Research article

Optimism in dire times: The buffering role of optimism in the relationship between food insecurity and mental health during the COVID-19 pandemic

Shani Pitcho [a],[*], Oren Heller [b], Yung Chun [b], Talia Meital Schwartz-Tayri [a],
Michal Grinstein-Weiss [b]

[a] *Ben Gurion University of the Negev, Israel*
[b] *Social Policy Institute (SPI) Washington University in St. Louis, USA*

ABSTRACT

Considering the need to gain a deeper understanding of the protective factors associated with coping with food insecurity, specifically in times of severe prolonged stress, the current longitudinal study seeks to examine the role of optimism in the relationship between food insecurity and adverse mental health outcomes during the COVID-19 pandemic. A three-wave longitudinal study involving 1921 Israeli adults was performed during the COVID-19 pandemic. Participants completed questionnaires assessing food insecurity, anxiety, depression, optimism, and socio-demographic characteristics. To explore the relationship between food insecurity and symptoms of anxiety and depression, as well as the moderating role of optimism in this relationship, we employed a set of panel regression models with individual fixed effects. Our results indicate that the degree and change in food insecurity over time were positively associated with both anxiety and depression symptoms, whereas the degree and change in optimism were negatively correlated. Optimism was found to moderate the association between food insecurity and anxiety symptoms over time, but not the association between food insecurity and depression symptoms. A subgroup analysis revealed that optimism moderated the relationship between food insecurity and anxiety and depression for women, but not for men; for married/coupled individuals but not for singles; for non-parents with regard to anxiety, and for parents with regard to depression. Our results highlight the need to practice and enhance optimism in times of great despair, uncertainty, and hardship, especially in situations of food insecurity where tangible change may take time.

1. Introduction

In January 2020, the World Health Organization declared the novel coronavirus disease outbreak (COVID-19) a public health emergency of international concern [1]. The highly contagious virus caused morbidity and mortality around the world, with 586 million cumulative confirmed cases and 6.43 million deaths [2]. Nonetheless, the indirect effects of the pandemic exceed the death and disease caused by the virus itself. Severe disruption was documented in all areas of life: politics, economy, education, healthcare, employment, social life, business, and travel. Millions of people have lost their jobs or other income sources, were plunged into

poverty, suffered food insecurity, and experienced widened inequalities [3,4]. Although the world rushed to respond to the crisis, the pandemic has taken its toll on the mental health of individuals, globally. Anxiety, depression, and other adverse mental outcomes were documented among the general population [5–7], while vulnerable population groups [8], especially those living in food insecurity [9], were found to be particularly at risk of experiencing more severe psychological effects. The current longitudinal three-wave study seeks to expand knowledge on the psychological effects of COVID-19 among food-insecure individuals. Considering the scarce literature on coping with food insecurity during times of prolonged severe stress such as a global health crisis, the current study suggests a resiliency model in which optimism might serve as a protective factor in the relationship between food insecurity and adverse mental health outcomes during the COVID-19 pandemic.

1.1. Food insecurity in times of COVID-19

Food insecurity (FI) is a condition defined by limited or uncertain access to sufficient, nutritious food for **an** active, healthy life [10]. Recent surveys reveal that FI has risen dramatically during the COVID-19 pandemic [11,12], mostly due to increasing unemployment rates, social isolation measures, and home quarantines, as well as disruptions to the food supply chain, all of which restricted physical and economic access to food. Israel was no exception to this phenomenon [13]. According to one of the largest Israeli food banks [14], 21.8 % of Israeli families reported FI during the COVID-19 pandemic, in comparison to 17.8 % before the pandemic [15].

While food insecurity is primarily a nutritional risk that adversely influences diet and body weight, it also holds negative consequences for psychological well-being [16]. Individuals may have to skip meals or go hungry, experience feelings of deprivation or restriction in their food choices and may constantly worry about their food supply [17]. Consequently, this stress-induced state may lead to negative psychological effects such as psychological distress, anxiety, sleep disorders, and depression, all of which have been documented in both cross-sectional and longitudinal studies [16,18–21]. These negative outcomes are particularly prevalent among vulnerable populations such as individuals in ethnic and/or racial minorities, of lower socioeconomic status, and chronically ill adults [10]. Other sociodemographic and circumstantial factors, such as living alone and being male, single, as well as being a parent, are often associated with poorer mental health outcomes in food-insecure populations [22].

Studies clearly demonstrate the serious adverse psychological effects FI has on individuals, and many of these focus on identifying at-risk populations. Nevertheless, studies on resiliency and coping with food-insecure conditions are relatively scarce. Of these studies, most focused on operational food and non-food coping strategies and behaviors, such as selling assets, borrowing food and/or money, purchasing food on credit, reducing meal sizes and frequency of food intake, maternal buffering, skipping meals, and skipping eating for whole days [23]. Conversely, there is limited exploration of the protective factors associated with the link between FI and mental health. The few studies addressing this subject revealed that a decrease in social support and mastery is associated with greater depressive symptomatology [18], and that experiencing loss of control, alienation, self-blame, and powerlessness may explain the observed association between FI and depressive symptoms [24,25]. Each of the above offers an important, yet incomplete, contribution to our understanding of the protective factors associated with the relationship between FI and mental health, especially those that promote coping and resiliency. As studies clearly demonstrate the positive influence of optimism in times of stress and suffering, we seek to examine its role in the relationship between FI and mental health.

1.2. Optimism and food insecurity

Optimism reflects one's subjective expectation that good things will happen in the future [26]. Optimistic individuals tend to report less psychological distress and utilize the optimistic tendency as a self-regulatory trait that promotes self-efficacy, self-esteem, hope, resilience, and the ability to flourish [27–30]. Optimism was especially associated with successfully coping with stress and unpleasant emotions [31,32], and was found to mediate the relationship between a general sense of insecurity and mental health outcomes [33]. Optimism also moderates the relationship between perceived psychological stress and depression [34]. Some sociodemographic factors have also been found to be related to higher levels of optimism. For example, women are often more optimistic than men [35, 36], and married individuals or those in committed relationships exhibit greater levels of optimism than those who are separated, divorced, or widowed [37]. Moreover, individuals with high socioeconomic status demonstrate higher levels of optimism compared to those with medium or low socioeconomic status [38]. Interestingly, parents, more than non-parents, display greater optimism and hopefulness, especially during times of stress and hardship [39,40].

In the context of the COVID-19 pandemic, optimism was found to have a positive effect on the general population's mental health as well as on the mental health of vulnerable populations, such as ethnic minorities and unemployed individuals [41]. Yet, such an effect has not been examined among those coping with FI, a population with unique social vulnerabilities and needs.

To better understand the protective factors associated with coping with food insecurity, specifically in times of severe prolonged stress, the current longitudinal study seeks to examine the role of optimism in the relationship between food insecurity and symptoms of anxiety and depression during the COVID-19 pandemic. Additionally, we will analyze this model across various sub-groups. Our research hypotheses are as follows.

H1. FI will positively associate with symptoms of anxiety and depression. More specifically, greater food insecurity and change in food insecurity will be associated with greater symptoms of anxiety and depression.

H2. Optimism will negatively associate with symptoms of anxiety and depression. More specifically, greater optimism and an increase in optimism will be associated with fewer symptoms of anxiety and depression.

H3. Optimism will moderate the negative effect of FI on anxiety and depression symptoms.

H4. The moderation effect will vary across diverse sub-groups, including gender, marital status, and parental status. We anticipate that these sub-groups will exhibit distinct patterns in the relationship between FI and symptoms of anxiety and depression due to the moderating influence of Optimism.

2. Materials and methods

2.1. Participants and procedure

This study utilized longitudinal data obtained by a three-wave online survey of a nationally representative sample of Israeli adults, administered during the COVID-19 pandemic. Ethical approval for this study was provided by the IRB of Washington University in St. Louis (approval nr. 202005139). Participants signed an electronic informed consent form before being transferred to the survey. The first wave was administered during the Winter of 2021 (12/29/2020-2/7/2021, n = 1440), followed by the second wave during the Spring and Summer of 2021 (5/13–6/29/2021; n = 1413) and the third during the Fall of 2021 (10/26–11/21/2021; n = 1650). The final sample included participants who responded to at least two waves and included a panel of 1921 participants, with 5059 observations. Table 1 represents descriptive statistics of the panel sample. Approximately half of the participants are women (52.8 %) and half men (47.1 %). One participant chose 'other' as their gender and was excluded from the analysis due to the small subgroup size; a vast majority are secular Jews (83.1 % secular Jews, 9 % Ultra-Orthodox, 6.3 % Arab Israelis); two-thirds are in a relationship (67 %) and one third (33 %) are single. Sample sociodemographic attributes composition did not significantly change between survey waves.

2.2. Measures

2.2.1. Food insecurity

We measured food insecurity using a modified version of the six-items Food Security Scale (FSS) [42]. We modified the assessment period of the original scale to cover the past three months instead of 12 months as assessed in the original scale. This adjustment aligns

Table 1
Sample characteristics.

	Overall	Wave 1	Wave 2	Wave 3	Difference significance level
Food Insecurity	0.62 (1.50)	0.70 (1.58)	0.56 (1.41)	0.60 (1.52)	$F = 3.84$[a]
Food Insecurity Categories					
No food insecurity (food secure)	85.4 %	83.3 %	86.3 %	86.6 %	$\chi^2 = 14.99$[b]
Low or high food insecurity	14.6 %	16.7 %	13.7 %	13.4 %	
Psychological distress					
Anxiety (GAD-7)	3.81 (4.99)	4.21 (5.19)	3.81 (4.90)	3.39 (4.87)	$F = 1.51$[c]
Depression (PHQ-9)	5.35 (6.04)	5.96 (6.35)	5.33 (5.87)	4.72 (5.84)	$F = 15.92$[c]
Optimism					
Cantril Ladder	6.94 (1.91)	6.82 (2.05)	7.04 (1.83)	6.97 (1.83)	$F = 5.88$[b]
Socio-Demographic Characteristics					
Gender					
Men	47.1 %	46.8 %	47.3 %	47.2 %	$\chi^2 = 0.102$
Women	52.8 %	53.1 %	52.6 %	52.8 %	
Age Group					
18-24	1.3 %	1.2 %	11.0 %	9.5 %	$\chi^2 = 2.758$
25-34	21.5 %	21.8 %	21.2 %	21.4 %	
35-44	19.4 %	19.4 %	19.5 %	19.3 %	
45-54	15.7 %	15.7 %	15.7 %	15.7 %	
55-64	14.0 %	13.9 %	13.7 %	14.4 %	
65+	19.2 %	19.0 %	18.8 %	19.7 %	
Population Group					
Non-Ultra-Orthodox Jew	83.1 %	82.9 %	82.8 %	83.7 %	$\chi^2 = 2.268$
Ultra-Orthodox Jew	9.0 %	8.8 %	9.3 %	8.9 %	
Arab Israeli	6.3 %	6.5 %	6.2 %	6.1 %	
Other	1.6 %	1.8 %	1.6 %	1.2 %	
Marital Status					
Married or co-habiting	67.0 %	67.1 %	66.7 %	67.2 %	$\chi^2 = 0.117$
Single (never married)	33.0 %	32.9 %	33.3 %	32.8 %	
Number of children in the household					
0	57.5 %	57.7 %	56.6 %	58.3 %	$\chi^2 = 1.727$
1	15.0 %	15.2 %	15.0 %	14.8 %	
2	13.4 %	13.5 %	13.9 %	12.8 %	
3 or more	14.1 %	13.7 %	14.6 %	14.0 %	

[a] $p < .05$.
[b] $p < .01$.
[c] $p < .001$.

with our survey, conducted on a quarterly basis. The scale assesses the access of household members to enough food to fully meet their basic needs, as detailed in Table 2. The scale consists of two types of questions. The first included two items on food affordability, which asked participants to indicate how frequently their household experienced hardship in buying food (Items 1 and 2). Responses were "Often true" (1), "Sometimes true" (2), and "Never true" (3). In accordance with the original tool instructions, responses 1 and 2 were recoded to 1, and 3 to 0. The second type of question included three items on whether the amount of food fit their households' needs, in which we asked participants to indicate if the situation described happened (Items 3, 5, and 6). Responses were "no" (0), "yes" (1). Lastly, if the response to item (3) was "yes", we also asked at what frequency the situation described in the item had happened. The total score was the sum of all responses which we aggregated to: no food insecurity (FSS = 0 and 1), and low or high food insecurity (FSS = 2 to 6). Like previous validation reports [42,43], the scale showed good internal consistency (Cronbach α = 0.85).

2.2.2. Anxiety and depression

(1) *Anxiety* symptoms were measured using the Generalized Anxiety Disorder-7 scale [GAD-7; 48]. We asked respondents to indicate the frequency of anxiety symptoms over the past two weeks on a 4-point Likert scale ranging from 0 (never) to 3 (nearly every day). For example, "feeling nervous, anxious, or on edge" and "not being able to stop or control worrying". The total score was the sum of all responses and ranged from 0 to 21, with greater scores indicating higher levels of anxiety. This widely used scale has good internal consistency (Cronbach α = 0.92) and adequate test-retest reliability (intra-class correlation = 0.83) [44]. Cut points 5, 10, and 15 were interpreted as representing mild, moderate, and severe levels of anxiety [44]. In the current study, Cronbach's alpha coefficient was excellent (α = 0.95).

(2) *Depression* and depressive symptoms were measured using the 9-item Patient Health Questionnaire [PHQ-9; 49]. Each of the nine items, for example, "Little interest or pleasure in doing things", was rated on a 4-point Likert scale ranging from 0 (never) to 3 (nearly every day), based on the frequency of each symptom over the previous two weeks. Cut points 5, 10, and 15 were interpreted as representing mild, moderate, and severe depression [45]. The total score was the sum of all responses and ranged from 0 to 27, with higher scores indicating higher levels of depression. The initial scale-validation reported good internal reliability (α = 0.89) and test–retest reliability (r = 0.84) [46]. In the current study, internal consistency was high (α = 0.91).

2.2.3. Optimism

To assess respondents' optimism about their future, we used the Cantril ladder index [47], which has been recognized as a valid and reliable tool for measuring life satisfaction and well-being in adults in studies conducted before [48] and during the pandemic [e.g., 49]. The scale is extensively used in various studies [50,51] aiming to assess one's view of the future and captures optimism/hope in both the near-term and the long-term. Participants were asked to: "Imagine a ladder, suppose the top of the ladder (10) represents the best possible life for you and the bottom (0) of the ladder the worst possible life. Where on the ladder do you feel you stand at the present time, in three months from now, and in five years from now?". Considering the rapid, almost day-to-day change in everyday life in terms of work, social restriction measures, and other related stressors during the COVID-19 pandemic, our assessment of future life satisfaction (optimism) relied on the three-month indicator.

2.2.4. Socio-demographic and financial characteristics

We assessed socio-demographic and economic indicators such as age, gender, marital status (in a relationship/single), number of children, and religiosity.

Table 2
Six-item food security scale.

#	Item	Affirmative Response (Score = 1)	Non-Affirmative Response (Score = 0)
1	Please tell us whether the following statement was often true, sometimes true, or never true for your household in the last 3 months: "The food that I/we bought just didn't last, and I/we didn't have money to get more."	Often true; Sometimes true	Never true
2	Please tell us whether the following statement was often true, sometimes true, or never true for your household in the last 3 months: "I/We couldn't afford to eat balanced meals."	Often true; Sometimes true	Never true
3	In the last 3 months, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?	Yes	No
4	[Ask only if #3 = YES] [In the last 3 months,] How many months did this happen?	2 months; 3 months	1 month
5	In the last 3 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?	Yes	No
6	In the last 3 months, were you ever hungry but didn't eat because you couldn't afford enough food?	Yes	No

Note: a modified version of the Food Security Scale (FSS) used in our study [42].

2.3. Empirical model design

To explore the relationship between food insecurity and symptoms of anxiety and depression, we employed a set of panel regression models with individual fixed effects. Each model assumes symptoms of anxiety and depression as a function of the food insecurity status in addition to individual sociodemographic attributes. In formal representation: (1) $y_{it} = \beta x_{it}^{FS} + \delta X_{it} + t + u_i + \epsilon_{it}$.

where y_{it} stands for the symptoms of anxiety and depression of individual i, at survey period t. x_{it}^{FS} indicates the food insecurity index varying from no food insecurity (*food security scale*: 0) to high food insecurity (6). Vector X_{it} comprises individual sociodemographic characteristics listed above. u_i is for individuals' fixed-effects, which controls for seemingly time-fixed observables in a short term (within 6 months), such as gender and religiosity, and unobservables such as fixed personal traits. ϵ_{it} is for individual-wave-level residuals. In this empirical model, the coefficient β captures the association between participants' change in food insecurity status and their change in symptoms of anxiety and depression.

Further, we explored whether optimism moderates the relationship between food insecurity and mental health, by estimating the following equation: (2) $y_{it} = \beta x_{it}^{FS} + \gamma x_{it}^{Cantril} + \theta x_{it}^{FS} x_{it}^{Cantril} + \delta X_{it} + t + u_i + \epsilon_{it}$.

where $x_{it}^{Cantril}$ represents optimism. Here, θ captures the moderation effect of optimism on the relationship between food insecurity and symptoms of anxiety and depression. To explore varying associations among food insecurity, optimism, and symptoms of anxiety and depression, we also conducted sets of subgroup analyses by gender (men/women), marital status (in a relationship/singles), and having a child (parent/non-parent). The data analysis in this study was conducted using Stata (Version 16; StataCorp, 2019), and we used thresholds of $\alpha = 0.05$ to assess statistical significance.

3. Results

3.1. Descriptive and bivariate analysis

Table 1 describes the food insecurity, anxiety, depression, and optimism levels of the analytic sample. Overall, 14.7 % of the respondents reported food insecurity (FI) during the pandemic. Food insecurity has changed throughout the study period. The incidence of respondents who reported FI decreased from 16.7 % in the first wave to 13.7 % and 13.5 % in the second and the third waves, respectively ($p < 0.01$). Accordingly, the average FSS decreased from 0.7 (SD = 1.58) in the first wave to 0.56 (SD = 1.41) and 0.6 (SD = 1.52) in the second and the third waves, respectively ($p < 0.05$).

The average of anxiety was 3.81 (SD = 4.99) across all three waves, with a decreasing trend from 4.21 (SD = 5.19) in the first wave, to 3.81 (SD = 4.9) in the second wave, to 3.39 (SD = 4.87) in the third wave ($p < 0.001$). Across all three waves, 33.2 % of the sample reported at least mild anxiety (i.e., $GAD7 \geq 5$), of which 8.3 % and 5.2 % reported moderate (10–14) and severe (15–21) levels of anxiety, respectively. Depression was measured at 5.35 (SD = 6.04) on average across all three waves, with a decreasing trend from 5.96 (SD = 6.35) in the first wave, through 5.33 (SD = 5.87) in the second wave, to 4.72 (SD = 5.84) in the third wave ($p < 0.001$). Across all three waves, 43.6 % of the sample reported at least mild depression (i.e., $PHQ7 \geq 5$), with 1.3 % and 1.6 % reporting moderate (10–14) and severe (15–27) levels of depression. The average optimism score of the sample was 6.9 (SD = 1.9), slightly increasing from 6.8 (SD = 2.1) in the first wave to 7 (SD = 1.8) in the second and third waves (F = 5.88, $p < 0.01$). As presented in Table 3, in all three waves, FI was significantly and positively correlated with anxiety and depression symptoms, while optimism was significantly and negatively correlated with anxiety and depression symptoms.

3.2. Explanatory analysis: panel analysis with fixed effects

Table 3 shows the results of panel regression analysis with individual fixed effects for predicting symptoms of anxiety and depression. We found that the positive relationships between FI, anxiety, and depression remained significant after controlling for within-individual variation, supporting our first hypothesis. The change over time in FI is positively associated with the change in each measure of symptoms of anxiety and depression. That is, the higher FI, the higher the anxiety and depression. Holding all observed characteristics fixed, a unit increase in one's FI is associated with a 0.368-point increase in anxiety and a 0.474-point increase in depression ($p < 0.001$; see Table 3). Changes in optimism were negatively associated with symptoms of anxiety and depression, supporting our second hypothesis. That is, the higher the optimism, the lower anxiety and depression. Specifically, a unit increase in one's optimism score is associated with a decrease of 0.337 and 0.455 points on anxiety and depression scales, respectively ($p < 0.001$; Table 3).

Table 3
Ranges of within- and between-waves Pearson intercorrelations between all the study variables.

	FI	Anxiety	Depression	Optimism
FI	1			
Anxiety	0.217, 0.330	1		
Depression	0.226, 0.352	0.560, 0.843	1	
Optimism	−0.0215, −0.0323	−0.273, −0.396	−0.311, −0.410	1

Note: All correlations are significant at the level of $p < 0.001$.

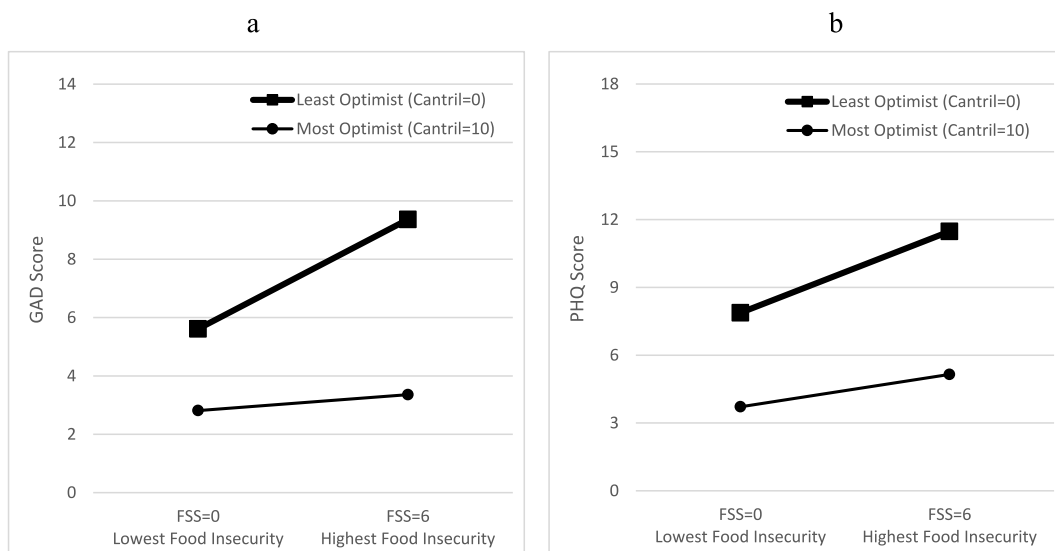### 3.3. Moderation effect of optimism

We examined the moderating role of optimism in the relationship between FI and symptoms of anxiety and depression. As illustrated in Fig. 1a and b, and statistically presented in Table 4, optimism moderated the association between FI and anxiety (b = −0.053 or −0.010 SD, p < .01), but not with depression (b = −0.031 or −0.006 SD, p > .05; Table 4), therefore our third hypothesis was partially supported. That is, as to the anxiety, the greater the optimism, the weaker the association between FI and anxiety. For those individuals who are the least optimistic, the association between FI and anxiety is highest, with a value of 0.625 (=0.121 SD). That means a unit increase in FI (higher FI) is associated with a 0.625-point increase on the anxiety scale (p < 0.001). On the other hand, for those with the highest levels of optimism, a unit increase in FI is associated with a non-significant 0.091-point (=0.018 SD) increase on the anxiety scale (p > 0.05). In other words, the moderation effect infers that optimism buffers the negative effect of FI on anxiety but not the negative effect of food insecurity on depression.

3.3.1. Subgroup analysis

Lastly, we decompose the sample into subpopulation groups to explore varying moderation effects of optimism on the adverse effect of FI on anxiety (Table 5) and depression (Table 6) across groups. Our first subgroup analysis was on gender differences (men/women). Whereas both men and women reported a significant relationship between FI and anxiety (men: b = 0.529 or 0.103 SD, p < 0.001; women: b = 0.683 or 0.133 SD, p < 0.001), only women reported a significant relationship with depression (b = 0.656 or 0.106 SD, p < 0.001). The moderating effect of optimism was significant for women (anxiety: b = −0.066 or −0.013 SD, p < 0.01; depression: b = −0.062 or −0.010 SD, p < 0.05), but not for men.

Our second subgroup analysis was on differences in marital status (in a relationship vs. single). The association between FI and anxiety is significant among both coupled people as well as singles. Nevertheless, the association was stronger among those in a relationship (in a relationship: b = 0.795 or 0.155 SD, p < 0.001; singles: b = 0.455 or 0.089 SD, p < 0.05). As for depression, the association between FI and depression was significant for coupled participants but not for singles (in a relationship: b = 0.972 or 0.157 SD, p < 0.001; singles: b = 0.029 or 0.005 SD, p > 0.05). Correspondingly, the moderation effect held among coupled individuals but not for singles (anxiety— in a relationship: b = −.081 or −0.016 SD, p < 0.001; singles: b = −.021 or −0.004 SD, p > 0.05; depression— in a relationship: b = −.080 or −0.013 SD, p < 0.001; singles: b = −.026 or −0.004 SD, p > 0.05).

Our third and last subgroup analysis compared parents vs. non-parents. FI was positively associated with anxiety, regardless of having a child (parents: b = 0.670 or 0.130 SD, p < 0.001; non-parents: b = 0.589 or 0.115 SD, p < 0.01). Nonetheless, a positive association between FI and depression was only significant among parents (parents: b = 1.054 or 0.170 SD, p < 0.001; non-parents: b = 0.124 or 0.020 SD, p > 0.05). While the moderation effect of optimism on the association between FI and anxiety was significant only among those without a child (parents: b = −.053 or −0.010 SD, p > 0.05; non-parents: b = −0.061 or −0.012 SD, p < 0.05), the moderation effect of optimism on the association between FI and depression was significant only among parents (parents: b = −.092 or −0.015 SD, p < 0.010; non-parents: b = 0.018 or 0.003 SD, p > 0.05). It is important to note that these findings were significant even when controlling for the relationship status of parents vs. non-parents.

Fig. 1. Optimism moderates the association between FI and mental health a: Anxiety b: Depression
Notes: This plot illustrates the moderation effect of optimism on the association of FI with anxiety (Fig. 1a) and depression (Fig. 1b). The values of the plot are calculated using regression (2) estimated coefficients of the constant value, FI, optimism, and the interaction term FI*optimism, as presented in Table 4, columns 3 (Figs. 1a) and 6 (Fig. 1b).

Table 4
Results from panel analyses with individual fixed effects.

	Anxiety			Depression		
	(1) b (SE)	(2) b (SE)	(3) b (SE)	(1) b (SE)	(2) b (SE)	(3) b (SE)
Survey wave (base = wave 1; Jan 2021):						
Wave 2 (June 2021)	−0.363[c]	−0.307[b]	−0.299[b]	−0.614[c]	−0.537[c]	−0.533[c]
	(0.107)	(0.107)	(0.107)	(0.132)	(0.131)	(0.131)
Wave 3 (Nov 2021)	−0.875[c]	−0.835[c]	−0.829[c]	−1.193[c]	−1.145[c]	−1.141[c]
	(0.116)	(0.115)	(0.115)	(0.143)	(0.141)	(0.141)
FI	0.368[c]	0.307[c]	0.625[c]	0.474[c]	0.390[c]	0.600[c]
	(0.0620)	(0.0620)	(0.134)	(0.0779)	(0.0777)	(0.165)
Optimism		−0.337[c]	−0.280[c]		−0.455[c]	−0.416[c]
		(0.0460)	(0.0507)		(0.0566)	(0.0626)
FI X Optimism			−0.0534[b]			−0.0361
			(0.0199)			(0.0249)
Constant	4.083[c]	6.056[c]	5.612[c]	5.612[c]	8.181[c]	7.876[c]
	(0.861)	(0.895)	(0.909)	(1.070)	(1.105)	(1.125)
Observations	4742	4742	4742	4604	4604	4604
R-squared	0.037	0.054	0.057	0.042	0.064	0.065
Number of individuals	1871	1871	1871	1860	1860	1860

Notes.

All models control for individual time-variant variables—age, marital status, number of children—in addition to individual fixed effects.
Standard errors are in parenthesis.

[a] $p < .05$.

[b] $p < .01$.

[c] $p < .001$.

Table 5
Results from panel analysis with individual fixed effects: Anxiety (GAD-7).

Subsample	Anxiety (GAD-7)					
	Men	Women	Married/Coupled	Single	No Children	Has Children
	(1A)	(1B)	(2A)	(2B)	(3A)	(3B)
FI	0.529**	0.683***	0.795***	0.455	0.589**	0.670***
	(0.204)	(0.180)	(0.166)	(0.233)	(0.190)	(0.197)
Optimism	−0.298***	−0.258***	−0.239***	−0.310**	−0.297***	−0.284***
	(0.0742)	(0.0701)	(0.0596)	(0.0955)	(0.0679)	(0.029)
FI * Optimism	−0.0337	−0.0660*	−0.0807***	−0.0210	−0.0611*	−0.053
	(0.0299)	(0.0271)	(0.0242)	(0.0357)	(0.0287)	(0.029)
Survey wave (base = wave 1; Jan 2021):						
Wave 2 (June 2021)	−0.185	−0.397*	−0.391**	−0.227	−0.274	−0.398*
	(0.144)	(0.157)	(0.123)	(0.207)	(0.144)	(0.163)
Wave 3 (Nov 2021)	−0.731***	−0.903***	−0.707***	−1.183***	−0.732***	−0.938***
	(0.156)	(0.169)	(0.132)	(0.228)	(0.155)	(0.181)
Constant	3.723**	7.287***	5.233***	7.768***	8.038***	3.057
	(1.274)	(1.317)	(1.294)	(1.537)	(1.461)	(1.798)
Observations	2245	2494	3202	1540	2709	2033
Number of individuals	879	991	1280	658	1113	841
R-squared	0.053	0.067	0.056	0.082	0.055	0.095

4. Discussion

The purpose of the current longitudinal study was to examine the psychological effects of FI in times of a global health crisis such as the COVID-19 pandemic. In addition, the study aimed at exploring the buffering role of optimism in the relationship between FI and symptoms of anxiety and depression. Our results demonstrate that the degree and change in FI over time were positively correlated with both anxiety and depression symptoms, thereby supporting our first hypothesis. Individuals experiencing an increase in FI during the pandemic showed an increase in levels of anxiety and depression symptoms. Unsurprisingly, this finding corresponds with literature published before and during the COVID-19 pandemic on FI and adverse mental health conditions [16,18–21] in which FI is acknowledged as a stressful, sometimes chronic, situation which may cause negative emotional outcomes [52]. Most studies examined FI in terms of duration, severity, or the state of being food insecure. Only one study examined changes in FI, and found that an improvement in FI was associated with an improvement in psychological distress and depressive symptoms [53]. Interestingly, the reported correlations seemed to be much lower in comparison to those found in the current study, either due to differences in assessment tools or due to the different contexts in which the studies were conducted – before the COVID-19 pandemic (between 2016 and 2017) or during the pandemic. Although both studies highlight the importance of assessing changes in FI over time, it is plausible

Table 6
Results from panel analysis with individual fixed effects: Depression (PHQ-9).

Subsample	Depression (PHQ-9)					
	Men	Women	Married/Coupled	Single	No Children	Has Children
	(1A)	(1B)	(2A)	(2B)	(3A)	(3B)
FI	0.446	0.656[b]	0.972[c]	0.0287	0.124	1.054[c]
	(0.272)	(0.208)	(0.200)	(0.291)	(0.236)	(0.241)
Optimism	−0.426[c]	−0.400[c]	−0.358[c]	−0.482[c]	−0.492[c]	−0.337[c]
	(0.0991)	(0.0812)	(0.0727)	(0.119)	(0.0839)	(0.097)
FI[a] Optimism	0.00782	−0.0622	−0.0801[b]	0.0261	0.0175	−0.092[b]
	(0.0405)	(0.0317)	(0.0293)	(0.0464)	(0.0366)	(0.0457)
Survey wave (base = wave 1; Jan 2021):						
Wave 2 (June 2021)	−0.306	−0.755[c]	−0.624[c]	−0.524[a]	−0.486[b]	−0.712[c]
	(0.190)	(0.182)	(0.150)	(0.254)	(0.177)	(0.201)
Wave 3 (Nov 2021)	−1.048[c]	−1.225[c]	−1.079[c]	−1.474[c]	−0.954[c]	−1.456[c]
	(0.205)	(0.196)	(0.161)	(0.280)	(0.190)	(0.222)
Constant	5.671[c]	9.745[c]	7.268[c]	9.521[c]	1.51[c]	5.835
	(1.692)	(1.531)	(1.563)	(1.857)	(1.797)	(2.239)
Observations	2196	2405	3124	1480	2628	1976
Number of individuals	874	985	1272	652	1103	837
R-squared	0.058	0.083	0.078	0.073	0.055	0.061

Notes.

All models control for individual time variant variables—age, marital status, number of children—in addition to individual fixed effects.

Standard errors are in parenthesis.

[a] $p < .05$.

[b] $p < .01$.

[c] $p < .001$.

that the unique cultural climate during the pandemic, which was characterized by a high degree of uncertainty, worry, and loss [54], has resulted in a greater correlation of FI-change with mental health.

The second hypothesis concerning optimism was also supported; optimism and changes in optimism were negatively associated with symptoms of anxiety and depression over time. Our results demonstrate that individuals experiencing higher levels of optimism during the pandemic showed lower levels of anxiety and depression symptoms and that an increase in one's level of optimism resulted in a decrease in one's levels of anxiety and depression symptoms. The positive effect of optimism on mental health has been well-established in the literature, especially in times of stress, insecurities [27–30], and during the COVID-19 pandemic [41]. Nevertheless, this study is the first to examine the effect of optimism and change in optimism in the context of food-insecure life conditions. This study's findings imply that in times of extreme and prolonged stress, optimism remains a significant predictor of mental health outcomes, even among individuals facing nutritional hardships and hunger. Optimism, as a subjective positive perception of a possible future, plays a crucial role in food-insecure conditions during a worldwide pandemic—as is established in our moderation model. Partially supporting our third hypothesis, optimism was found to moderate the association between FI and anxiety symptoms over time, but not the association between FI and depression symptoms.

An examination of optimism in the context of FI in times of a worldwide pandemic requires a complex and dialectical understanding of the balance between positives and negatives, between hope and suffering [55,56]. Therefore, to enhance our understanding of the findings, we conceive 'optimism' not as a state of mere positivity, but rather as a form of 'tragic optimism' - a positive outlook of life that concurrently acknowledges suffering and hardships [54,55,57,58]. This conceptualization is informed by Victor Frankl's [59] proposition of 'tragic optimism', defined as optimism in the face of tragedy despite pain, guilt, and death. Unlike 'unrealistic optimism', also denoted as self-deception or positive illusion [60,61], tragic optimism maintains the core of optimism while concurrently acknowledging and embracing hardship and suffering [62]. The conceptual framework of tragic optimism finds further elaboration in Wong's theory of existential positive psychology (EPP) [57], offering a more realistic and existential perspective on the world as one replete with suffering, yet laden with the potential for overcoming difficulties—a perspective inherently optimistic. Several studies have already demonstrated the importance of tragic optimism in the context of the COVID-19 pandemic [63,64], but none have yet examined the effect of optimism (i.e., tragic optimism) among food-insecure populations. Within this perspective, which acknowledges the intricate nature of optimism amid tragedy (or 'tragic optimism'), resiliency in difficult times is strengthened by one's ability to hold two opposing emotions simultaneously, tolerate uncertainty and ambivalence, and find an adaptive balance between both ends [65]. As the core characteristics of depression are sadness and loss of pleasure and hope [ICD-11: 60], the essence of the depressive experience is one's present situation of suffering. By contrast, anxiety is characterized by excessive worrying [ICD-11: 66], which in essence involves the anticipation of future danger. It is possible that optimism in times of great tragedy may lessen worries (i. e., anxiety) and thereby promote the necessary balance between positive and negative outlooks. On the other hand, while optimism may assist in predicting a better future, it may not sufficiently alleviate the present experience of suffering (i.e., depression), thus the balance remains tilted towards the negative perception of the situation and possible future. Nonetheless, optimism may still have an indirect effect on depressive symptoms, as studies demonstrate that an improvement in one's anxiety may lead to an improvement in depressive symptoms [See [67].

A differential examination of the moderating effect of optimism on the relationship between FI and anxiety and depression symptoms in terms of gender, marital status, and parenthood provides a more detailed understanding of relevant protective individual factors. The results of our study largely align with our fourth hypothesis, providing substantial support for the anticipated varying moderation effect across the three different subgroups. First, our results indicate that optimism moderated the relationship between FI and anxiety and depression symptoms for women, but not for men. This finding is in line with previous literature documenting higher levels of optimism among women in general [68], and more changes in optimism levels during the pandemic in comparison to men [69]. Women also tend to report higher levels of depression, anxiety, and psychological distress than men [70], and experience greater food insecurity [71], which may explain how the suggested moderation model is more accurate for women than for men.

Second, our results indicate that optimism moderated the relationship between FI and anxiety and depression symptoms for coupled individuals but not for singles. Being in a relationship may serve as a buffer against stressful situations and may contribute to a more realistic as well as optimistic view of life [72] as coupled individuals feel less alone and more socially supported [73]. As demonstrated in the current study, optimism in the face of tragedy may lessen the negative relationship between FI and mental health outcomes among coupled individuals in times of a worldwide pandemic.

Third, optimism moderated the relationship between FI and anxiety symptoms only for non-parents, while it moderated the relationship between FI and depression symptoms only for parents. Since our analysis remained significant even after controlling for relationship status, we believe that the parental role had an important contribution to these two finding. Being a parent is a social role that encompasses obligations, responsibilities, and above all, the constant need to care for others, which may constitute a continuous state of worry and anxiety [74,75]. This additional responsibility may also intensify stress and become a burden, especially in times of heightened concern for the health, protection, and well-being of one's children such as during the COVID-19 pandemic [76]. Thus, it is possible that parents may still experience a continuous and heightened state of worry and anxiety regarding the well-being of their children, irrespective of their levels of optimism. The moderating effect of optimism may not be as potent for parents, given that their concerns are closely tied to the tangible and immediate needs of their dependents, especially in times of food insecurity which serves a real existential threat to one's family and self. This is also why, for non-parents, who do not bear the same level of commitment and responsibility for children, optimism may play a more effective role in mitigating anxiety associated with food insecurity. In this context, the optimism of non-parents could be more resilient in providing a buffer against anxiety, offering them a greater capacity to navigate the challenges posed by uncertain food availability.

The finding that optimism moderated the relationship between FI and depression symptoms only for parents shows, once again, the salient role of parenthood. Interestingly, the unique circumstances faced by parents, particularly during the COVID-19 pandemic, have elevated the significance of their role in ways that surpass enduring personality traits [76]. The distinct role of parenthood becomes even more pronounced when considering the unique circumstances imposed by the pandemic, including quarantines, social isolation regulations, and closures of educational institutions like kindergartens and schools [77]. In the context of the current study, optimism may help parents who must care for their children in the difficult reality of food insecurity and may not have the privilege of feeling depressed. The constant demand for caregiving, coupled with the uncertainties brought about by the pandemic, may necessitate an optimistic outlook as an adaptive response. This outlook and the necessity to function for the sake of a dependent other may help parents who feel obliged to provide a better future for their children to imagine this future, find meaning in their current suffering [78], and consequently cope more adaptively with the stressful situation.

4.1. Practical implications

Our findings derive several implications for practice. As our results emphasize the significant adverse relationship between FI and the mental health of individuals during the pandemic, our recommendation for policymakers concerns the need to allocate proper financial, material, and psychological resources to food-insecure populations, especially during a global pandemic. FI incorporates nutritional and financial hardships, but also psychological ones; as such, social policy services should direct assistance toward all aspects of the experience. To appropriately leverage our findings, which do not necessarily imply causation, healthcare professionals should contemplate optimism in times of tragedy as a potential buffer in food-insecure situations. Therefore, we recommend healthcare professionals to actively apply the concept of optimism, with a particular emphasis on familiarizing themselves with the concept of tragic optimism, in their interactions with food-insecure populations. Attending and participating in workshops that center on modifying explanatory styles may also play a crucial role in the development of such skills [79,80].

Specifically concerning tragic optimism, it is essential to shift one's perception from a binary, either/or mindset to a more nuanced, inclusive approach that acknowledges the coexistence of positive and negative elements [57]. To avoid misleading patients and clients, social workers and psychologists sometimes refrain from encouraging false or unrealistic expectations, a phenomenon referred to as 'toxic positivity,' characterized by a mindset that adheres to the belief that simply thinking positively will yield positive outcomes. However, our recommendation is that optimism should not be discouraged in general. Rather, it should be utilized in a way that integrates the negative with the positive [55]. In such ways, food-insecure individuals may transform challenges into hopes and genuine changes in their lives.

4.2. Study's limitations and future research

Our findings should be interpreted considering several limitations which yield recommendations for future research. The first limitation concerns the sample of the current study. Although efforts were made to ensure that the sample was as diverse as possible, the final set comprised a low representation of minority groups and other religious sub-populations such as ultra-orthodox Jews,

Muslims, Christians, Druze, and Bedouin. This limitation demands further investigation as these populations are at higher risk to experience FI [10,14]. Furthermore, as our sample comprised Israeli participants, it might be useful to examine the same mediation model among other countries and cultures. Another limitation concerns our sub-group comparisons, which only assessed one's status (coupled/single; parent/non-parent). Assuming the interplay between one's status and the quality of that status, future research should investigate how relationship factors (such as relationship satisfaction and perceived support), as well as parental factors (such as parenting style and parental role perception), interact in situations of FI and mental health outcomes. Furthermore, future research endeavors in this domain may benefit from conducting dedicated mediation analyses to further explore the underlying psychological mechanisms involved in the relationship between FI and mental health. This additional investigation could provide a more comprehensive understanding of the pathways and potential mediators at play, contributing to a nuanced comprehension of the protective factors associated with FI and mental health outcomes. Moreover, the individual fixed effect model used in our study allowed us to control for observable and unobservable time-fixed individuals' characteristics. This yielded results closer to causal relationships than regular cross-sectional analysis, representing the average magnitude of an individual's mental health change when his/her FI or optimism are changed. It should be noted that our presented results do not prove causality, but rather support it as a plausible interpretation. Unfortunately, fully identified causality is out of the scope of this study. Another methodological limitation pertains to the measurement of optimism, specifically focusing on a measure of general optimism rather than tragic optimism. Given the potential value in achieving a more nuanced understanding of optimism during periods of profound despair, it would be advantageous for future research to incorporate tools designed to assess tragic optimism, such as the Life Attitudes Scale and the Life Acceptance Measure [63,64]. Lastly, a qualitative inquiry of tragic optimism in times of FI may help deepen our understanding of such a stressful experience. It might also be beneficial to further investigate gender differences in perceptions of FI and tragic optimism.

5. Conclusions

In our attempt to theoretically and practically interpret the protective role of optimism in the relationship between FI and anxiety and depression, we utilized the notion of 'tragic optimism'. Our results highlight the need to practice and enhance optimism in times of great despair, uncertainty, and hardship, especially in situations of food insecurity where tangible change may take time. This form of 'aware' optimism to the negative aspects of life can help food-insecure individuals find hope and motivation. Importantly, adopting such a perspective has the potential to transform the attitudes of social policymakers and healthcare professionals toward FI populations and their possible fate.

Data availability statement

The data related to this study has not been deposited into a publicly available repository; nevertheless, it will be made accessible upon request.

CRediT authorship contribution statement

Shani Pitcho: Writing – original draft, Methodology, Conceptualization. **Oren Heller:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis. **Yung Chun:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis. **Talia Meital Schwartz-Tayri:** Writing – review & editing, Methodology. **Michal Grinstein-Weiss:** Conceptualization, Data curation, Resources, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e30385.

References

[1] WHO. Available online: https://www.who.int/director-eneral/speeches/detail/who-director-general-s-statement-on-ihr-emergency-committee-on-novel-coronavirus-(2019-ncov) (accessed on 1 May 2023).
[2] WHO. Available online: https://covid19.who.int (accessed on 3 May 2023).
[3] G.K. Jiskrova, M. Bobák, H. Pikhart, A.J. Ksinan, Job loss and lower healthcare utilization due to COVID-19 among older adults across 27 European countries, J. Epidemiol. Community Health 75 (2021) 1078–1083.
[4] WHO. Available online: https://www.who.int/director-general/speeches/detail/who-director-general-s-guest-lecture-at-vice-chancellor-lectures-on-globalization-sustainability-and-the-power-of-ideas-university-of-cambridge-1-march-2022 (accessed on 2 April 2023).

[5] M. Mahat-Shamir, S. Pitcho-Prelorentzos, M. Kagan, M. Kestler-Peleg, O. Lavenda, Adjustment disorder in the face of COVID-19 outbreak: the impact of death anxiety, media exposure, fear of contagion and hypochondriasis symptoms, Omega: J. Death Dying 87 (2021) 1189–1206, 302228211034372.

[6] S. Mahmud, M. Mohsin, M. Dewan, A. Muyeed, The global prevalence of depression, anxiety, stress, and insomnia among general population during COVID-19 pandemic: a systematic review and meta-analysis, Tre. Psy. 31 (2022) 143–170.

[7] M. Maynard, L. Andrade, S. Packull-McCormick, C.M. Perlman, C. Leos-Toro, S.I. Kirkpatrick, Food insecurity and mental health among females in high-income countries, Int. J. Environ. Res. Publ. Health 15 (2018) 1424.

[8] S.H. Nam, J.H. Nam, C.Y. Kwon, Comparison of the mental health impact of COVID-19 on vulnerable and non-vulnerable groups: a systematic review and meta-analysis of observational studies, Int. J. Environ. Res. Publ. Health 18 (2018) 10830.

[9] M. Alegría, M. Cruz-Gonzalez, I.S. O'Malley, K. Alvarez, G.L. Stein, L. Fuentes, P.E. Shrout, Role of social determinants in anxiety and depression symptoms during COVID-19: a longitudinal study of adults in North Carolina and Massachusetts, Behav. Res. Ther. 154 (2022) 104102.

[10] U.S. Department of Agriculture, Economic Research Service. Available online: https://www.ers.usda.gov/webdocs/publications/99282/err-275.pdf?v=4853.3 (accessed on 3 May 2023).

[11] C. Gundersen, M. Hake, A. Dewey, E. Engelhard, Food insecurity during COVID-19, Appl. Econ. Perspect. Pol. 43 (2021) 153–161.

[12] U. Pool, M. Dooris, Prevalence of food security in the UK measured by the food insecurity experience scale, J. Publ. Health (2021) fdab120.

[13] J. Azarieva, E.M. Berry, A.M. Troen, Child food insecurity in the wake of the COVID-19 pandemic: urgent need for policy evaluation and reform in Israel's school feeding programs, Isr. J. Health Pol. Res. 11 (2022) 1–9.

[14] Latet. Available online: https://www.latet.org.il/upload/files/163973447461bc5ccabc08627896.pdf (accessed on 3 April 2023).

[15] Latet. Available online: https://www.latet.org.il/upload/files/15446269055c1122d99bb63885325.pdf (accessed on 3 April 2023).

[16] C.A. Myers, Food insecurity and psychological distress: a review of the recent literature, Curr. Nutri. Rep. 9 (2020) 107–118.

[17] S.A. Anderson, Core indicators of nutritional state for difficult-to-sample populations, T. J. Nutri. 120 (1990) 1555–1600.

[18] G. Ciciurkaite, R.L. Brown, The link between food insecurity and psychological distress: the role of stress exposure and coping resources, J. Community Psychol. 50 (2022) 1626–1639.

[19] C. Gundersen, V. Tarasuk, J. Cheng, C. De Oliveira, P. Kurdyak, Food insecurity status and mortality among adults in Ontario, Canada, PLoS One 13 (2018) e0202642.

[20] C. Gundersen, J.P. Ziliak, Food insecurity and health outcomes, Health Aff. 34 (2015) 1830–1839.

[21] A.D. Jones, Food insecurity and mental health status: a global analysis of 149 countries, Am. J. Prev. Med. 53 (2017) 264–273.

[22] D.L. Shepherd, Food insecurity, depressive symptoms, and the salience of gendered family roles during the COVID-19 pandemic in South Africa, Soc. Sci. Med. 301 (2022) 114830.

[23] C. Gunderson, Food insecurity is an ongoing national concern. American Society for Nutrition, Adv. Nutr. 4 (2013) 36–41.

[24] A.M. Hamelin, M. Beaudry, J.P. Habicht, Characterization of household food insecurity in Quebec: food and feelings, Soc. Sci. Med. 54 (2022) 119–132.

[25] R. Loopstra, V. Tarasuk, The relationship between food banks and household food insecurity among low-income Toronto families, Can. Publ. Pol. 38 (2012) 497–514.

[26] C.S. Carver, M.F. Scheier, Optimism, in: C.R. Snyder, S.J. Lopez (Eds.), Handbook of Positive Psychology, Oxford University Press, England, 2002, pp. 231–243.

[27] C.S. Carver, M.F. Scheier, S.C. Segerstrom, Optimism, Clin. Psychol. Rev. 30 (2010) 879–889.

[28] E. Dupuis, T. Foster, Understanding holistic wellness from a midlife perspective: a factor analytic study, J. Pos. Sch. Psy 4 (2020) 105–116.

[29] M.W. Gallagher, S.J. Lopez, Positive expectancies and mental health: identifying the unique contributions of hope and optimism, T. J. Pos. Psy. 4 (2009) 548–556.

[30] W.S. Helton, W.N. Dember, J.S. Warm, G. Matthews, Optimism, pessimism, and false failure feedback: effects on vigilance performance, Curr. Psychol. 18 (1999) 311–325.

[31] B. Duy, M.A. Yıldız, The mediating role of self-esteem in the relationship between optimism and subjective well-being, Curr. Psychol. 38 (2019) 1456–1463.

[32] L.S. Nes, S.C. Segerstrom, Dispositional optimism and coping: a meta-analytic review, Pers. Soc. Psychol. Rev. 10 (2006) 235–251.

[33] W. Yuan, L. Wang, Optimism and attributional style impact on the relationship between general insecurity and mental health, Pers. Indiv. Differ. 101 (2016) 312–317.

[34] H.H. Faye-Schjoll, I. Schou-Bredal, Pessimism predicts anxiety and depression in breast cancer survivors: a 5-year follow-up study, Psycho Oncol. 28 (2019) 1314–1320.

[35] K.S. Lyons, Optimism, pessimism, mutuality, and gender: predicting 10-year role strain in Parkinson's disease spouses, Geron 49 (2009) 378–387.

[36] X.D. Yue, N.A. Hiranandani, F. Jiang, Z. Hou, X. Chen, Unpacking the gender differences on mental health: the effects of optimism and gratitude, Psychol. Rep. 120 (2017) 639–649.

[37] T.C. Bailey, C.R. Snyder, Satisfaction with life and hope: a look at age and marital status, Psychol. Rec. 57 (2007) 233–240.

[38] K.A. Robb, A.E. Simon, J. Wardle, Socioeconomic disparities in optimism and pessimism, Int. J. Behav. Med. 16 (2009) 331–338.

[39] K.A. Bonfils, E.L. Adams, R.L. Firmin, L.M. White, M.P. Salyers, Parenthood and severe mental illness: relationships with recovery, Psychiatr. Rehabil. J. 37 (2014) 186–193.

[40] S.K. Nelson, K. Kushlev, T. English, E.W. Dunn, S. Lyubomirsky, Defense of parenthood: children are associated with more joy than misery, Psychol. Sci. 24 (2013) 3–10.

[41] G. Arslan, M. Yıldırım, Coronavirus stress, meaningful living, optimism, and depressive symptoms: a study of moderated mediation model, Aust. J. Psychol. 73 (2021) 113–124.

[42] S.J. Blumberg, K. Bialostosky, W.L. Hamilton, R.R. Briefel, The effectiveness of a short form of the household food security scale, Am. J. Publ. Health 89 (1999) 1231–1234.

[43] R. Kaufman, R. Isralowitz, A. Reznik, Food insecurity among drug addicts in Israel: implications for social work practice, J. Soc. Work. Pract. Addict. 5 (2005) 21–32.

[44] R.L. Spitzer, K. Kroenke, J.B. Williams, B. Löwe, A brief measure for assessing generalized anxiety disorder: the GAD-7, Arch. Intern. Med. 166 (2006) 1092–1097.

[45] K. Kroenke, R.L. Spitzer, J.B. Williams, The PHQ-9: validity of a brief depression severity measure, J. Gen. Intern. Med. 16 (2001) 606–613.

[46] K. Kroenke, R.L. Spitzer, The PHQ-9: a new depression diagnostic and severity measure, Psychiatr. Ann. 32 (2002) 509–515.

[47] H. Cantril, The Pattern of Human Concern, Rutgers University Press, New Jersey, USA, 1965.

[48] E. Diener, R. Inglehart, L. Tay, Theory and validity of life satisfaction scales, Soc. Indicat. Res. 112 (2013) 497–527.

[49] D.T.H. Chen, Y.J. Wang, Inequality-related health and social factors and their impact on well-being during the COVID-19 pandemic: findings from a national survey in the UK, Int. J. Environ. Res. Publ. Health 18 (2021) 1014.

[50] V.C. Franke, C.N. Elliott, Optimism and social resilience: social isolation, meaninglessness, trust, and empathy in times of covid-19, Societies 11 (2021) 35.

[51] N. Park, C. Peterson, It's not just the economy: the psychological well-being of an electorate also matters for election outcomes, J. Posit. Psychol. 14 (2019) 127–132.

[52] C.W. Leung, E.S. Epel, L.D. Ritchie, P.B. Crawford, B.A. Laraia, Food insecurity is inversely associated with diet quality of lower-income adults, J. Acad. Nutr. Diet. 114 (2014) 1943–1953.

[53] S.A. Berkowitz, D. Palakshappa, H.K. Seligman, J. Hanmer, Changes in food insecurity and changes in patient-reported outcomes: a nationally representative cohort study, J. Gen. Intern. Med. 37 (2022) 3638–3644.

[54] P.T. Wong, C.H. Mayer, G. Arslan, COVID-19 and existential positive psychology (PP2. 0): the new science of self-transcendence, Front. Psychol. 12 (2021).

[55] P.T. Wong, T.T. Yu, Existential suffering in palliative care: an existential positive psychology perspective, Medicina 57 (2021) 924.

[56] T. Lomas, I. Ivtzan, Second wave positive psychology: exploring the positive–negative dialectics of wellbeing, J. Happiness Stud. 17 (2016) 1753–1768.

[57] P.T.P. Wong, Positive psychology 2.0: towards a balanced interactive model of the good life, Can. Psychol. 52 (2011) 69–81.

[58] P.T. Wong, Second wave positive psychology's (PP 2.0) contribution to counseling psychology, Counsell. Psychol. Q. 32 (2019) 275–284.
[59] V. Frankl, Man's Search for Meaning, Beacon Press, Boston, 1963.
[60] A. Maercker, T. Zoellner, The Janus face of self-perceived growth: toward a two-component model of posttraumatic growth, Psychol. Inq. 15 (2004) 41–48.
[61] S.E. Taylor, Adjustment to threatening events: a theory of cognitive adaptation, Am. Psychol. 38 (1983) 1161.
[62] Volpe, A. "Tragic optimism": The antidote to toxic positivity. Available online: https://www.bbc.com/worklife/article/20210302-tragic-optimism-the-antidote-to-toxic-positivityhttps://covid19.who.int (accessed on 7 May 2023).
[63] M.M. Leung, G. Arslan, P.T. Wong, Tragic optimism as a buffer against COVID-19 suffering and the psychometric properties of a brief version of the life attitudes scale, Front. Psychol. 12 (2021) 646843.
[64] J.P. Mead, Z. Fisher, J.J. Tree, P.T. Wong, A.H. Kemp, Protectors of wellbeing during the COVID-19 pandemic: key roles for gratitude and tragic optimism in a UK-based cohort, Front. Psychol. 12 (2021) 647951.
[65] L. Jans-Beken, P.T. Wong, Development and preliminary validation of the existential gratitude scale (EGS), Counsell. Psychol. Q. 34 (2021) 72–86.
[66] WHO. Available online: https://icd.who.int/en (accessed on 9 May 2023).
[67] L.S. Duarte-Guerra, E. Kortchmar, E.C.S. Maraviglia, T. da Silva Costa, C.M. Lasmar, R.M.R. Morin, Y.P. Wang, Longitudinal patterns of comorbidity between anxiety, depression and binge eating symptoms among patients with obesity: a path analysis, J. Affect. Disord. 303 (2022) 255–263.
[68] X.D. Yue, N.A. Hiranandani, F. Jiang, Z. Hou, X. Chen, Unpacking the gender differences on mental health: the effects of optimism and gratitude, Psychol. Rep. 120 (2017) 639–649.
[69] L. de Vries, M. van de Weijer, D. Pelt, L. Ligthart, G. Willemsen, D. Boomsma, E. de Geus, M. Bartels, Individual differences in the effect of the COVID-19 pandemic on optimism and meaning in life, Behav. Genet. 52 (2021) 13–25.
[70] E. Curran, M. Rosato, F. Ferry, G. Leavey, Prevalence and factors associated with anxiety and depression in older adults: gender differences in psychosocial indicators, J. Affect. Disord. 267 (2020) 114–122.
[71] R.L. Brown, G. Ciciurkaite, A. Imlay, Gender differences in the association between functional limitation and depressive symptoms: the salience of food insecurity, Women Health 60 (2020) 735–747.
[72] V.P. Ta, A.N. Gesselman, B.L. Perry, H.E. Fisher, J.R. Garcia, Stress of singlehood: marital status, domain-specific stress, and anxiety in a national US sample, J. Soc. Clin. Psychol. 36 (2017) 461.
[73] J.A. Vaingankar, E. Abdin, S.A. Chong, S. Shafie, R. Sambasivam, Y.J. Zhang, M. Subramaniam, The association of mental disorders with perceived social support, and the role of marital status: results from a national cross-sectional survey, Arch. Publ. Health 78 (2020) 1–11.
[74] P.A. Thoits, Handbook of the Sociology of Mental Health, Springer, Dordrecht, NL, 2013.
[75] E. Yaakobi, M. Mikulincer, P.R. Shaver, Parenthood as a terror management mechanism: the moderating role of attachment orientations, Pers. Soc. Psychol. Bull. 40 (2014) 762–774.
[76] M. Kestler-Peleg, M. Mahat-Shamir, S. Pitcho-Prelorentzos, M. Kagan, O. Lavenda, Being a parent, emotional stability, and adjustment disorder symptoms in the face of COVID-19, Fam. Relat. 71 (2022) 1325–1338.
[77] O. Heller, M. Moran, S. Pitcho, T.M. Schwartz-Tayri, J. Jabbari, Y. Shlomo, M. Grinstein-Weiss, Home quarantines and cumulative risk exposure among young children: isolation and maladaptation, Am. J. Orthopsychiatry 93 (2023) 504–515.
[78] X. Zhou, Q. Lei, S.C. Marley, J. Chen, Existential function of babies: babies as a buffer of death-related anxiety, As. J. Soc. Psy. 12 (2009) 40–46.
[79] A. Carr, K. Cullen, C. Keeney, C. Canning, E. Chinseallaigh, A. O'Dowd, Effectiveness of positive psychology interventions: a systematic review and meta-analysis, J. Posit. Psychol. 16 (2021) 749–769.
[80] G. Steinberg, L.A. Gano-Overway, Developing optimism skills to help youths overcome adversity, J. Phys. Educ. 74 (2003) 40.