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The Impact of Age on Negative Emotional Reactions, Compliance With Health Guidelines, and Knowledge About the Virus During the COVID-19 Epidemic: A Longitudinal Study From Israel

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Abstract

In a longitudinal study we examined the impact of age on negative emotional reactions, compliance with health guidelines and knowledge about the virus during the COVID-19 epidemic. A total of 2509 people participated in a two-phase study: 1424 participants in the first phase (March 12-21) and 1085 participants in the second phase (April 23 to May 5). Age was categorized into 4 groups: age 18 to 30, age 31 to 40, age 41 to 50, and age 51 and over. In the first and second phase, compliance with health guidelines was highest among participants over the age of 50. Knowledge was significantly higher in the second phase than in the first among participants over age 50 and those between the ages of 40 and 50. In the second phase, knowledge did not differ by age group. Negative emotional reactions were significantly higher in the first phase than in the second. Moreover, negative emotional reactions were higher among participants up to age 30 than among all other participants. Perceived susceptibility did not differ by phase or by age group. The paper underscores the impact of age during the COVID-19 epidemic and points to the necessity of taking the needs of different age groups into consideration.

Keywords

COVID-19, emotional reactions, knowledge about the CoVID-19 virus, perceived susceptibility, compliance with health guidelines

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Introduction

The novel coronavirus disease (COVID-19) first appeared in Wuhan, China in late 2019 and spread rapidly across the globe.[1] In Israel, the first COVID-19 cases were reported on February 21, 2020. Data about the disease are updated daily, and as of August 2020 there were over 25,801 active cases and over 561 deaths in Israel.[2] During the epidemic, affected countries have exhibited major variations in emotional reactions, compliance with health guidelines, and knowledge about the disease.[3-5] Age may be 1 factor in explaining these variations.[6-9]

A report from the Israel Ministry of Health indicates that the first confirmed cases of COVID-19 in Israel included a high percentage of individuals between the ages of 40 and 69. During this period, most of the cases were imported from abroad. After the week of March 8 to 14, when parties were held to celebrate the Purim holiday, a growing number of people between the ages of 20 and 39 were among the confirmed cases. As the number of confirmed cases continued to rise, more people age 60 and over contracted the disease. While this age group represented 19.4% of all confirmed cases, they were more seriously ill than all other age groups. Moreover,

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the risk of deteriorating health and hospitalization increased with patient age, and half of the deaths in Israel were people age 80 and over.[2] An age-structured mathematical model for epidemic data from China, Italy, Japan, Singapore, Canada, and South Korea estimates that susceptibility to infection rises to 69% (57%-82%) in people over the age of 70.[3]

The Israel Ministry of Health is continuing to release and update guidelines and instructions on an ongoing basis to instruct the lay public how to behave in this new reality (e.g., social distancing and wearing masks).[2] Israeli citizens, like their counterparts around the world, were alarmed by news about the pandemic reporting overwhelming numbers of new cases and fatalities every day. Yet because citizens receive information about COVID-19 from various sources, their knowledge about the disease may be incorrect.[5] In addition, the rising numbers of suspected and confirmed cases may affect the public's assessments of the severity and controllability of the virus. A study among UK residents found that those who conformed to all protective health behaviors tended to be older.[9]

In many countries, the benchmark age of 60 was used to specify those at high risk for COVID-19 complications.[10,11] The epidemic's rising menace generated a global atmosphere of negative emotional reactions due to disrupted travel plans, the closing of shops and schools, the need to work from home, social isolation, media information overload, and more.[12,13] Among the factors that may influence people's willingness and motivation to comply with health guidelines are perceived susceptibility[14] and emotional reactions such as worry, fear, and stress.[4] Perceived susceptibility has been used to measure perceptions of the likelihood of contracting a disease or a virus.[15] A large Italian study of 18,147 individuals during the COVID-19 lockdown found post-traumatic stress symptoms among 37%, depression among 17.3%, anxiety among 20.8%, insomnia among 7.3%, high stress among 21.8%, and adjustment disorders among 22.9%.[16] In that study, younger age was a risk factor for mental health problems. In a study examining the mental health status of the general population during the COVID-19 pandemic in Japan, Ueda et al[17] found moderate to severe depression among 18.1% and moderate to severe anxiety among 11.4%. In that study, younger age and unemployment were risk factors. Huang and Zhao[18] reported a higher prevalence of general anxiety disorder during the COVID-19 outbreak, especially among the younger population. During the COVID-19 pandemic, stress level was especially high in younger age groups in Iran[19] and in Germany.[20] About 4 weeks after the COVID-19 lockdown in Austria, the pandemic as well as the lockdown seem to have had a major impact on the mental health of young adults (<35 years).[8] Another study explored how older people, who constitute a targeted risk group, perceived the COVID-19 pandemic in its initial phase with respect to information received, compliance with recommendations and feelings about their mental health.[21]

The current study examined younger, middle-aged, and older people in Israel with the aim of revealing age differences in knowledge about the virus, compliance with health guidelines, perceived susceptibility, and negative emotional reactions to COVID-19. The study was conducted in 2 phases: Phase 1 referred to the period March 12 to 21, a month after the first COVID-19 cases were diagnosed in Israel. Phase 2 referred to the period April 23 to May 5, 2 months after the first appearance of COVID-19.

Note that the COVID-19 crisis emerged naturally and has had a worldwide impact, while its controllability is limited. Examining age-related emotions and coping mechanisms in the face of this crisis allowed us to keep predictability and controllability constant across age groups. Due to the longitudinal nature of the study, participants served as their own controls, thus controlling for dispositional factors that may influence emotional reactions.

Methods

Procedure and Participants

This study involved 2 phases of data collection. Data were collected across Israel using a snowball design via the Qualtrics online platform (www.qualtrics.com). Participants in this study were 2509 Israeli citizens: 1424 participants in Phase 1 (March 12-21, a month after the first COVID-19 cases were diagnosed in Israel) and 1085 participants in Phase 2 (April 23 to May 5, 2 months after the outbreak). Inclusion criteria included age 18+ and Hebrew speaking. The study was approved by the Ethics Committee of Bar-Ilan University (Authorization No. 032003).

During the first phase, severe restrictions were imposed on the public, including restricting movement to within 100 m of home and limiting activities at places of work, religious institutions, and public transportation. During the Passover holiday, which fell between the 2 phases (April 8-15), families were restricted to celebrating only with those living in the same house.

The restrictions began to be eased during the second phase. Street-facing retail stores and hair and beauty salons opened, and restaurants began making deliveries, all under strict supervision. During that period, the daily number of confirmed cases began to decline, while the number of COVID-19 tests increased significantly. At the same time, media campaigns were used to provide information about the epidemic and to encourage people to get tested and comply with hygiene measures. Wearing masks and complying with guidelines were compulsory by law.

Measures

The following measures were administered in both phases of the study:

Compliance with health guidelines was measured by 4 items written by the authors in accordance with the precautionary guidelines issued by the Israel Health Ministry.[22] Scale validity was assessed by expert validity, a form of content validity. The scale was reviewed by a panel of 4 expert physicians. Participants were asked to indicate how often they complied with the various health guidelines on a five-point scale ranging from 1 = not at all to 5 = very often. A composite index of the average of all items was created, with a higher score indicating that participants comply more with health guidelines. Sample items include wearing a face mask, practicing hygiene, and maintaining a distance of 2 m from other people. The index exhibited strong internal consistency (Cronbach's $\alpha = 0.75$).

Knowledge about the COVID-19 virus was measured using a 6-item COVID-19 knowledge test that assessed symptoms, diagnosis, risk factors, means of infection, ways to protect oneself from COVID-19 infection and knowledge regarding when an individual suspected of having COVID-19 should be referred for treatment.[22] Expert validity was used to assess the validity of the scale. Participants answered on a 5-point Likert-type scale ranging from 1 = don't know anything to 5 = know very much. A composite index of the average of all items was created, with a higher score indicating higher levels of knowledge about the virus. The index exhibited strong internal consistency (Cronbach's $\alpha = 0.82$).

Negative emotional reactions to COVID-19 were assessed based on previous studies conducted among the lay public[23] by means of 3 questions concerning stress, fear, and worry deriving from COVID-19[22] (e.g., "To what extent do you worry about COVID-19?"). Participants answered on a 5-point Likert-type scale ranging from 1 = not at all to 5 = very much. A composite index of the average of all items was created, with a higher score indicating higher levels of negative emotional reactions toward COVID-19. The index exhibited strong internal consistency (Cronbach's $\alpha = 0.94$).

Perceived susceptibility is a one-item measure used to assess participants' appraisal of their likelihood of being infected by the virus.[22] (e.g., "What is the likelihood that you will be infected by COVID-19?"). Participants answered on a 5-point Likert-type scale ranging from 1 = not at all likely to 5 = very likely.

Socio-demographic and background variables included gender, age, years of education, marital status, number of children, employment status, medical problems, subjective health evaluation, and resources for coping more easily with COVID-19.

Statistical Analyses

Data were analyzed with SPSS ver 26. The analysis entailed using Chi-square tests and independent proportion Z tests for categorical variables and independent sample t-tests for continuous variables. Demographic and background characteristics, as well as health problems, subjective health evaluation, and resources needed to cope more easily with the COVID-19 virus were compared by phase and age groups. Compliance with health guidelines, knowledge about the virus, negative emotional reactions, and perceived susceptibility were analyzed by phase and age group through a series of analyses of covariance. Participants were divided into 4 age groups, each representing about a quarter of the sample. Due to the relatively low percentage of male respondents and in order to avoid small cells, analyses were conducted while controlling for gender. A multiple hierarchical regression model using knowledge about the virus, negative emotional reactions and perceived susceptibility was calculated for compliance with health guidelines while controlling for phase, gender, and age group. Variables were standardized, and the interactions with phase were defined and entered in a stepwise manner on the third step of the regression model. Significance level was set at $P = .01$.

Results

Participants in this study were 2509 Israeli citizens who were examined during the COVID-19 outbreak: 1424 participants in Phase 1 and 1085 participants in Phase 2. In both phases, most respondents were female and had up to 3 children. Most of the participants were married (62.3%-66.7%), while the others were mostly single (19.7%-27.2%). During Phase 1, 82.7% of the respondents were employed, compared with about 69.2% in Phase 2. Most respondents reported no health problems (84.9%-76.3%) and good overall health (66.1%-79.1%; Table 1).

The study variables were compared between the 2 data collection phases according to age group. Age was categorized into 4 groups: 18 to 30 (n = 660, 26.3%), 31 to 40 (n = 568, 22.6%), 41 to 50 (n = 624, 24.8%), and 51 and over (n = 657, 26.3%).

Table 2 shows the distribution of health problems and subjective health evaluation by phase and age group. In Phase 1, 9% to 13% of the participants up to age 50 reported health problems, compared to about 30% of the participants over age 50, representing a significant difference. In Phase 2, health problems were reported by 9% to 15% of the participants up to age 50, compared to about 37% of the participants over age 50, also representing a significant difference. No differences between the phases were found among participants up to age 50, while among participants over 50 the prevalence of health problems was greater in the second phase than in the first ($Z = 4.04$, $P < .001$).

In Phase 1, 80% to 85% of the participants up to age 50 reported being in good health, compared to about 70% of the participants over 50, a significant difference. In Phase 2, 69% to 77% of the participants up to age 50 reported

Table 1. Participants' Background Characteristics (N = 2509).

	Phase 1 (N = 1424)	Phase 2 (N = 1085)	
Gender—female (%)	1137 (79.8%)	829 (77.5%)	$Z = 1.43$ ($P = .152$)
Mean age (SD), range	40.70 (14.78), 18-97	45.13 (15.16), 18-96	$t(2450) = 7.25$ $P < .001$
Mean number of years of education (SD), range	15.85 (3.81), 9-30	16.53 (3.46), 9-31	$t(2260.59)^{\dagger} = 4.58$ $P < .001$
Marital status (%)			χ^2 (4) = 22.45 $P < .001$
Married	880 (62.3%)	713 (66.7%)	
Single	384 (27.2%)	211 (19.7%)	
Divorced	82 (5.8%)	89 (8.3%)	
Widowed	24 (1.7%)	24 (2.2%)	
Other	42 (3.0%)	32 (3.0%)	
Mean number of children (SD), range	2.36 (1.27), 0-9	2.10 (1.55), 0-13	$t(1948.97)^{\dagger} = -4.37$ $P < .001$
Employment (%)			$Z = 7.92$ ($P < .001$)
Yes	1178 (82.7%)	740 (69.2%)	
No	246 (17.3%)	329 (30.8%)	
Health problems (%)			$Z = 5.45$ ($P < .001$)
Yes	215 (15.1%)	257 (23.7%)	
No	1209 (84.9%)	828 (76.3%)	
Health status (%)			χ^2 (2) = 76.70 $P < .001$
Poor	19 (1.3%)	68 (6.6%)	
Fair	278 (19.5%)	282 (27.4%)	
Good	1127 (79.1%)	681 (66.1%)	
Resources for easier coping with COVID-19 (%)			χ^2 (4) = 120.24 $P < .001$
More information about COVID-19	264 (19.5%)	175 (18.3%)	
Professional support	173 (12.8%)	61 (6.4%)	
Non-professional support (friends and family)	143 (10.6%)	260 (27.2%)	
Working from home	531 (39.3%)	318 (33.3%)	
Other	241 (17.8%)	142 (14.9%)	

$^{\dagger}t$ for unequal variances.

Table 2. Health Problems and Subjective Health Evaluation by Phase and Age Group (N = 2509).

	Phase 1				Phase 2			
	Up to 30	31-40	41-50	51 and over	Up to 30	31-40	41-50	51 and over
Health problems (%)								
Yes	39 (8.9%)	33 (10.3%)	45 (13.4%)	98 (29.7%)	55 (8.5%)	63 (12.1%)	94 (15.1%)	245 (37.3%)
No	399 (91.1%)	288 (89.7%)	290 (86.6%)	232 (70.3%)	595 (91.5%)	458 (87.9%)	530 (84.9%)	412 (62.7%)
		χ^2 (3) = 74.51 $P < .001$				χ^2 (3) = 128.50 $P < .001$		
Subjective health evaluation (%)								
Poor	8 (1.8%)	1 (0.3%)	3 (0.9%)	7 (2.1%)	7 (3.3%)	10 (5.2%)	16 (5.8%)	29 (9.7%)
Fair	82 (18.7%)	46 (14.3%)	60 (17.9%)	90 (27.3%)	41 (19.3%)	47 (24.2%)	71 (25.5%)	112 (37.5%)
Good	348 (79.5%)	274 (85.4%)	272 (81.2%)	232 (70.6%)	164 (77.4%)	137 (70.6%)	191 (68.7%)	158 (52.8%)
		χ^2 (6) = 25.29 $P < .001$				χ^2 (6) = 38.94 $P < .001$		

being in good health, compared to about 53% of the participants over 50, also a significant difference. No differences between the phases were found among the youngest participants, while among all the other age groups the prevalence of good health was lower in the second phase than in the first (age 31-40: χ^2 (2) = 23.13 $P < .001$; age 41-50: χ^2 (2) = 18.85 $P < .001$; age 51 and over: χ^2 (2) = 28.77 $P < .001$).

Table 3 depicts the resources participants perceived as necessary for coping more easily with the COVID-19 virus, by phase and by age group. In Phase 1, about 56% of the participants up to age 30 stated that working from home would help, compared with 38% of those over 50. About 24% noted that information about the virus would help. About 12% to 16% of those up to age 50 mentioned that professional support would have helped them, compared

Table 3. Resources Needed for Coping More Easily With COVID-19, by Phase and Age Group (N = 2509).

	Phase 1				Phase 2			
	Up to 30	31-40	41-50	51 and over	Up to 30	31-40	41-50	51 and over
Information regarding COVID-19	85 (23.5%)	61 (24.3%)	60 (23.0%)	58 (24.4%)	29 (16.9%)	23 (14.9%)	44 (19.4%)	71 (31.7%)
Professional support	42 (11.6%)	31 (12.4%)	41 (15.7%)	59 (24.8%)	25 (14.5%)	12 (7.8%)	14 (6.2%)	8 (3.6%)
Non-professional support	33 (9.1%)	37 (14.7%)	43 (16.5%)	30 (12.6%)	59 (34.3%)	50 (32.5%)	69 (30.4%)	69 (30.8%)
Working from home	201 (55.7%)	122 (48.6%)	117 (44.8%)	91 (38.2%)	59 (34.3%)	69 (44.8%)	100 (44.1%)	76 (33.9%)
		χ^2 (9) = 35.39 $P < .001$				χ^2 (9) = 38.24 $P < .001$		

with about 25% of those over 50. Non-professional support was mentioned by about 9% to 16% of the participants in this phase. In Phase 2, about 44% of the participants between 30 and 50 reported that working from home would help, compared with about 34% of those up to age 30 and those over 50. About 32% of the participants over 50 indicated that information about the virus would help, compared with about 15% to 19% of the younger participants. About 14% of those up to age 30 noted that professional support would have helped them, compared with about 4% to 8% of those over 30. Non-professional support was mentioned by about 30% to 34% of the participants in this phase.

Differences between the phases were significant for all age groups. Among the youngest group, desire to work from home and need for information were less prevalent in the second phase, while the need for non-professional support was more prevalent (χ^2 (3) = 56.85 $P < .001$). For the group in their thirties, the need for information was less prevalent in the second phase, while the desire for non-professional support was more prevalent (χ^2 (3) = 20.16 $P < .001$). For the group in their forties, the need for professional support was less prevalent in the second phase, while the desire for non-professional support was more prevalent (χ^2 (3) = 20.82 $P < .001$). Finally, for the oldest group, the need for information was more prevalent in the second phase, as was the desire for non-professional support, while the expressed need for professional support was less prevalent (χ^2 (3) = 56.47 $P < .001$).

Table 4 shows the distribution of compliance with health guidelines, knowledge about the virus, negative emotional reactions, and perceived susceptibility by phase and age group. A two-way analysis of covariance was calculated for each variable. The analysis included phase and age group as independent variables and controlled for gender.

Compliance with health guidelines was found to be significantly higher in the second phase than in the first (F(1, 2429) = 335.85, $P < .001$, $\eta^2 = .121$). It was highest among participants over age 50 (M = 4.25, SE = 0.03), second among participants between the ages of 31 and 40 (M = 3.96, SE = 0.03), and those between 41 and 50 (M = 4.02, SE = 0.03), and lowest among participants up to age 30 (M = 3.81, SE = 0.03) (F(3, 2429) = 35.83, $P < .001$, $\eta^2 = .042$). The phase-by-age-group interaction was significant (F(3, 2429) = 5.63, $P = .001$, $\eta^2 = .007$), indicating that in the first phase, compliance with health guidelines was highest among participants over age 50, second among participants between 31 and 50, and lowest among participants up to age 30 (F(3, 2429) = 45.53, $P < .001$, $\eta^2 = .050$). In the second phase, compliance with health guidelines was higher among participants over age 50 than among participants up to age 40 (F(3, 2429) = 6.29, $p < .001$, $\eta^2 = .008$).

Knowledge emerged as significantly higher in Phase 2 than in Phase 1 (F(1, 2422) = 82.54, $P < .001$, $\eta^2 = .033$). Moreover, knowledge was higher among participants over age 50 (M = 3.90, SE = 0.03) and among those between 40 and 50 (M = 3.93, SE = 0.03) than among participants up to age 30 (M = 3.72, SE = 0.03) (F(3, 2422) = 12.23, $P < .001$, $\eta^2 = .015$). The phase-by-age group interaction was significant (F(3, 2422) = 6.21, $P < .001$, $\eta^2 = .008$), revealing that in Phase 1 knowledge was higher among participants over 30 (three sub-groups) than among participants up to age 30 (F(3, 2422) = 22.99, $P < .001$, $\eta^2 = .028$). In Phase 2, knowledge did not differ according to age group (F(3, 2422) = 0.90, p=.439, $\eta^2 = .001$).

Negative emotional reactions were significantly higher in Phase 1 than in Phase 2 (F(1, 2430) = 31.25, $P < .001$, $\eta^2 = .013$). These reactions were higher among participants up to age 30 (M = 3.39, SE = 0.04) than among all other participants (31-40: M = 3.06, SE = 0.05, 41-50: M = 2.90, SE = 0.04, over 50: M = 3.03, SE = 0.04) (F(3, 2430) = 23.38, $P < .001$, $\eta^2 = .028$). The phase-by-age group interaction was significant (F(3, 2430) = 5.14, p=.002, $\eta^2 = .006$), revealing that in Phase 1, negative emotional reactions were higher among participants up to age 30 than among all other participants (F(3, 2430) = 34.01, $P < .001$, $\eta^2 = .040$). Age group differences were not significant in Phase 2 (F(3, 2430) = 2.75, p=.042, $\eta^2 = .003$). *Perceived susceptibility* did not differ by phase (F(1, 1715) = 0.01, p=.966, $\eta^2 = .001$) or by age group (F(3, 1715) = 1.09, $P = .351$, $\eta^2 = .002$) or by the interaction of phase with age group (F(3, 1715) = 1.95, $P = .119$, $\eta^2 = .003$).

Table 4. Compliance With Health Guidelines, Knowledge About the COVID-19 Virus, Negative Emotional Reactions and Perceived Susceptibility, by Phase and Age Group (N = 2509).

	Phase 1					Phase 2				
	Total	Up to 30	31-40	41-50	50 and over	Total	Up to 30	31-40	41-50	50 and over
Compliance with health guidelines M(SD)	3.71 (0.85)	3.45 (0.93)	3.68 (0.78)	3.75 (0.78)	4.03 (0.76)	4.31 (0.62)	4.20 (0.71)	4.24 (0.59)	4.30 (0.59)	4.42 (0.60)
Knowledge about the virus M(SD)	3.71 (0.71)	3.51 (0.75)	3.70 (0.69)	3.84 (0.65)	3.84 (0.70)	3.98 (0.61)	3.94 (0.67)	3.97 (0.64)	4.03 (0.56)	3.95 (0.59)
Negative emotional reactions M(SD)	3.25 (1.14)	3.69 (1.21)	3.19 (1.09)	2.93 (1.00)	3.06 (1.04)	2.96 (1.02)	3.17 (1.09)	2.96 (0.99)	2.86 (1.03)	2.89 (0.95)
Perceived susceptibility M(SD)	2.39 (0.87)	2.38 (0.90)	2.39 (0.84)	2.36 (0.90)	2.44 (0.81)	2.38 (0.86)	2.29 (0.93)	2.49 (0.92)	2.47 (0.89)	2.32 (0.73)

Range 1 to 5. Different letters mark significant within-phase differences in age group.

Table 5. Multiple Hierarchical Regression for Compliance With Health Guidelines.

	Model 1			Model 2		
	B (SE)	β	*P*-value	*B* (*SE*)	β	*P*-value
Phase	0.65 (0.04)	.39	<.001	0.57 (0.03)	.35	<.001
Gender	−0.27 (0.05)	−.13	<.001	−0.13 (0.04)	−.06	.002
Age group (31-40)	0.12 (0.05)	.06	.015	0.14 (0.04)	.07	.001
Age group (41-50)	0.20 (0.05)	.11	<.001	0.21 (0.04)	.11	<.001
Age group (51 and over)	0.37 (0.05)	.19	<.001	0.40 (0.04)	.20	<.001
Knowledge about the COVID-19 virus				0.44 (0.02)	.36	<.001
Negative emotional reactions				0.21 (0.01)	.29	<.001
Perceived susceptibility				−0.01 (0.02)	−.01	.938
Adj. R^2	.207, $P < .001$			.405, $P < .001$		

A multiple hierarchical regression model was calculated for compliance with health guidelines. The model included knowledge about the virus, negative emotional reactions, and perceived susceptibility, while controlling for phase (0-Phase,1-Phase 2), gender (0-female, 1-male), and age group (as 3 binary variables; Table 5). The results show that phase, gender, and age explain about 21% of the variance in compliance with health guidelines, and that knowledge, negative emotional reactions, and perceived susceptibility add about another 19% to the explained variance. Compliance with health guidelines was higher in Phase 2, higher among female participants than among male participants, and higher among older participants than among younger participants. Beyond these background variables, compliance with health guidelines was higher in conjunction with greater knowledge and higher negative emotional reactions. Perceived susceptibility was unrelated to compliance with health guidelines, and the interactions with phase were also unrelated.

Discussion

The present study took advantage of the context of the COVID-19 outbreak to examine age differences in negative emotional responses, compliance with health guidelines and knowledge during 2 phases of the COVID-19 epidemic (1 and 2 months post-lockdown). Our findings indicate that compliance with health guidelines and knowledge were significantly higher in Phase 2 than in Phase 1. Compliance with health guidelines and knowledge about the virus were higher among participants over age 50. In Phase 1, compliance with health guidelines was lowest among participants up to age 30, while in Phase 2 compliance with health guidelines was highest among participants over age 50. Negative emotional reactions were significantly higher in Phase 1 than in Phase 2. These reactions were higher among participants up to age 30 than among all other participants. One possible explanation for this differential compliance based on age is that restrictive measures have a greater economic risk and a lower potential health benefit for younger people than for older people. Hence, assuming that everyone is behaving rationally, younger people make much different risk-benefit calculations than older people.

The results of this study suggest that Israelis tend to conform to government regulations and exhibit a relatively high level of trust in guidelines issued by the health authorities.[22-25] The Ministry of Health and the media made major efforts to disseminate knowledge and guidelines to the general public, perhaps leading to an increase in knowledge between the first and second waves of the epidemic.[22,26,27] Nonetheless, during Phase 1 younger people may not have internalized all the regulations. Indeed, younger people may have still felt that the virus was harmful only to older people and those with preexisting conditions and thus felt less need to conform to the guidelines. With the rise in the level of knowledge and understanding about the virus and the rise in morbidity and mortality rates, all age groups demonstrated higher compliance to the guidelines during Phase 2.

The international health community and health institutions have warned of the risk of exposure to the COVID-19 virus, particularly among older people.[6,7] In addition, the high compliance rate among the over 50 age group is liable to be related to the fact that the Ministry of Health and the media called upon people over the age of 60 to be especially cautious regarding social distancing.[2] This high compliance rate can also be attributed to the high morbidity and mortality rates among this population group, particularly in nursing homes.[28] Moreover, as time went by, more and more published research pointed to the vulnerability of older people as an at-risk population group.[29,30]

In our sample, negative emotional reactions were significantly higher in Phase 1 than in Phase 2. In Phase 1, negative emotional reactions were higher among participants up to age 30 than among all other participants. Age group differences in negative emotional reactions were not significant in Phase 2. The reason negative emotional reactions were higher in Phase 1 may be related to the need to adapt

to the new situation as well as to the rapid closing of shops, schools, and entertainment venues.[12,13] These findings are supported by a study conducted in India in which young people between the ages of 20 and 40 reported higher levels of stress and fear than those between the ages of 40 and 61 and those over age 61.[31] One possible hypothesis to explain this finding is that older people exhibited more resilience than younger people because they had encountered more personal difficulties throughout their lives than younger people.[32] In addition, during the COVID-19 pandemic, older adults in Israel were given stricter guidelines about social distancing as they were 1 of the first groups encouraged to stay home.[26,27] These guidelines may have helped them feel more confident about their health, with the influence on their emotional state becoming evident over time. The significant impact of age (up to age 30) may stem from the fact that this group usually includes students, young couples, and parents of young children. These groups often do not have steady work or a solid financial situation, such that when workplaces and entertainment venues closed many of them found themselves without any income or forced to work from home.[22] Working from home when one's spouse and often one's young children are also home is liable to arouse negative emotions, particularly in the presence of existential fears about one's own health and the health of one's loved ones.[33] The notion that older adults are particularly vulnerable to the negative outcomes of COVID-19 can generate considerable fear among older adults.[34] Yet no differences in age emerged during Phase 2. Perhaps their sense of shock and chaos at the outbreak of the epidemic was followed by a gradual process of adjustment to the new situation, along with fears and concerns for their own welfare and that of their loved ones.[35]

Limitations of the Study

This study has several limitations. First, most of the study participants were female. Furthermore, although this is a longitudinal study, the study findings cannot be directly extrapolated to other populations. Therefore, conclusions about directionality or causality in the relationships should be treated with caution, as should any generalization of these results. Another limitation is that the present study is based on participants' self-report questionnaires. Moreover, the online design biased the sample toward populations that are digitally literate or have access to digital resources and those who may be more socially connected, at least virtually. Nevertheless, the online recruitment method helped us collect data from a diverse sample within a short time, given the restrictions on physical mobility due to the lockdown. Indeed, to the best of our knowledge this is the first web-based longitudinal study from Israel examining insights regarding psychological well-being during the pandemic. Finally, due to the dynamic nature of the coronavirus the findings refer only to what happened at the particular time period examined. Future research should examine the impact of emotions at different times during the crisis and in other countries.

Conclusion

The COVID-19 pandemic is continuing to exert a major impact on the emotions and behavior of the Israeli public. Our findings indicate that negative emotional responses diminished from Phase 1 to Phase 2, while compliance with health guidelines and knowledge increased, particularly among participants over age 50. In Phase 1, negative emotional reactions were highest among participants up to age 30, while their compliance with health guidelines was lowest.

Authors' Contributions

I.L.: formulated the research design, wrote the study protocol and organized the study, coordinated the data collection, carried out the analysis, wrote the manuscript and approved the final submitted manuscript.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical Approval

Before the research began, the Ethics Committee of Bar-Ilan University approved the study (Authorization No. 032003). All study data were stored safely, and only the researcher had access to the data. All personal data were coded so that the identities of the participants remained confidential.

Informed Consent

The participants gave their consent to participate in the study and were informed that any publications based on the data would not include identifying information.

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Availability of Data

The author has the research data, which is available upon request.

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