


# COVID-19 Vaccinations and Anxiety in Middle-Aged and Older Jews and Arabs in Israel: The Moderating Roles of Ethnicity and Subjective Age

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## Abstract

Subjective age (i.e., feeling younger/older than one's chronological age) plays a significant role in older minority group members' psychological well-being. In light of the importance of vaccinations for fighting COVID-19, it is unclear whether ethnicity and subjective age moderate the connection between receiving COVID-19 vaccinations and anxiety in Israel. Jewish ( $n = 198$ ) and Arab older adults ( $n = 84$ ) provided information regarding COVID-19 vaccinations, subjective age, and anxiety symptoms, as well as additional socio-demographic and COVID-19-related health factors (age range = 40–100,  $M = 62.5$ ,  $SD = 12.34$ ). Results demonstrated that feeling older was associated with increased anxiety ( $p < .001$ ) and that vaccinations were linked to increased anxiety among Jews ( $p < .05$ ). Moreover, the association between COVID-19 vaccinations and anxiety was significant only among Jewish participants with an older subjective age ( $p < .05$ ). We stress the importance of examining cultural diversities regarding the contribution of subjective age in the context of COVID-19 and psychological well-being.

## Keywords

anxiety, COVID-19 vaccines, cultural differences, subjective aging

## What this paper adds

COVID-19 vaccination acceptance/refusal is influenced by cultural factors and subjective age

The link between COVID-19 vaccination refusal and anxiety was significant only for Jews who felt older than their chronological age.

## Applications

The study highlights the importance of examining subjective aging perceptions as a contributing factor to COVID-19 vaccinations and anxiety among older adults.

The study demonstrates the relevance of cultural factors for understanding vaccination tendencies in older adults.

## Introduction

The COVID-19 pandemic has become a global phenomenon, resulting in significant detrimental physical and psychological consequences. However, it seems that specific age-groups

and cultural minorities are particularly at risk for the adverse effects of COVID-19. For example, older adults in Spain (López et al., 2020) and the Arab minority in Israel (e.g., Taubman-Ben-Ari et al., 2020) have reported increased COVID-19-related anxiety. As COVID-19 vaccinations have become available to the general population in Israel, it seems feasible that such groups would demonstrate increased

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willingness to receive the vaccination. However, while this trend was found for older adults, Arabs in Israel, who constitute its largest ethnic minority group (21%; Rosen et al., 2021), reported high levels of vaccine hesitancy and prospective vaccine refusal in comparison to Israeli Jews, and this is in accordance with findings concerning minority groups in additional countries (e.g., Green et al., 2021). This is intriguing, especially when taking into account that infection rates in the Arab community were similar to those reported in the general society (RIC, 2021), together with the fact that this group reports higher rates of psychological distress and may be at greater risk for such distress during COVID-19 (Taubman-Ben-Ari et al., 2020). In this regard, vaccine hesitancy has been associated with specific COVID-19 anxiety (e.g., Bendau et al., 2021) and with additional psychiatric conditions (e.g., Palgi et al., 2021), and vaccine acceptance was shown to reduce anxiety among healthcare professionals (Karayürek et al., 2021). However, the extent to which vaccine acceptance/refusal among older adults in general, and those belonging to different cultural groups in particular, is associated with general anxiety symptoms has, to the best of our knowledge, not been previously examined.

Given the significance of vaccinations for controlling COVID-19, together with the relative lack of knowledge pertaining to the link between vaccine acceptance/refusal and general anxiety symptoms, it seems important to delineate factors which may highlight how COVID-19 vaccinations are associated with anxiety among older adults. Recent research demonstrated cultural and cross-national differences in COVID-19 vaccine hesitancy and anxiety, and that older adults may report reduced willingness to receive vaccinations (e.g., Burkova et al., 2021; Hoffman et al., 2021; Stojanovic et al., 2021). Moreover, as will be shown, cultural and personal factors have been associated with various aspects of physical and mental health among older adults. In light of the grave consequences of COVID-19, it is imperative to expand our knowledge regarding the role of such factors in the connection between COVID-19 vaccination acceptance/refusal and subsequent anxiety among these populations. Accordingly, the current study aims at examining cultural differences in vaccine acceptance and anxiety symptoms between middle-aged and older Jewish and Arab citizens in Israel. Additionally, this work also focuses on the possible moderating role of subjective age (SA) in this regard, an issue we address herein.

There has been a growing awareness of the relevance of how individuals perceive their aging selves as a determinant of physical and psychological well-being, and much emphasis has been made regarding the importance of SA (i.e., how old individuals feel vis-à-vis their chronological age) among middle-aged and older adults. For example, in their comprehensive meta-analysis, Westerhof et al. (2014) report that a young SA was associated with positive health outcomes and increased longevity, whereas an old SA was linked with increased anxiety in older adults during COVID-19 (Shrira

et al., 2020). Interestingly, it seems that the protective role of a young SA is culture dependent. Indeed, Bergman and Shrira (2022) report that among Israeli older adults, the positive effect of a young SA on physical and psychological health was significantly more pronounced in Arabs in comparison to Jews. It was suggested that this phenomenon could stem from the relative reduced availability of health services and/or willingness to utilize such services in this group, which increases the importance of subjective aging perceptions as health determinants (see also Choi et al., 2021). However, while research has demonstrated the moderating role of SA for anxiety symptoms during COVID-19 (e.g., Avidor et al., 2021), little is known about the cultural aspects of SA in the context of COVID-19 vaccinations and distress among older populations. Accordingly, the current study attempts to highlight the moderating role of ethnicity and SA in the connection between COVID-19 vaccination acceptance and anxiety symptoms among Jews and Arabs in Israel. Two hypotheses were formulated: (H1) High SA (i.e., feeling older than one's chronological age) and vaccine refusal would be associated with increased anxiety symptoms among Jewish and Arab Israelis; (H2) Ethnicity and SA would moderate the vaccine-anxiety connection, as this link would be stronger among Arabs with high SA.

## Methods

### *Participants and Procedure*

A convenience sample of 282 middle-aged (over 40) and older (over 65) adults was gathered using snowball sampling through various social platforms (e.g., Facebook, WhatsApp). Age range was 40–100 ( $M = 62.51$   $SD = 12.34$ ); 198 participants were Jewish and 84 were Arabs (for group differences and descriptive information, see Table 1). Most Arabs ( $n = 64$ , 76.2%) were Muslim. Information was collected between December 28th, 2020, and February 10th, 2021, and by the last day of data collection, over 3 million Israelis (i.e., over 35% of the population) had received the COVID-19 vaccination (Bodner et al., 2022). At the beginning of data collection, vaccinations were available for individuals over the age of 65, and by the completion of data gathering, all individuals over the age of 40 were eligible for COVID-19 vaccinations.

Inclusion criteria for the study were being over the age of 40, reporting no significant cognitive decline, and proficiency in Hebrew. Participants were contacted by research assistants, who targeted individuals who met the aforementioned requirements. Participants were given a designated Qualtrics link in which they provided informed consent and filled out the study scales. Anonymity was guaranteed as identifying details were neither required nor requested. Moreover, as virtually all eligible participants provided information, no reminders were needed. The study scales were back-translated into Hebrew by two experienced bilingual psychologists. The study received ethical approval by the IRB of the University of Haifa.

**Table 1.** Means, standard deviations, and group differences for the study variables.

	Jews ( <i>n</i> = 198)		Arabs ( <i>n</i> = 84)		Group differences
	<i>M</i> / <i>%</i>	<i>SD</i>	<i>M</i> / <i>%</i>	<i>SD</i>	
Age	61.95	12.47	63.82	11.97	$T_{(280)} = -1.16, p > .05$
Gender (male)	38.9%	--	48.8%	--	$\chi^2 (N = 282) = 2.38, p > .05$
Self-rated health	3.84	.99	3.40	1.13	$T_{(280)} = 3.25, p < .01, \text{Cohen's } d = .41$
Education <sup>a</sup> (formal academic)	58.0%	--	28.9%	--	$\chi^2 (N = 282) = 70.07, p < .001$
Income	3.74	.92	3.12	1.04	$T_{(280)} = 5.05, p < .001, \text{Cohen's } d = .63$
COVID-19 exposure	.98	1.17	2.32	1.72	$T_{(280)} = -7.57, p < .001, \text{Cohen's } d = .91$
Anti-vaccination attitudes	1.40	.76	1.33	.56	$T_{(280)} = .78, p > .05$
COVID-19 vaccination <sup>b</sup> (received vaccination)	80.2%	--	63.1%	--	$\chi^2 (N = 282) = 9.21, p < .01, \text{Cramer's } V = .18$
Subjective age	-.12	.17	-.06	.14	$T_{(280)} = -2.73, p < .01, \text{Cohen's } d = .38$
Anxiety symptoms	2.23	3.75	4.05	4.53	$T_{(280)} = -3.50, p < .01, \text{Cohen's } d = .44$

Notes. *n* = 282; <sup>a</sup>: 1 = no formal education, 2 = elementary education, 3 = partial high-school level, 4 = high-school education, 5 = partial academic education, 6 = academic degree;

<sup>b</sup>: 0 = did not receive COVID-19 vaccination, 1 = received COVID-19 vaccination.

## Materials

Participants provided background characteristics, including ethnicity (Jew/Arab), age, gender, and perceived health status (rated from 1, “not good at all” to 5, “very good”). We also examined exposure to COVID-19, calculated as the sum of positive responses to eight different types of exposure (e.g., being tested positive for COVID-19), and general anti-vaccination attitudes, calculated as the mean score of responses to three items (e.g., “I refused receiving vaccinations for me/my child because I think vaccinations are useless or harmful”) on a scale ranging from 1 (“not concerned at all”) to 5 (“extremely concerned”; Bodner et al., 2022). Finally, participants were asked to indicate whether they had received at least one of the required two COVID-19 vaccinations.

Subjective age was assessed by asking participants to indicate how old they feel most of the time in years. The SA score was calculated by subtracting SA from chronological age, and dividing the result by chronological age (see Bergman & Shrira, 2022). A negative score indicates feeling younger than one’s chronological age, whereas a positive score indicates feeling older. For example, a 60-year-old subject who feels 54 will have a score of  $-0.1$ , indicating that he/she feels 10% younger than his/her chronological age.

Anxiety symptoms were assessed with the 7-item Generalized Anxiety Disorder scale (GAD-7; Spitzer et al., 2006). Participants rated symptoms (e.g., “feeling nervous,

anxious, or on edge”) during the last 2 weeks on a 4-point scale (0 = “not at all” to 3 = “almost every day”). A sum score was calculated, with higher scores reflecting increased anxiety. Internal reliability was good ( $\alpha = .93$ ; see Table 2 for correlation matrix for Jews and Arabs).

## Data Analysis

A preliminary power analysis for achieving a power of 0.95 and a medium effect size of 0.15 with 14 predictors required a sample size of 194, indicating that the current sample was sufficient for examining the study model. Moreover, as four participants did not provide relevant socio-demographic information, we conducted Little’s MCAR analysis and found that missing information was random ( $\chi^2_{(7)} = 10.38, p > .05$ ).

Analyses were conducted using the SPSS-25 software, and significant interactions were probed using Model 3 of the PROCESS 3.4 macro (Hayes, 2018), which calculates the regression coefficients for the effects of the predictor (i.e., receiving/not receiving COVID-19 vaccination) on anxiety symptoms for  $\pm 1SD$  of the moderators (i.e., ethnicity and SA). Hypotheses were examined by a hierarchical regression with anxiety symptoms as the outcome variable. The first step included participants’ age, gender, self-rated health, education level, income, COVID-19 exposure, general anti-vaccination attitudes, and ethnicity (Jews/Arabs), in order to control for possible confounding effects (see Callow & Callow, in press). The second step included

**Table 2.** Descriptive statistics and correlations for Jews (lower left; N = 198) and Arabs (upper right; N = 84).

	Mean/% (Jews)	SD	1	2	3	4	5	6	7	8	9	10	Mean/% (Arabs)	SD
1. Age	61.95	12.47		-.09	-.55***	-.58***	-.40***	.08	-.08	.10	.23*	.19	63.82	11.97
2. Gender (male)	38.9%	--	-.03		-.01	-.21	.03	.02	-.01	.01	.03	.22*	48.8%	--
3. Self-rated health	3.84	.99	-.38***	.07		.61***	.60***	-.03	-.02	.02	-.27*	-.31**	3.40	1.13
4. Education level <sup>a</sup> (formal academic)	58%	--	-.33***	.14*	.23**		.47***	-.10	.01	-.03	-.30**	-.33**	28.9%	--
5. Income	3.72	.92	-.11	-.04	.35***	.21**		-.15	-.06	.09	-.16	-.31**	3.12	1.04
6. COVID-19 exposure <sup>b</sup>	.98	1.17	-.25***	.04	.02	.15*	.06		.07	-.24*	-.22*	.16	2.32	1.72
7. Anti- vaccination attitudes <sup>c</sup>	1.40	.76	-.14*	.02	.12	-.04	-.19**	-.02		-.11	.19	.13	1.33	.56
8. COVID-19 vaccination <sup>d</sup> (received vaccination)	80.2%	--	.37***	.13	-.07	-.02	.14	-.26***	-.22**		.09	.07	63.1%	--
9. Subjective age	-.12	.17	-.17*	-.02	-.01	.04	-.09	-.01	.10	-.13		.23*	-.06	.14
10. Anxiety symptoms	2.23	3.75	-.01	.10	-.14*	-.11	-.27***	.01	.04	-.16*	.34***		4.05	4.53

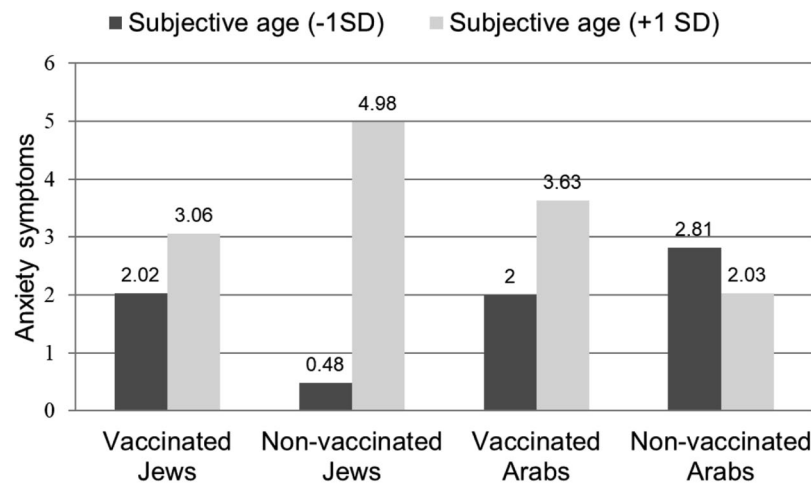
Notes. Correlation values are Pearson coefficients, except for values involving items 2 and 8, which are point-biserial coefficients, and item 4, which represent Spearman's Rho.

<sup>a</sup>: 1 = no formal education, 2 = elementary education, 3 = partial high-school level, 4 = high-school education, 5 = partial academic education, 6 = academic degree;

<sup>b</sup>: calculated as the sum of positive responses to eight items examining COVID-19 exposure (e.g., being tested positive for COVID-19);

<sup>c</sup>: 0 = calculated as the mean score for three items examining general anti-vaccination attitudes (e.g., "I refused receiving vaccinations for me/my child because I think vaccinations are useless or harmful");

<sup>d</sup>: 0 = did not receive COVID-19 vaccination, 1 = received COVID-19 vaccination. \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$



**Figure 1.** The moderating role of ethnicity and subjective age in the connection between receiving COVID-19 vaccinations and anxiety symptoms (scores were calculated using PROCESS; see Hayes, 2018).

COVID-19 vaccination (no/yes) and SA. In order to control for the hypothesized three-way interaction of ethnicity  $\times$  SA  $\times$  COVID-19 vaccination tested in the fourth step, the third step included three two-way interactions (ethnicity  $\times$  SA; ethnicity  $\times$  COVID-19 vaccination; COVID-19 vaccination  $\times$  SA). Table 3 delineates the regression details and provides unstandardized coefficients (B, which represent the slope of the regression line between the predictors and

the outcome variable), standardized error, and confidence interval, (SE, CI, respectively), as well as standardized coefficients, which are similar to correlation coefficients ( $\beta$ ) and  $p$ -values. Potential multicollinearity between the predicting variables was rejected, as the values of both tolerance and variance inflation factor (VIF) for the study variables ranged between 0.58 and 0.98, and between 1.02 and 1.71, respectively.

**Table 3.** Regression coefficients for predicting anxiety symptoms.

	Predictor	$\Delta R^2$	B	SE	LLCI $\S$	ULCI $\S$	$\beta$	$T$	$p$
Step 1		.193***							
	Age		-.03	.02	-.07	.01	-.09	-1.41	.160
	Gender		.97	.47	.05	1.89	.13	2.07	.039
	Self-rated health		-.38	.28	-.94	.18	-.09	-1.33	.184
	Education level		-.71	.19	-1.10	-.33	-.26	-3.68	<.001
	Income		-.66	.29	-1.23	-.09	-.16	-2.28	.023
	COVID-19 exposure		.22	.17	-.11	.56	.08	1.31	.192
	Anti-vaccination attitudes		.23	.34	-.44	.90	.04	.68	.499
	Ethnicity <sup>a</sup>		.05	.61	-1.16	1.25	.01	.08	.940
Step 2		.057***							
	COVID-19 vaccination		-.14	.57	-1.26	.97	-.01	-.25	.802
	Subjective age		6.29	1.41	3.51	9.08	.25	4.45	<.001
Step 3		.017							
	Ethnicity $\times$ subjective age		-.65	.55	-1.74	.44	-.08	-1.18	.240
	Ethnicity $\times$ COVID-19 vaccination		1.60	1.08	-.53	3.72	.15	1.48	.141
	COVID-19 vaccination $\times$ subjective age		-.99	.57	-2.12	.13	-.21	-1.74	.083
Step 4		.036***							
	Ethnicity $\times$ subjective age $\times$ COVID-19 vaccination		4.35	1.20	1.99	6.71	.43	3.63	<.001
Total $R^2$		.303***							
$N$		282							

Notes. <sup>a</sup>: 0 = Jews, 1 = Arabs.

\*\*\*  $p < .001$

$\S$ Lower/Upper Limit for 95% Confidence Interval.



## Results

As Table 2 demonstrates, not receiving COVID-19 vaccinations ( $r = -.16, p < .05$ ) and an older SA ( $r = .34, p < .001$ ) were associated with increased anxiety symptoms among Jewish participants. However, among Arabs, only the SA-anxiety association ( $r = .23, p < .05$ ) was found to be significant. In partial corroboration of the first hypothesis, high SA ( $\beta = .25, p < .001$ ) was associated with increased anxiety symptoms, but no main effect was found for COVID-19 vaccinations ( $\beta = -.01, p > .05$ ). In line with the second hypothesis, a significant three-way interaction of ethnicity  $\times$  SA  $\times$  COVID-19 vaccination was discovered ( $\beta = .43, p < .001$ ), accounting for an additional 3.6% of variance (total  $R^2 = .303$ ; see Table 3). Upon probing the interaction with PROCESS (Hayes, 2018), we discovered that young/old SA was not a significant moderator in Arabs ( $B = -.80, SE = 1.29, \beta = -.32, p > .05$ ;  $B = 1.60, SE = .91, \beta = .43, p > .05$ , respectively). However, not receiving COVID-19 vaccinations was associated with increased anxiety among Jews with an older SA ( $B = -1.92, SE = .77, \beta = -.50, p < .05$ ), an effect which was nullified for Jews with a young SA ( $B = 1.54, SE = .98, \beta = .37, p > .05$ ; see Figure 1). The results remained unchanged when the study model was examined without covariates. In sum, whereas SA had a significant effect on the link between vaccination and anxiety for Jews in addition to the variables in the first step, no such connection was evident for Arabs.

## Discussion

While the global effects of COVID-19 are clear and undisputed, research has demonstrated cultural and societal differences in the psychological consequences of COVID-19, as well as in how such differences are associated with COVID-19 vaccine hesitancy both globally (e.g., Burkova et al., 2021; Stojanovic et al., 2021) and among sub-cultures within a given society (e.g., Woolf et al., 2021). As subjective aging perceptions and ensuing psychological well-being are also affected by culture (e.g., Bergman & Shrira, 2022), the current work examined how SA and ethnicity moderate the association between receiving COVID-19 vaccinations and anxiety among Jewish and Arab older adults in Israel. In line with the first hypothesis, a young SA was associated with reduced anxiety levels regardless of ethnicity and receiving COVID-19 vaccinations. This finding corroborates with the positive impact of a young SA on older adults' physical (Westerhof et al., 2014) and psychological (Shrira et al., 2020) health and offers an insight into the important role of SA for a broader age-group during COVID-19. Interestingly, no main effect of COVID-19 vaccinations was found for anxiety symptoms, but the significant three-way interaction demonstrates that this link may be subjected to specific ethnic and personal factors.

In accordance with the second hypothesis, ethnicity and SA moderated the association between COVID-19 vaccinations

and anxiety symptoms. However, not receiving vaccinations was linked with increased anxiety only among Jews with an older SA. This finding is in line with previous research emphasizing the deleterious psychological consequences of feeling older than one's age (Bergman & Shrira, 2022) and emphasizes the importance of addressing how older Jews' SA contributes to anxiety associated with vaccine acceptance/refusal. Still, the lack of significant effects of SA in Arabs seems inconsistent with Bergman and Shrira (2022), who reported that SA was a more powerful determinant for Arabs' physical/psychological health in comparison with Jews. This is particularly intriguing when one considers the relative high anxiety levels of older-SA vaccinated Arabs. In this regard, while Israel provides healthcare (and in this case, COVID-19 vaccinations) for all its citizens, it is possible that as a majority group, Jews may have increased access to healthcare facilities and better knowledge of their rights and privileges (Remennick & Ottenstein-Eisen, 1998). Accordingly, it may be argued that these factors, together with increased anti-vax messaging in Arab social media (Rosen et al., 2021) can inhibit the protective role of a young SA for vaccinations and anxiety symptoms among this group. While this line of reasoning corroborates with previous findings indicating that reliance on social media contributes to vaccine hesitancy (Bhagianadh & Arora, 2022), this issue requires further exploration in future studies.

Several limitations should be noted. First, as the study was conducted online, we cannot vouch for the generalizability of our results for additional groups of older adults who were not able to fill out online questionnaires. Moreover, we surmised that the online nature of this study would require participants to be free of significant cognitive and/or physical declines which would render them unable to participate. However, as we did not examine such declines directly, it is important to take these issues into account in future research concerning additional cultural groups. Additionally, the study was conducted in Hebrew, and although Arabs are quite proficient in Hebrew (and such proficiency was, in fact, part of the inclusion criteria for this study), this may have posed a problem for certain eligible participants, and future studies may opt to examine our model using subjects' first language. Second, due to the cross-sectional design, we have no information regarding previous anxiety levels, and although our findings are in line with longitudinal examinations (e.g., Westerhof et al., 2014), there is a need for additional examinations of how COVID-19 vaccinations, SA, ethnicity and anxiety symptoms are connected across time. In this regard, while an analysis which examined a possible reverse causality (i.e., that anxiety symptoms may be associated with vaccine acceptance) was not significant, this direction cannot be ruled out as the data is cross-sectional. Third, while we controlled for certain sociodemographic variables and for general anti-vaccination attitudes, it seems important to examine the contribution of additional factors (e.g., utilization of healthcare facilities during COVID-19) to cultural differences in specific COVID-19 vaccination

anxiety/hesitancy with respect to SA, the decision to receive the vaccination, and psychological distress. More specifically, it may be argued Jews and Arabs differed in the general disruption of daily life due to COVID-19, which could have contributed to the differences found in this study. For example, we did not assess differences in Jews' and Arabs' ability to engage in their usual work and daily activities during the pandemic, which may have affected their SA and subsequent anxiety. It should also be noted that during data collection no reliable information was available regarding the duration of the vaccination's effect, and therefore, we did not assess whether participants received one or two vaccinations. Moreover, while information concerning vaccinations was available in several languages, their effect on vaccine hesitancy, as well as the impact of cultural differences concerning anti-vaccination media and their consequences, requires further investigation in the future.

Nevertheless, our study offers an initial insight into how different cultural groups' SA correspond with COVID-19 vaccinations and anxiety symptoms across a wide age-range. As literature concerning cultural aspects of SA in general, and such aspects in association with receiving COVID-19 vaccinations in particular is, to date, scarce, we hope our findings will contribute to increasing the understanding of these issues in the context of COVID-19.

### Declaration of Conflicting Interests

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### IRB Approval

The study was approved by the IRB of the Faculty of Social Welfare & Health Sciences, University of Haifa, on 18/2/21 (approval no. 117/21)

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