspective of healthcare professionals. A study conducted on nurses from the oncology department found that, for some of them, a positive attitude is related to the efficacy and adverse effects of treatments.[17]

The research about PTI and cancer in healthy populations is scarce. A study conducted in France found that 61.1% of the population considers that going through painful experiences constitutes a risk for cancer, whereas 50.6% stated that affective or emotional disappointments cause the disease, and 39.6% associated the illness with not being able to express emotions.[18] Previous studies have operationalized the construct of positive thinking on a scale. Matel-Anderson and Bekhet[19] developed a positive thinking skills scale (PTSS) for prevention of suicide in students. Bekhet and Zauszniewski[20] evaluated the properties of PTSS in caregivers of individuals with autism spectrum disorders. Bekhet et al[21] conducted a cross-cultural adaptation and evaluation of the psychometric properties of the PTSS in the Arab population. The three previous studies considered positive thinking a skill that improved mental health and quality of life, consistent with the positive psychology approach. The emphasis of the current study differs of the aforementioned studies. This is the first study to design a scale and assess psychometrics for the PTI construct concerning cancer. This topic was operationalized in three constructs consistent with the characteristics of the PTI: negative emotions in the etiology of cancer, cancer as an event with redeeming power, and the relation of PTI with cancer treatment.

The aforementioned information highlights that few empirical studies worldwide were conducted on the influence of PTI regarding the perception of the etiology and treatment of cancer; there is no agreed-upon approach to the PTI; the available measures do not do the psychometric evaluation of the construct, and the factors associated with this construct have not been explored.

Specifically, in Colombia is estimated that there are approximately 275,348 people with cancer. In 2018, 37,630 new cases were diagnosed, and 19,814 people died for this cause.[22] Furthermore, there is a tendency to resort to alternative or nonbiomedical treatments.[23] An example of this is the well-known case of the country's Minister of Science, Technology and Innovation, who said that she had the formula for a drink (plant-based) with therapeutic properties for patients with cancer.[24] Additionally, several businessmen consider Colombia a good market for self-help experts.[25] However, there are no studies in the country describing the effects of PTI on cancer risk and ways to treat it.

The current study is important because beliefs about the risk of a disease are related to seeking help or not at the onset of symptoms, early diagnosis, choosing a type of treatment and therapeutic adherence.[26] In the same sense, the results would have implications for clinical practice and health professionals, especially in communication with patients, and in the morals implications of discourses that relate positive thoughts with etiology and treatment of the cancer.[27] Attributing the disease and treatment to thoughts and emotions, the responsibility for the etiology of cancer and therapeutic success is transferred to the patient. Positive thinking becomes a moral requirement that generates a double burden for patients: the burden of the biological disease, and the internal and external burden to think positively, since if the disease progresses, the patient feels guilty and ashamed for his inability to overcome the disease.[28] Furthermore, it is a contribution to medical sociology, a neglected domain of the research in Colombia, which can help understand the ideological discourses surrounding a disease as widespread as cancer.

We conducted a study with three objectives: i) to evaluate the psychometric properties of the instrument on PTI to demonstrate the validity and reliability of the measurements (literature there is no record of a study that operationalizes PTI), ii) to describe the perception of the population of Medellin, Colombia about the role of negative emotions in the etiology of cancer, cancer as an event with redemptive power, and the relationship of PTI with cancer treatment, and iii) to identify the associated factors with PTI in cancer.

Methods

Type of Study

To achieve the first objective we implemented a study of design and psychometric validation of a construct; for objectives two and three, a cross-sectional study was developed.

Study Population

The study was conducted in Medellin, the second largest city in Colombia. Medellin is a city that has approximately two million inhabitants over the age of 18 distributed into 16 communes and five rural zones (Corregimientos).[29] Accordingly, the sample size was calculated using the following parameters: a population of two million inhabitants,[29] a standard deviation in each construct of 12 points (due to the fact that a similar study has not been conducted in the world, this variation was based on an expected level of homogeneity in perceptions within the population subgroups studied), a precision of 1, a design effect of 1, 95% confidence, leading to a total of 554 people. We added 10% to compensate lost or incomplete data, so the total number of participants in this study was 611.

A multistage sampling according to distribution of the city's inhabitants by commune was applied. In the first stage, a stratified sampling with proportional assignment for allocation was performed to ensure that the contribution of individuals from each commune. Within each commune, the sampling was done with surveyors distributed in largely inhabited places; that is, the Metro was used as the main transportation system of the city, parks, and churches. Sampling in each commune ended when the minimum number of individuals that guaranteed proportional assignment was accomplished. Representativeness was guaranteed by considering three factors that characterize the demographic and socioeconomic situation of the city's inhabitants: women represent 52% and men represent 47% of the population; unemployment in the city is approximately 13%, and the self-perception of poverty is approximately 30%.[30] The sampling was conducted between June 2021 and January 2022.

Information Collection Instrument

The information collection instrument was a survey with sociodemographic and economic characteristics (age, sex, education level, occupation, training in health-related areas, self-perception of poverty, reading self-help books, and

personal or family history of cancer), and three constructs indices that operationalize the PTI, whose items were identified through a systematic search of the scientific literature (Supplementary Material). The instrument was designed and validated in a way that each item of the instrument as well as the score of each construct index could be analyzed separately. The score of each construct index is calculated by adding the items together to transform it into a scale from 0 (worst possible score) to 100 (best possible score) with the following formula:

$$\text{Total score} = [(\text{score obtained} - \text{lowest possible score})/(\text{maximum possible score} - \text{minimum possible score})] \times 100$$

Construct 1: Role of negative emotions in the etiology of cancer. This includes four items that, in some studies or for some authors, have been associated with causing cancer.[18,31] Each item is answered on a 4-level Likert scale, where 1 corresponding to no risk and 4 indicating that that emotion represents a high risk to cause cancer. The score adjusted to a scale of 0–100 is interpreted as follows: 0–25 indicates that, for the subject, negative emotions do not constitute a risk to cause cancer; 0–50 indicates that negative emotions represent a low risk to cause this disease; 51–75 indicates a moderate risk, and >75 entails high risk.

Construct 2: Cancer as an event with redemptive power. It comprises five items that are answered on a 4-level Likert scale, where 1 indicates full disagreement, and 4 indicates full agreement that cancer is a positive-favorable event for the reasons indicated in each item. A score between 0 and 25 indicates that the disease is not perceived as an event with redemptive power; a score between 26 and 50 reflects that the belief in that characteristic of the disease is low; a score between 51 and 75 indicates that the perception of cancer as an event with redeeming power is moderate, and a score greater than 75 denotes a high perception.

Construct 3 relation of PTI with cancer treatment. It includes six items that are answered on a 4-level Likert scale, where 1 indicates that the person considers that the option presented has no effect on the treatment of the disease and 4 represents those who consider that it has a high effect on the success or effectiveness of the treatment. A score of 0–25 indicates that positive thoughts and attitude have no effect in treating the disease, 26–50 indicates that they have a low effect, 51–75 denotes a moderate perception, and a score >75 indicates a very high effect.

Validation of the Data Collection Instrument

The survey was administered by trained surveyors. A pilot test was conducted on 20% of the sample to examine the final version of the instrument. With this same percentage of the population, face validity, applicability, and acceptability were assessed from the perspective of the participants. With the total surveys (n=611), the following properties were evaluated:

Reliability: With Cronbach's alpha, values >0.7 were considered satisfactory.

Internal consistency: With the Spearman correlation coefficient between the items and the index to which they belong, values ≥0.4 were considered satisfactory, and the success percentage was determined using the following formula:

$$\%\ \text{success} = (\#\ \text{of item} - \text{index correlations to which it belongs} \geq 0.4/\text{total correlations of each index}) \times 100$$

Discriminating power: With Spearman correlations between item-index to which it does not belong, values lower than the correlation of the items with their respective index were considered satisfactory, and the success percentage under the following formula:

% success =(# of item-index correlations to which it does not belong<the item-index correlations to which it belongs)/ total number of item-index correlations to which it does not belong)×100

Content validity: Lambda coefficients or factor loadings ≥0.3:

$$\%\ \text{success} = (\#\ \text{of lambda coefficients} \geq 0.3/\text{total lambda coefficients of each index}) \times 100$$

Data Analysis Plan

The description of the sociodemographic and economic characteristics and history of cancer was made with absolute (#) and relative (%) frequencies and their 95% confidence intervals. Age was categorized into groups according to the Ministry of Health's classification of life cycles: 18–26 years=youth; 27–59 years=adulthood, and 60 years or older=old age.[32] Scores of the 3 constructs or indices were described using the median with the interquartile range. These scores were compared according to sociodemographic and economic characteristics and history of cancer using the Mann–Whitney U and the Kruskal–Wallis

H-tests, because the assumption of normality was not fulfilled (according to Kolmogorov–Smirnov test with Lilliefors correction). To identify confounding variables, a linear regression model was constructed with the score of each index as dependent variable, the independent variables were those that met two conditions: presenting statistical association with the dependent variable and with another independent variable associated with the score of each index.

To identify associated factors, a linear regression model was constructed using the score of each index as the dependent variable and the independent variables as those that met the Hosmer Lemeshow criterion ($p<0.25$ in the bivariate analysis). The final model included only the statistically significant variables in the multivariate adjustment. The regression model applied was:

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta nXn$$

Validating compliance of the assumptions of linearity using ANOVA, nonmulticollinearity with the variance inflation factor, and noncorrelation with Durbin–Watson, normality of the residuals through the Kolmogorov–Smirnov test with Lilliefors correction, and the constant variance of the residuals with the graphical method.

Finally, a structural equation model was employed to establish relationships of constructs. In the model, each item was considered an observable variable, and the constructs were the latent variables. The goodness-of-fit parameters comprised the normalized fit index (NFI), incremental fit index (IFI), Tucker–Lewis index (TLI), and comparative fit index (CFI), which were considered satisfactory for values ≥0.80. The parsimony-adjusted measure (PRATIO, PNFI, PCFI) was considered satisfactory for values close to 1; the root mean square error of approximation per degree of freedom (RMSEA) was satisfactory for results close to zero. Analyses were performed in SPSS version 27.0 with a significance level of 0.05.

Results

The Psychometric Properties of the Instrument

The psychometric properties of the instrument for reliability, internal consistency, discriminating power, and content validity were excellent in each construct. In the construct "negative emotions related to the etiology of cancer" the item-domain correlations were between 0.692 and 0.851, the item-other domain correlations were between 0.0 and 0.329, the reliability was 0.789 and the factor loadings were between 0.637 and 0.883. In the construct "cancer as an event with redemptive power" the item-domain correlations were between 0.613 and 0.776, the item-other domains correlations were between −0.028 and 0.384, the reliability was 0.751 and the factor loadings were between 0.641 and 0.792. In the construct "relation of PTI with cancer treatment" the item-domain correlations were between 0.641 and 0.731, the item-other domains correlations were between 0.091 and 0.427, the reliability was 0.809 and the factor loadings were between 0.597 and 0.800 (Table 1).

Population Response on Each Construct of PTI and Cancer

The median age was 32 years (IQR 24–48) with a range of 18–85; 51% were women, the female/male ratio was 1.04, 36.7% had completed university studies, 27.2% considered themselves poor, 63.7% had a personal or family history of cancer, and 34.4% read self-help books (Table 2).

In the perception of the risk of negative emotions in the etiology of cancer, 47% considered that holding anger, resentment, and hatred represent a moderate or high risk of generating the disease, 37.5% reported that going through painful experiences, such as mourning the death of a loved one, generates a moderate to high risk of cancer, 34.1% reported that not being able to adequately express emotions generates a moderate–high risk for cancer, and 34.7% stated that this occurs in people dealing with personal or professional disappointments (Figure 1).

In cancer as an event with redeeming power, 66.5% considered cancer to be a lesson, 64.2% agreed that it is an opportunity to change bad habits and behaviors, 55.8% believed that the disease constituted an opportunity to be a better person, 46.5% found that cancer is a battle that the best warriors win, and 25.5% considered it a test (Figure 2).

Concerning the treatment, 79.5% believed that thoughts and a positive attitude had a moderate to high effect on treating the disease, 77.3% considered that facing the disease with a fighting spirit had a moderate to high positive effect

Table 1 Description of the Psychometric Properties of the of the Instrument

Negative Emotions Related to the Etiology of Cancer	**Lambdas**	**Item-Domain Correlation**	**Cancer as an Event with Redemptive Power**	**Effect of PTI in Treatment**
Holding anger, resentment, hatred toward others	0.637	0.692**	0.128**	0.329**
Going through painful experiences, such as grieving the death of a loved one	0.865	0.831**	0.054	0.256**
Dealing with personal or professional disappointments	0.883	0.851**	0.026	0.225**
Not expressing emotions properly	0.742	0.738**	0.000	0.207**
Content validity success %	100% (4/4)			
Internal consistency success %	100% (4/4)			
Discriminating power success %	100% (8/8)			
Cronbach's Alpha	0.789			
Cancer as an Event with Redemptive Power	**Lambdas**	**Item-Domain Correlation**	**Negative Emotions in the Etiology**	**Effect of Positive Thinking Ideology in Treatment**
Cancer is an opportunity to change bad habits and behaviors	0.659	0.668**	0.133**	0.381**
Cancer is a test from God	0.614	0.613**	0.046	0.259**
Cancer is a battle that the best warriors win	0.679	0.701**	−0.028	0.383**
Cancer is a lesson for patients	0.792	0.776**	0.034	0.384**
Cancer is an opportunity to be a better person	0.790	0.776**	0.123**	0.385**
Content validity success %	100% (5/5)			
Internal consistency success %	100% (5/5)			
Discriminating power success %	100% (10/10)			
Cronbach's Alpha	0.751			
Relation of PTI with Cancer Treatment	**Lambdas**	**Item-Domain Correlation**	**Risk of Negative Emotions in the Etiology**	**Cancer as an Event with Redemptive Power**
Express emotions better (eg, do not keep quiet, express what you feel, etc.)	0.690	0.674**	0.407**	0.312**
Mind reprogramming	0.597	0.642**	0.223**	0.324**
Positive thoughts and attitude	0.800	0.726**	0.142**	0.407**
Forgive those who hurt you (eg, let go of resentment and anger)	0.713	0.731**	0.380**	0.377**
Face the illness with a fighting spirit	0.723	0.641**	0.091*	0.393**
Avoid negative feelings and seek happiness	0.789	0.715**	0.155**	0.427**
Content validity success %	100% (6/6)			
Internal consistency success %	100% (6/6)			
Discriminating power success %	100% (12/12)			
Cronbach's Alpha	0.809			

Note: *P<0.05, **P<0.01.

Table 2 Sociodemographic and Economic Characteristics and History of Cancer in the Study Group

	Median		IQR
Age	**32**		**24–48**
	N	**%**	**CI 95%**
Age group			
18–26 years old	189	30.9	27.4–34.7
27–59 years old	343	56.1	52.2–60.0
60 years or older	79	12.9	10.4–15.8
Sex			
Female	312	51.1	47.1–55.0
Male	299	48.9	45.0–52.9
Education level			
Primary school	79	12.9	10.4–15.8
Secondary school	213	34.9	31.2–38.7
Technical-technological	95	15.5	12.8–18.6
University	224	36.7	32.9–40.5
Occupation			
Unemployed	70	11.7	9.3–14.4
Home care	62	10.4	8.1–13.0
Student	127	21.2	18.1–24.6
Worker	318	53.1	49.1–57.1
Retired	22	3.7	2.4–5.4
Other characteristics			
Training in health-care areas	93	15.2	12.5–18.2
Considers oneself poor	166	27.2	23.8–30.8
Reads self-help books	210	34.4	30.7–38.2
Personal or family history of cancer	389	63.7	59.8–67.4

Abbreviations: N, absolute frequency; CI, confidence interval; IQR, Interquartile range.

in response to the treatment, and 72.7% thought that avoiding negative feelings and seeking happiness had a moderate to high effect on the treatment, 66.3% reported that expressing emotions better had a moderate to high effect on treatment, 52.4% believed that this effect was achieved with forgiveness, and for 50% of the participants, mental reprogramming had a moderate to high effect in the treatment of cancer patients (Figure 3).

Associated Factor with PTI in Cancer

The perception of the risk of negative emotions on the etiology of cancer was greater in people aged 60 or older (p=0.001), women (p=<0.001), those with a primary education level (p=<0.001), those who read self-help books (p=<0.001), and those with a personal or family history of cancer (p=0.001) (Table 3).

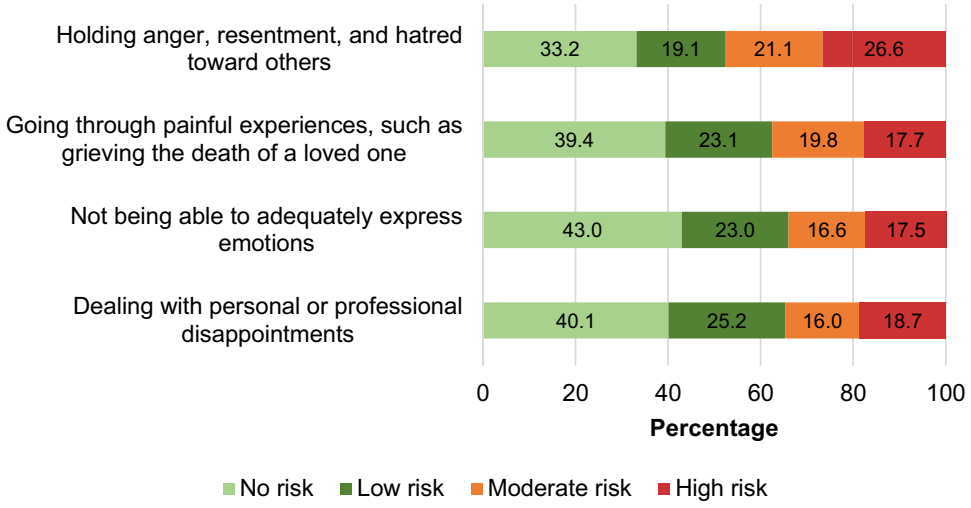

Figure 1 Response to the items concerning the risk of negative emotions on the etiology of cancer.

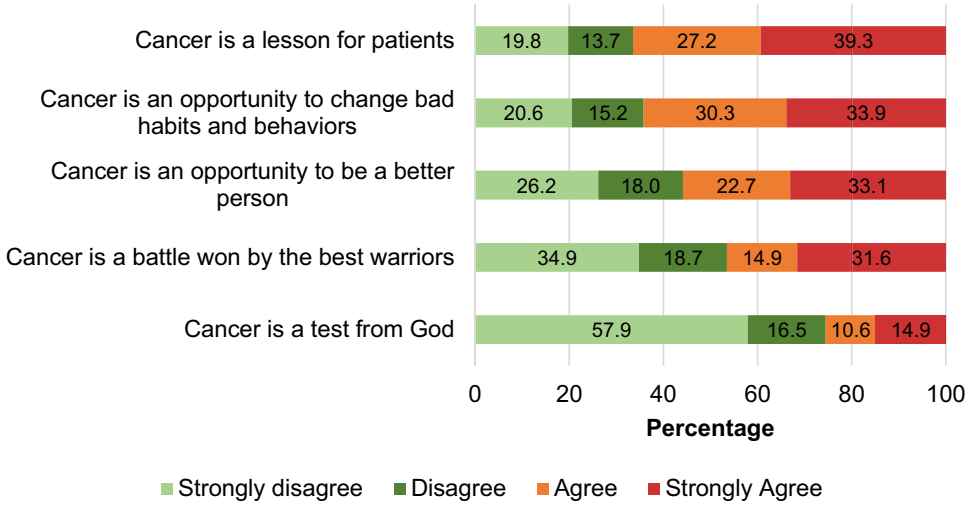

Figure 2 Response to items for the construct of cancer as an event with redemptive power.

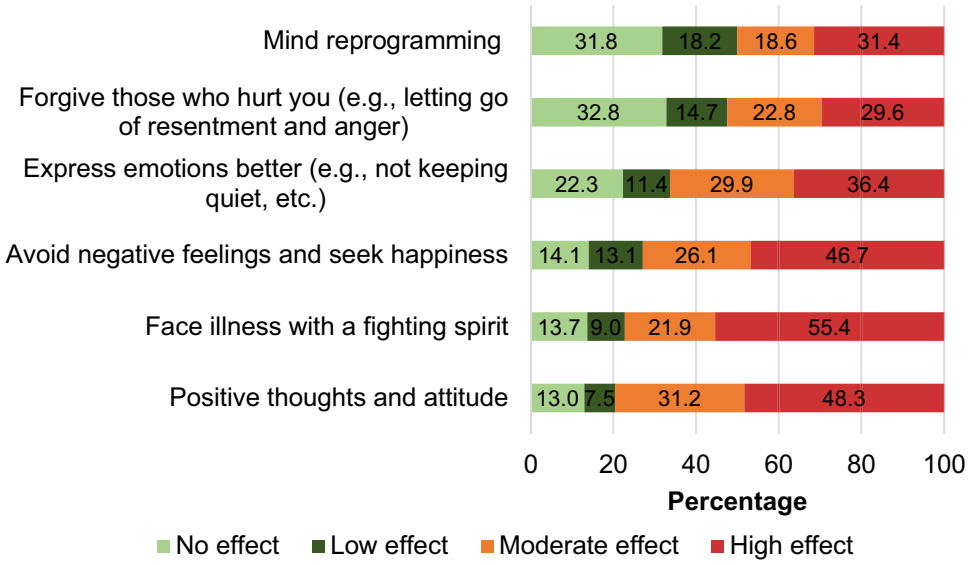

Figure 3 Response to the items of the construct on the effect of the ideology of positive thinking in the treatment of cancer.

Table 3 Variables That are Associated with PTI in Cancer

	Risk of Negative Emotions in the Etiology of Cancer	Cancer as an Event with Redemptive Power	Effect of Positive Thinking Ideology in Treatment
	Me (IQR)	Me (IQR)	Me (IQR)
Age group			
18–26 years old	33.3 (0.0–50.0)	40.0 (20.0–66.7)	55.6 (33.3–72.2)
27–59 years old	41.7(16.7–66.7)	46.7 (33.3–73.3)	66.7 (44.4–83.3)
60 years or older	50.0(25.0–75.0)	60.0 (40.0–80.0)	72.2 (55.6–88.9)
P-value	0.001	<0.001	<0.001
Sex			
Female	41.7(25.0–66.7)	46.7 (30.0–66.7)	61.1 (41.7–83.3)
Male	33.3(0.0–58.3)	53.3 (26.7–73.3)	66.7 (38.9–83.3)
P-value	<0.001	0.324	0.938
Education level			
Primary school	50.0(16.7–75.0)	73.3 (46.7–86.7)	72.2 (55.6–88.9)
Secondary school	25.0(0.0–50.0)	60.0 (33.3–80.0)	66.7 (44.4–83.3)
Technical-technological	33.3(16.7–58.3)	53.3 (33.3–80.0)	66.7 (50.0–77.8)
University	41.7(25.0–66.7)	40.0 (20.0–53.3)	55.6 (33.3–72.2)
P-value	<0.001	<0.001	<0.001
Occupation			
Unemployed	37.5(16.7–66.7)	60.0 (40.0–80.0)	66.7 (44.4–83.3)
Home care	41.7(16.7–75.0)	60.0 (40.0–80.0)	66.7 (50.0–83.3)
Student	33.3(0.0–50.0)	33.3 (13.3–53.3)	50.0 (27.8–66.7)
Worker	41.7(16.7–66.7)	53.3 (33.3–73.3)	66.7 (44.4–83.3)
Retired	29.2(16.7–58.3)	53.3 (40.0–80.0)	58.3 (33.3–88.9)
P-value	0.103	<0.001	<0.001
Training in a healthcare field			
No	33.3(16.7–58.3)	53.3 (33.3–73.3)	66.7 (44.4–83.3)
Yes	41.7(25.0–66.7)	40.0 (26.7–53.3)	55.6 (33.3–72.2)
P-value	0.103	<0.001	0.016
Perception of being poor			
No	33.3(16.7–58.3)	40.0 (26.7–66.7)	61.1 (38.9–77.8)
Yes	41.7(16.7–66.7)	60.0 (40.0–80.0)	66.7 (50.0–88.9)
P-value	0.240	<0.001	0.002

(*Continued*)

Table 3 (Continued).

	Risk of Negative Emotions in the Etiology of Cancer	Cancer as an Event with Redemptive Power	Effect of Positive Thinking Ideology in Treatment
Reading self-help books			
No	33.3(8.3–58.3)	53.3 (26.7–73.3)	61.1 (33.3–77.8)
Yes	50.0(25.0–66.7)	46.7 (33.3–66.7)	66.7 (50.0–83.3)
P-value	<0.001	0.346	0.008
Personal or family history of cancer			
No	33.3(0.0–58.3)	46.7 (26.7–66.7)	61.1 (38.9–77.8)
Yes	41.7(25.0–66.7)	53.3 (33.3–73.3)	66.7 (38.9–83.3)
P-value	0.001	0.314	0.181

Abbreviations: Me, median; IQR, Interquartile range.

The perception of cancer as a disease with redeeming power was greater in people over 60 years (p=<0.001), those who had completed primary education (p=<0.001), those who were unemployed or were dedicated to taking care of the home (p=<0.001), people who did not receive training in the healthcare sector (p=<0.001), and people who considered themselves poor (p=<0.001) (Table 3).

The perception of the effect of positive thinking and attitude in cancer treatment was higher in people aged 60 or above (p=<0.001), those who had a primary education (p=<0.001), those who were dedicated to taking care of the home (p=<0.001), people who did not receive training in healthcare sectors (p=0.016), those who considered themselves poor (p=0.002), and people who had read self-help books (p=0.008) (Table 3).

The associated factors with negative emotions in the etiology of cancer were age (regression coefficient: 0.155), sex (higher in women; regression coefficient: 0.146), reading self-help books (regression coefficient: 0.138), and having a personal or family history of cancer (regression coefficient: 0.080). Associated factors for the construct of cancer as an event with redemptive power were the age group (regression coefficient: 0.100) and education level (regression coefficient: 0.312), whereas in the construct of positive thinking and attitude about the effectiveness of cancer treatment, the factors were education level (regression coefficient −0.106) and reading self-help books (regression coefficient: 0.116).

The structural equation model showed excellent validity and representation of each construct in the items that make it up as well as favorable results in the goodness-of-fit statistics with NFI 0.890, IFI 0.913, TLI 0.895, and CFI 0.913. The PRATIO was 0.829, PNFI 0.738, PCFI 0.756, and RMSEA 0.071. The model indicates a positive and direct relationship of the three constructs. The role of negative emotions in the etiology of cancer increases the perception of the disease as an event with redeeming power with a β coefficient of 0.13. In turn, the perception of the disease as an event with redeeming power corresponds to an increase in the effect of the PTI in ways of treating cancer with a β coefficient of 0.59 (Figure 4).

Discussion

In the population of Medellin, the PTI affects the perceptions about cancer, its etiology, and treatment. This effect is greater in people with a low education level and in readers of self-help books. Additionally, the instrument designed to measure each construct of the PTI has an excellent psychometric performance. In the three constructs, excellent properties of reliability, internal consistency, discriminating power, content, and construct validity were demonstrated. Further studies should evaluate the performance of the psychometrics of this instrument in other populations, and should also use it to evaluate the effect of the PTI in relation to cancer in cultures where it has been more widespread, such as the North American.

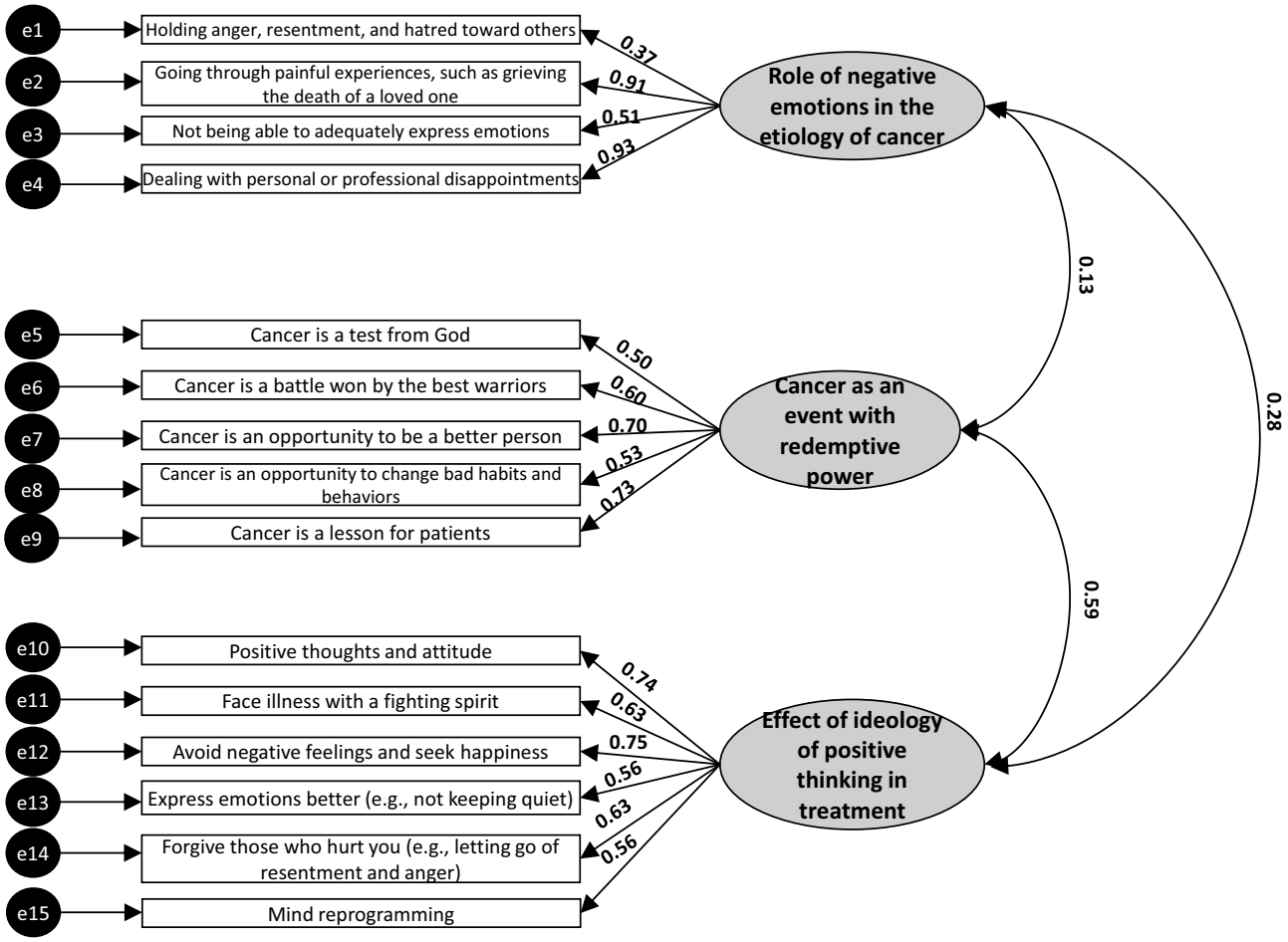

Figure 4 Structural equation model for the three constructs of the PTI in cancer. The p-values of all the data are <0.001.

In the etiology of cancer, this study revealed that, for more than a third of the population, negative emotions represent a high risk of developing the disease. Sontag[33] highlighted that cancer has long been associated with repression and mismanagement of emotions. Gallegher[34] maintain that these ideas began to popularize in the XVIII century with their incorporation into the literary portraits of the time. In these stories, patients with cancer were characterized as people who were prey to emotions such as pain, anger, and envy; emotions that they were unable to handle and caused the disease. As in the novels of the XVIII century, today's self-help books establish the link between these emotions and the etiology of the disease; therefore, there is still pressure to reduce or destroy the expressions of sadness, fear, anger, and despair[34] to maintain "positive thinking" and hold patients with cancer responsible for their illness if they fail to do so.[10] Notably, these narratives contribute to legitimizing the idea of individual responsibility in the etiology of cancer, the omission of structural problem management, and the lack of attention paid by the state to its responsibility for the common good, ideas that are in line with the interests of neoliberal government rationalities[35] but are contrary to the medical evidence. Studies in this sense indicate that the structural problems related to educational level, income, inequality, the availability of cancer control policies, and the performance of health systems are important predictors of incidence and mortality from this disease.[36]

The PTI requires its discourse to be mobilized and legitimized by science. Therefore, new theories were constructed of positive thinking took the results of the experiments conducted by Hans Selye and Robert Ader,[37] whose experiments in animal models showed that extreme stress could affect the immune system and cause health problems. Based on these findings, these theories established the false equivalence between stress, negative emotions and the immune system's malfunction.[2,7] There are studies that evince the relationship between certain stress conditions and cancer (without

demonstrating the causal order; that is, it is unclear which is the risk factor and which is the outcome in this dyad). However, it cannot be assumed that stress is equivalent to emotions and that emotions, such as hate, anger, or sadness, can also be considered negative. Certainly, these constructions could well be considered scientific ideology, given that they hold more a place in the plane of knowledge than of religious belief. They are discourses with a scientific pretense that appears accessible and beneficial to those who consume them, but whose goal is previously determined by assessments, and biases that are akin to the interests of those who produce them, immediately making them susceptible to suspicion.[4]

This emotional hierarchy has been institutionalized through positive psychology with works such as those by Fredrickson and Losada.[38] These authors note that negative emotions dominate positive ones in intensity, whereas positive emotions dominate negative ones in frequency. However, that there is no real evidence for causal claims on the efficacy of positive thinking in cancer care.[39] Similarly, Cabanas and Illouz[1] revealed that emotions are very complex experiences and, therefore, difficult to define. They highlighted that emotional experiences cannot be reduced to a single term, such as hate, sadness, or joy, because these terms by themselves neither capture the complexity of the emotional experience nor would a combination of them and even less a distinction between positive and negative. In addition, they argued that positive psychology ignores that emotions are properties, not only of individuals but also of societies; that is, these views obviate that emotions are loaded with cultural meanings, consumption patterns, and power relations.[1]

This shows that the general population of Medellin, similar to other populations in the world, is immersed in the PTI and its etiological models of cancer, which merit continuing in this line of research to clarify aspects (questions) such as the following: i) in the general population, what are the relationships between these ideologies and etiological models of biomedical traditions (complementarity, antagonism, etc.); do these ideologies coexist on equal terms with medical models or is their positioning at the expense of a sort of undervaluation of other etiological models? ii) What are the mechanisms and technologies that make it possible for such thinking to become naturalized? and iii) Class or social status analyses are required to separate the emergence of this effect among different subgroups and determine which experiences and sociocultural determinants could explain the results of these subgroups.

Another finding that stands out in this study is that a high proportion of the population perceives the disease as an event with redeeming power.[40] As Illouz[40] notes, this notion refers to a narrative of suffering that is intertwined with the North American therapeutic culture based on self-help, psychoanalysis, and religious narrative. This result coincides with some research conducted from a qualitative approach in patients with cancer and their family members, who mention that, after the diagnosis, they experienced positive changes in their lives. These include closer relationships with family and friends, adding more value to life, helping clarify priorities, increasing faith and empathy, and promoting the development of healthy habits.[41] These findings reflect a characteristic of the PTI that is related to looking for the positive side of all situations and, thus, representative authors of positive psychology suggest that happiness itself depends on the personal capacity to transform unfortunate or adverse situations into fortunate and convenient ones.[42] In the specific field of health, and particularly in psycho-oncology studies, this idea has been brought to life as the notion of post-traumatic growth, referring to the personal development that occurs in an individual experiencing an extreme event and that transcends their previous functional level.[43] Qualitative studies[44] on this topic suggest that a significant proportion of patients with cancer experience post-traumatic growth. However, major criticisms have been made around these facts.[39,45]

In this context, it is important to study the perception of the disease as an event with redemptive power in the general population because approximately 63% of the people included in this study were diagnosed with cancer or had a family member with the disease. The ideological strength of positive thinking persuades people to hide feelings such as anger, fear, and pessimism (understandable emotions in the face of a diagnosis, such as cancer) under a cosmetic layer of joy, encourages denial of reality, minimizes the problem, and can delay the search for help, generating false expectations and encouraging people to find the good in the disease. This places an additional burden on patients and their families, who must not only overcome cancer but also feel better after that experience; moreover, if the disease aggravates, it prompts them to identify the cause of therapeutic failure in the coping mechanism of the disease.[2,39,46] This scenario leads to the following questions: i) Will it be necessary for health professionals (nurses, doctors, oncologists, social workers, and

psychologists) to design interventions aimed at transforming these ways of perceiving the disease in the general population? ii) Do social studies of medicine in Colombia have theoretical and methodological resources to understand how this ideology spread in our population, or are further studies necessary to understand the constitution mechanisms of this type of construct?

Effect of positive thinking ideology in treatment was the construct that presented the highest scores. While 79.5% believed that positive thoughts and attitude have a high or very high effect in treating the disease, 77.3% thought that facing the disease with a fighting spirit has a high or very high effect in response to the treatment. There is a growing interest in this topic in the literature, dating back to a study conducted in 1979, which found that, in a small group of patients with cancer, coping with the disease characterized by a "fighting spirit" was associated with longer survival.[47] The mechanism by which thoughts, a positive attitude, and a fighting spirit are thought to have an effect on cancer outcome involves the immune and neuroendocrine systems.[47] However, a systematic review of the literature conducted in 2002 revealed that 10 studies that investigated the effect of fighting spirit and 12 studies that addressed helplessness/hopelessness found no statistically significant associations with survival or cancer recurrence. In addition, the studies that yielded some positive results tended to include a low number of patients, had methodological limitations, and did not adjust the analyses for confounding variables.[48] Andrade[7] raised several ethical issues concerning the uses that have been attributed to positive thinking in treating patients with cancer. First, the emotional autonomy of patients is violated to the extent that they are guided by other people to feel a certain way, that is, a kind of totalitarianism of positive attitude, joy, fighting spirit, and constant pressure to avoid emotions such as anxiety or sadness. By removing this autonomy, patients with cancer are treated like minors and are infantilized. Ehrenreich[2] well characterized this phenomenon as the "pink bow culture." Second, a characteristic of the PTI is the ostracism of negative people. In this sense, Gitomer,[49] a practitioner of the PTI, noted "Get rid of negative people in your life." In patients with cancer who do not adhere to the ideal of someone who thinks positively, the result of these recommendations is catastrophic; they are discriminated against and expelled from support groups for representing a danger to others. Third, the ideological force of positive thinking can lead some health professionals to give false expectations to patients regarding the prognosis and the chances of therapeutic success. This deprives patients of the complete knowledge of their situation and conditions their decisions about treatment; for instance, whether to continue with a therapy. Fourth, based on the PTI, therapies that can induce patients to abandon conventional treatments are suggested. Such is the case of the new German medicine[50] that invites patients to treat their illness with positive thoughts based on the law of attraction and assuming that thoughts are capable of influencing matter. Thus, patients with cancer assume that all they have to do is think about recovering, and those thoughts will have the power to attract good health and recover from cancer. Finally, treatments based on the PTI lead to victim blaming. If the disease aggravates, patients "lose the battle." The explanation for this is that people did not try hard enough to visualize the cure and, therefore, got what they deserved. This type of thinking generates stigma and shame among patients, adding to the already heavy burden of the disease.[7]

Another result that stands out in this study is that the PTI was higher in readers of self-help books, indicating that self-help books constitute a successful platform for the dissemination of the PTI and that these texts are embedded in and modify people's practices. The success of these types of texts lies in the fact that they address various problems that fit practically into any individual scenario. They are addressed to varied segments of readers and the advice or formulas they transmit are surrounded by a scientific halo combined with quackery and popular myths.[51] In this sense, as Vanina Papalini has stated, self-help books are a kind of "tool" for adapting subjectivity to current demands, that is, a set of rhetorical instruments and guides aimed at the governance of life in scenarios of malaise, crisis, and individualization of social problems.[6] Therefore, it is important for publishers to recognize that they have an important ethical responsibility in the dissemination of these ideas and should assume it. These tools, as cultural mechanisms, operate morally and constitute an ethos and ways of being, thinking, experiencing the disease, and assuming it.

Another variable associated with the PTI was education, to the extent that the scores on the scale were higher in people with low education levels. One explanation for this finding is that people with a high education levels have easier and timely access to health services, and, during their interaction with health personnel, misconceptions about cancer can be disproven. Furthermore, people with high education levels may have different cognitive tools allowing them to anticipate the harmful consequences for health[52] of incorporating these types of ideologies such as positive thinking. Finally, the education level contributes to recognizing the symptoms of the disease in a timely manner and

seeking appropriate medical help so that the biomedical understanding of the disease can displace other attributive categories of popular origin. Owing to the growing evidence between the education level and different health outcomes, such as infant mortality, life expectancy, and vaccination,[52] education constitutes a structural variable that states should address to improve direct and indirect health outcomes.

When comparing the three constructs of the PTI scale, a direct and significant relationship was found between negative emotions in the etiology of the disease, cancer as an event with redemptive power, and the cancer treatment. This finding is consistent with theories on the sociology of health and disease indicating that the ways in which a disease is perceived is related to the individuals' health behaviors, influencing the perception of risk, practices, and adherence to treatments or seeking alternative therapies.[53] Therefore, it is important to recognize that addressing this phenomenon from one construct will have repercussions on others.

Among the limitations of the study are those inherent to the type of study, that is, the impossibility of establishing causal associations given the cross-sectional nature of the study. Faced with this type of limitation, the discussion proposes various themes for developing analytical studies that help reveal the causal relationships of the phenomenon described (in addition, notably, without this type of descriptive study, it would not be possible to advance in generating subsequent etiological knowledge). In psychometric terms, this study is based on the classical theory in which the measurements are only comparable against the same test; that is, each instrument has its own scale that is not comparable with other similar ones. Furthermore, the psychometric properties are dependent on the sample in which the study was conducted. In relation to these psychometric limitations, this study designed a simple and useful instrument that makes it easy to calculate scores so that its use can be extended to other populations in which the psychometric performance found in this population should be corroborated.

Some important issues to highlight include the following. First, it is a system of representations on moral grounds with a sanctioning nature in the face of behaviors, habits, and thoughts that do not belong to the positive order. In this case, these discourses are consistent with the neoliberal morals promoted in Latin America since the 1990s, morals focused on cultivating and disciplining a subject that must be able to adapt to the demands of a social and economic order centered on the premise of being an "entrepreneur of oneself".[54] Positivity as a moral imperative is revealed as an individual's disposition toward flexibility, adaptability, and resilience in unstable, risky, and unregulated scenarios. The PTI, in other words, would be a great example of an individualization of social problems by locating the causality of the pathology and strategies to face it in the springs of subjectivity rather than in a multifactorial complexity that overflows individual realities. Second, understanding cancer as a "redemptive power" constitutes an ideology that legitimizes and reinforces such individualization by highlighting the idea that obstacles and losses are necessary to achieve individual self-realization and fullness. In this case, the label or diagnosis serves as a kind of necessary mechanism, a kind of moral motivating force for individuals to encourage them to become certain types of moral subjects capable of facing life and its hardships and adversities.

Conclusions

PTI has had a great impact on perceptions, etiological explanations and treatment of cancer. This research generates the first construct to measure this ideology in the Colombian population, with a reproducible and valid scale; and simultaneously shows a greater impact of PTI in undereducated people and in self-help book readers. PTI has become an important construct from which the population studied understands and faces cancer, which is a serious problem for health care, since the burden of the disease is individualized; the causal complexity of cancer, its prevention and intervention are hindered; the progress in identifying the social, economic and cultural determinants of cancer is blocked; the acceptability (use and adherence) of preventive and therapeutic methods with proven effectiveness is put at risk, among other negative consequences. Finally, this research is relevant to alert about the strength and negative impacts of PTI in Colombian populations, to promote a deeper reflection of the implications of PTI among patients, family members, doctors, psychologists, social workers and other professions linked to prevention. and cancer care.

Data Sharing Statement

Data has not been deposited in a public repository. Anonymised data is available on reasonable request to the authors.

Ethics Approval and Consent to Participate

This study was conducted in accordance with the Declaration of Helsinki, resolution no. 8430 by the Colombian Ministry of Health, and the ethics, bioethics and scientific integrity policy for Colombia promoted by Colciencias (currently the Ministry of Science, Technology and Innovation). Informed consent was obtained and recorded in audio and/or video for all participants. Procedures were authorized by the bioethics subcommittee of Universidad Cooperativa de Colombia, under record no. 027-2020.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in relation to this work and declared no potential conflicts of interest with respect to the research and publication of this article.

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