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Italian version of the Vaccination Fear Scale (VFS-6): internal and external validation

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Abstract

Background: COVID-19 is one of the biggest threats in our current society in terms of mental and public health. Vaccination represents the most cost-efficient way to avoid disease, mental health negative outcomes, and an overload of the healthcare system, however, many people expressed fears and concerns related to COVID-19 vaccines. This paper presents the Italian validation of the Vaccination Fear Scale (VFS-6) originally developed in Spanish to complement clinical efforts in the prevention of vaccine hesitancy.

Methods: The sample was composed of 1111 Italian participants (14.2% not vaccinated) recruited by means of on-line anonymous voluntary census. The items of the VFS-6 were firstly adapted to the Italian language by means of a translation and back-translation standard procedure, and subsequently administered together with convergent and divergent concurrent measures to ascertain their reliability and validity (i.e., internal and external) properties. Finally, confirmatory factor analysis has been carried out to validate the internal structure of the test and investigate its psychometric properties.

Results: Confirmatory factor analysis supported a bifactorial model (cognitive and physical factors) also for the Italian version of the test, with very robust goodness of fit indicators, reliability, and internal consistency. Our data indicated that fear of vaccination is greater for females and highly correlated with vaccine anxiety and hesitancy. In particular, vaccine fear appeared strongly related to vaccination.

Conclusion: The Italian version of the VFS-6 appears valid and reliable to assess the fear of vaccination among the Italian population, as well as to support the research for the design of public campaigns devoted to decreasing vaccine hesitancy.

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1. Introduction

COVID-19 greatly affected people's lives both directly (i.e., through the experience of the disease) and indirectly (e.g., lockdown, remote-working, remote learning) and their mental health. More specifically, the literature stressed how the COVID-19 pandemic contributed to both increasing the feeling of loneliness, psychological distress, anxiety, depression, post-traumatic symptoms, and problematic gaming (Caffieri & Margherita, 2021; Ciccarelli et al., 2022; Filindassi et al., 2022; Gori et al., 2022; Guazzini et al., 2022a; Ranieri et al., 2021; Rollè et al., 2022), and decreasing well-being (Di Giacomo, 2020; Guazzini et al., 2022b). COVID-19 patients are particularly exposed to adverse mental health outcomes that could be linked either to the intensity of the disease experienced or to the disruption of personal and social bonds (Moroianu et al., 2021). However, the COVID-19 impact is to be considered systemic and not limited to individual-level repercussions. For instance, the congestion of hospitals due to the pandemic had an impact on healthcare workers (Di Trani et al., 2022; Maniaci et al., 2022) and on other vulnerable patients (e.g., cancer patients; Rahnea-Nita et al., 2021).

A study from the World Health Organisation has found vaccination as one of the most cost-efficient ways to avoid diseases, preventing 2 to 3 million deaths a year (WHO, 2019) However, more and more people refuse vaccination, causing a new threat to global health (WHO, 2019). The World Health Organisation states that it is vital to monitor why a considerable number of people do not like to receive the recommended vaccination, especially during this time of pandemic (WHO, 2019).

Until January 2022 the COVID-19 virus has infected approximately 375 million people worldwide (OWID, 2022). For the first time in history, within 10-12 months from the virus outbreak, seventeen vaccines have been designed, developed, rigorously tested, fast-tracked for approval, and distributed worldwide (OWIDM, 2022). Despite vaccines having already been demonstrated to play a crucial role in reducing the harm and the diffusion of COVID-19 worldwide, people's awareness and hesitancy toward vaccination still represent a critical issue in many countries (Killgore et al., 2021). Beyond COVID-19, vaccine hesitancy was already described by a large literature coming from the last century (Betsch et al., 2018; Dubé et al., 2013; MacDonald, 2015; Robison & Skiles, 2008), and in line with such literature, one of the most impacting factors on vaccine hesitancy is the vaccination fear (Larson et al., 2015; MacDonald, 2015; Rief, 2021; Tsheten et al., 2022). In fact, Covid-19 vaccine hesitancy is associated with fear of adverse effects of vaccines (Larson et al., 2015; Rief, 2021). Fearing the

safety of vaccines makes the hesitancy stronger (Karlsson et al., 2021), and the newness of the vaccine was associated with concerns and hesitancy (Freeman et al., 2020; Karafillakis et al., 2019). Fear is usually defined as an unpleasant emotion that is activated as a reaction to a stimulus perceived as potentially dangerous and that can trigger protective behaviors such as avoidance (Ornell et al., 2020; Pakpour & Griffiths, 2020; Vlaeyen & Linton, 2016). The recent work of Malas & Tolsá (2021) finally tried to condense the quite large literature related to vaccination fear by developing a test, namely the Vaccination Fear Scale (VFS-6). The Vaccination Fear may emerge from different phenomena and psychic processes. For instance, Tahir et al., (2021) included factors such as the fear of side effects and of needles as possible reasons to explain the fear of COVID-19 vaccination. The beliefs that vaccines could have no beneficial effects or even harm people were explored as other possible dimensions connected with vaccine fear (Sato & Fintan, 2020). Despite several tries to properly measure vaccine fear using single or ad-hoc items (Killigore et al., 2021; Sato & Fintan, 2020), just the VFS-6 (Malas & Tolsá, 2021) was able to represent the complexity of the construct of vaccine fear in a valid and reliable way.

1.1 Aims and hypotheses development

Our goal is to translate and validate in the Italian context the VFS-6. In order to validate the VFS-6 in the Italian context, it is necessary to consider which factors may affect or be related to vaccine fear. First, Sato & Fintan (2020) identified 4 possible vaccination-related fears: 1) fears of needles/injections, 2) fear of side effects of vaccination, 3) fear that vaccines have no benefit in preventing diseases, 4) fear that vaccines might be harmful. Since 3 out of 4 fears envisaged by Sato & Fintan (2020) are also included in the VFS-6, we expected Sato & Fintan (2020) fears to be highly correlated with VFS-6. Moreover, since fear of needles/injections is not encompassed in the vaccine fear construct as measured by VFS-6, we expect these two measures to be quite independent.

Hypothesis 1 (H1): VFS-6 is positively and highly correlated with fear of side effects, receiving harm from vaccination, and no benefit, while it is not correlated with fear of needles/injections.

As already mentioned, vaccination fear plays an important role in vaccine hesitancy (Larson et al., 2015; MacDonald, 2015; Rief, 2021; Tsheten et al., 2022). "In some cases, the fear dimension is even included within vaccine hesitancy definition" (Kotta et al., 2021). Given the close relationship between vaccine fear and vaccine hesitancy, we expected the following:

Hypothesis 2 (H2): vaccine fear is strongly and positively correlated with vaccine hesitancy scores.

As the scientific literature stressed vaccine hesitancy is directly associated with vaccination (Kotta et al., 2021; Larson et al., 2015; MacDonald, 2015; Rief, 2021; Tsheten et al., 2022). Since we assumed vaccine fear to be highly related to vaccine hesitancy (Cerda & García, 2021), we expect vaccine fear to affect people's availability to get vaccinated against Covid-19. This claim is further justified by the evidence coming from the literature regarding the connection between fear of side effects and vaccination (Hammour et al., 2022; Jiménez-Corona & Ponce-de-León-Rosales, 2011).

Hypothesis 3 (H3): People with a higher vaccination fear are less inclined to get vaccinated

Vaccination anxiety is another dimension that may affect people's intention to get vaccinated (Bodner et al., 2020). Vaccine anxiety has been positively related to fear of vaccination side effects (Hoffman et al., 2021), which is an important component of vaccine fear definition as envisaged by VFS-6. Furthermore, since anxiety and fear are two close-related psychological concepts (APA, 2013) we expect the same relation to emerge when we analyze and measure them in the specific domain of vaccination:

Hypothesis 4 (H4): Vaccine anxiety to be positively correlated with vaccine fear.

For what concern sociodemographic dimensions, people's sex has been reported as associated with vaccine fear. More specifically, females appeared more scared about vaccines (Killgore et al., 2021; Malas & Tolsá, 2021; Tahir et al., 2021). For this reason, we expect the following:

Hypothesis 5 (H5): Females are more afraid of vaccination.

2. Method

The scale was translated from Spanish into Italian in the present study following the protocol described by Beaton et al. (2000). More specifically, the scale was translated by 2 Italian psychologists into Italian, and then the Italian items were back-translated by two native Spanish translators (who had never seen the scale before) into Spanish. All translators compared all forward and backward translated versions to consolidate and develop an interim Italian version of the VFS-6. This was then piloted on 20 participants of different ages and education levels to investigate if there could be any problems in understanding the items.

2.1 Participants

1111 Italian speakers recruited online participated in the study, 26.6% men and 68.9% women, with a mean age of 38.33 (SD: 13.94). A part of the sample has a high school educational level (38.3%) while 25.9% have a master's degree. Most of the sample was coupled or married (67.5%), followed by single (25.7%), divorced or separate (5.5%), and widowed (1.4%). Regarding cohabitation, the vast majority were living with family members (50.3%) or partners (25.7%), with 12.9% leaving alone.

2.2 Procedure and ethics

Instruments were administered online. Recruitment was carried out with a message containing the study link, which was distributed via the web, social media (Facebook, Instagram, Linkedin), and mailing list to all potential participants. Participation was completely voluntary. A consent form was inserted at the beginning of the study to inform the participants of the aim of the research and the protection of privacy. To continue with the administration of the questionnaires, each participant had to accept the terms of the study that complied with the Helsinki declaration, Italian law's requirements of privacy and informed consent (Law Decree DL-101/2018), EU regulation (2016/699), and (APA) guidelines.

2.3 Context

We applied the survey in the COVID-19 context, from 20 December 2021 to 10 January 2022, in this period about 21.3% of the Italian population was not vaccinated (Il Sole 24 ore, 2022). Data collection was interrupted due to the announcement of the Italian government of mandatory vaccination for people older than 50 years (Italian Government, 2022) since it may create a significant discrepancy between pre- and post-announcement answers.

2.4 Instruments

The survey used for this study was composed of 55 items. The next variables were measured:

Sociodemographic information. We asked about age, gender, education level, marital status, and current cohabitation.

Additional information: two direct items were added in order to get information about previous Covid-19 infection and the decision to get vaccinated.

Fear of vaccination: The Fear of Vaccination Scale (VFS-6) (Malas & Tolsá, 2021) was adapted and translated into Italian through a translation and back translation process (Hambleton & Kanjee, 1995). It is composed of six items that were rated on a 5-point scale, from 1 (strongly

disagree) to 5 (strongly agree) with scores ranging from 6 to 30. Higher scores reflect higher levels of fear related to vaccination. The scale showed good internal reliability (Cronbach's α = .88).

Generalised fear of vaccination: four direct items, previously used by Sato & Fintan (2020), were used to measure the internal validation of our main scale. Those four items asked about fear of side effects, fear of needles, fear of vaccines doing harm, and fear of not obtaining benefits.

Vaccination hesitancy: The 5-C scale (Betsch et al., 2018) covers the broader theoretical conceptualization of vaccine hesitancy and acceptance and identifies psychological barriers of vaccination behavior. It's a 15-item scale and we used a 5-point scale from strongly disagree to strongly agree. This scale was used to measure external validation. (Cronbach's α ranging from .67 to .88).

Covid-19 Vaccination Anxiety: this variable was measured with 7 items, previously used by Bodner et al., (2021), that were rated on a 5-point scale, from 1 (strongly disagree) to 5 (strongly agree). Those items showed good internal reliability (Cronbach's α = .91). This scale was used to assess external validity.

2.5 Statistical analysis

First, prior to the participants' recruitment, efforts have been made to identify an adequate sample size for the study. For Confirmatory Factor analysis, we simply relied on the 10:1 ratio between participants and items rule (Comrey, 1988), and thus, 60 participants would have been enough. Nonetheless, since the authors planned to use Pearson's correlation and two Welch's t-tests (for sex and vaccination-related differences) several power analyses were performed. We relied on G*Power software to accomplish this procedure (Faul et al., 2007, 2009). Power analysis allows researchers to determine the sample size required to detect an effect of a given size with a given degree of confidence. For each type of statistical analysis, a power analysis should be performed, and the final sample size should be evaluated based on the power analysis that requires the largest sample size. For Pearson correlation, a sample of 782 would be required to achieve a statistical power (i.e., 0.80), while assuming a smaller effect size (r = 0.10). For testing sex-related differences (t-test) a sample of 932 individuals would be required to reach a statistical power of 0.80, supposing a small effect size (d =.20) and a possible sex imbalance ratio of 1:2.3. Lastly, vaccination-related differences we considered that in Italy during our data-collection roughly the 21% of people were not-vaccinated (Il Sole 24 ore, 2022) but since non-vaccinated are a difficult target to recruit for social desirability issues a sample of 766 individuals

would be required to reach a statistical power of 0.80, supposing a small-medium effect size (d =.30) considering a harsher imbalance (i.e., 90% vaccinated people vs 10% non-vaccinated people).

For confirmatory factor analysis AMOS was employed (Arbuckle, 2014). Maximum Likelihood Estimation (MLE) was used for estimating the model's parameters. To evaluate the goodness of models, we relied on the following goodness-of-fit indices: the chi-square to degree of freedom ratio (χ^2/df; Jöreskog, 1969), the Tucker-Lewis index (TLI; Tucker & Lewis, 1973), the standardized root mean square residual (SRMR; Bentler, 1995), the root mean square error of approximation (RMSEA; Browne & Cudeck, 1993), and the comparative fit index (CFI; Bentler, 1990). The models are supported by a TLI value higher than 0.95, a CFI value close to 0.95 (0.90 to 0.95 for a reasonable fit), a SRMR value less than 0.08, and a RMSEA less than 0.06 (0.06 to 0.08 for a reasonable fit; Hu & Bentler, 1999).

Subsequently, sex and vaccination invariance of VFS-6 was assessed through multigroup confirmatory factor analysis. Three levels of invariance were tested (i.e., configural, metric, and scalar) by relying on changes in RMSEA and CFI fit indices to evaluate misfit instead of the chi-square due to its sensitivity to sample size (Chen, 2007; Cheung & Rensvold, 1999). Changes in model fit indexes should be less than .002 for the CFI (Meade et al., 2008) and .010 in the RMSEA (Chen, 2007).

3. Results

3.1. Descriptive statistics

As a first step, we produced the descriptive statistics for all VFS-6 items (Table 1) and we compared our values with those coming from the Spanish version of Malas & Tolsá (2021) through a Student's t test.

Table 1. Descriptive statistics of the VFS-6.

N°	Item	Min	Max	Mean	s.d.	t	d
1	**ENG:** You are very afraid to get vaccinated against [...] **ESP**: Le da mucho miedo vacunarse de [...] **IT**: Ti fa molta paura vaccinarti contro il Covid-19	1	5	2.37	1.42	3.61***	0.28
2	**ENG:** You feel uncomfortable thinking about getting vaccinated against [...] **ESP**: Siente incomodidad al pensar en vacunarse de [...] **IT**: Ti senti a disagio se pensi di doverti vaccinare contro il Covid-19	1	5	2.37	1.51	4.58***	0.36

3	**ENG:** Your hands get wet or sweaty when you think about getting vaccinated with [...] **ESP:** Las manos se le humedecen o sudan cuando piensa en vacunarse de [...] **IT**: Ti si inumidiscono o sudano le mani quando pensi di vaccinarti contro il Covid-19	1	5	1.62	1.02	1.34^{ns}	
4	**ENG:** You are afraid that the [...] vaccine could cause side effects **ESP:** Tiene miedo de que la vacuna de [...] pueda causarle efectos secundarios **IT**: Hai paura che la vaccinazione contro il Covid-19 possa causarti effetti indesiderati	1	5	2.88	1.46	5.79^{***}	0.45
5	**ENG:** You cannot sleep because you are worried about having to get vaccinated against [...] **ESP:** No puede dormir porque le preocupa tener que vacunarse de [...] **IT**: Non riesci a dormire perché ti preoccupa doverti vaccinare contro il Covid-19	1	5	1.66	1.11	-1.65^{ns}	
6	**ENG:** Your heart races or beats when you think you need to get vaccinated with [...] **ESP:** El corazón se le acelera o palpita cuando piensa que tiene que vacunarse de [...] **IT**: Ti si accelera il battito cardiaco o hai le palpitazioni quando pensi di doverti vaccinare contro il Covid-19	1	5	1.72	1.16	-1.24^{ns}	

Note: N = 1111; s.d. = standard deviation; ns = not statistically significant; ESP = Spanish version of Malas & Tolsá (2021); ENG = English version of the items presented in Malas & Tolsá (2021); IT = Italian version of the items that are actually validated in the paper.

As shown in Table 1 for half of the items there were no statistically significant differences between the Italian and Spanish versions. For items 1, 2, and 4 small-medium differences were detected following the well-established Cohen's cut-offs (0.2 for small effects, 0.5 for medium effects, 0.8 for large effects; Cohen, 2013). For all these three items the Spanish sample reported higher values of vaccine fear, plausibly due to the different times in which data collection occurred between the two studies (December 20 for the Spanish version, December 21/January 22 for the Italian version) and thus, familiarity with vaccination (Elbur et al., 2016; Elgendy & Abdelrahim, 2021; Saied et al., 2021).

3.2. Confirmatory Factor Analysis.

CFA was performed on the whole sample (N = 1111) to confirm the factor structure found by Malas & Tolsá (2021). The six items (i.e., exogenous variables) were used as indicators of the two latent variables (i.e., somatic and cognitive fear of vaccination) as represented in Fig.1. Overall, the hypothesized measurement model provided satisfactory data model fit statistics also

in our Italian sample (χ^2/df = 2.45; CFI = 0.99; TLI = 0.99; RMSEA = 0.036; SRMR = 0.010). Moreover, all factor loadings resulted statistically significant and in line with the values of Malas & Tolsá (2021).

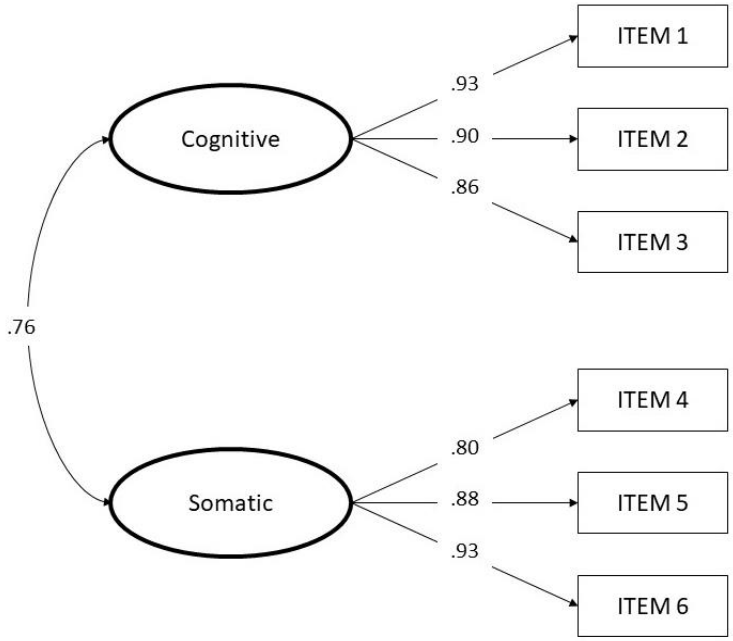

Figure 1. Results of confirmatory factor analysis of the two-factor model.

3.3. Sex and Vaccination invariance.

Subsequently, we proceeded with two multigroup confirmatory factor analyses to investigate VFS-6 invariance across sex and vaccination. In general, three types of invariance can be tested: configural (i.e., the structural CFA model is equivalent across groups), metric (i.e., factor loadings are the same across groups), and scalar (the intercepts are assumed equal between groups). From a theoretical point of view, a construct should be scalar invariant, nonetheless, reaching metric invariance has been considered enough by several authors for proceeding with inferential analyses (Hsiao & Lai, 2018; Vandenberg & Lance, 2000). Regarding the variable sex, the difference between the configural and metric models was not statistically significant ($\Delta CFI_{configural\text{-}metric} = .001$; $\Delta RMSEA_{configural\text{-}metric} = .005$), while the configural and scalar models appeared to be statistically different at least regarding the variation in CFI ($\Delta CFI_{metric\text{-}scalar} = .005$; $\Delta RMSEA_{metric\text{-}scalar} = .01$). As for the difference between people vaccinated and non-vaccinated, once again just metric invariance was achieved ($\Delta CFI_{configural\text{-}metric} = .001$; $\Delta RMSEA_{configural\text{-}metric} < .001$; $\Delta CFI_{metric\text{-}scalar} = .052$; $\Delta RMSEA_{metric\text{-}scalar} = .07$). Overall, factor loadings appeared equivalent across both sex and vaccination.

3.4. Validity and reliability

As a first step, to test hypotheses 1, 2, and 4 we relied on Pearson's correlation (Table 2).

Table 2. Full correlation matrix of the psychological variables included in the data collection.

Variable	M	s.d.	1	2	3	4	5	6	7	8	9	10	11	12
1. VFS-6 cognitive	7.61	4.09												
2. VFS-6 somatic	5.00	3.01	0.70***											
3. VFS-6 total	12.62	6.56	0.94***	0.90***										
4. Fear of needles	1.73	0.97	-0.03	0.02	-0.01									
5. Fear of side effects	2.28	0.97	0.65***	0.50***	0.63***	0.10**								
6. Fear of no benefit	1.86	0.92	0.38***	0.35***	0.40***	0.01	0.54***							
7. Fear of harm	2.09	0.99	0.66***	0.50***	0.64***	0.04	0.79***	0.58***						
8. VH confidence	10.21	3.35	-0.77***	-0.55***	-0.73***	0.07*	-0.57***	-0.41***	-0.65***					
9. VH complacency	5.44	2.83	0.62***	0.46***	0.60***	-0.07*	0.43***	0.30***	0.50***	-0.71***				
10. VH constraints	4.77	2.29	0.65***	0.57***	0.67***	-0.04	0.46***	0.34***	0.50***	-0.65***	0.75***			
11. VH calculation	11.03	2.65	0.40***	0.28***	0.38***	-0.04	0.28***	0.17***	0.30***	-0.36***	0.31***	0.30***		
12. VH collective responsibility	11.95	3.00	0.67***	-0.50***	-0.65***	0.06*	-0.43***	-0.32***	-0.50***	0.77***	-0.75***	-0.67***	-0.31***	
13. Vaccine Anxiety	2.62	1.09	0.85***	0.62***	0.81***	-0.05	0.67***	0.48***	0.74***	-0.85***	0.69***	0.67***	0.39***	-0.72***

Note: N = 1111. *p<0.05; **p<0.01; ***p<0.001; s.d. = standard deviation.

As we can gather from Table 2, VFS-6 (both in its dimensions and total score) was positively correlated with fear of side effects, receiving harm from vaccination, and no benefit, while it appeared independent from fear of needles/injections (H1). As expected vaccine fear was strongly correlated with all dimensions of vaccine hesitancy (H2). Notably, on average, the vaccine fear cognitive component appeared to have a higher correlation with vaccine hesitancy than the somatic component. Vaccine anxiety appeared to be positively and highly correlated with vaccine fear (with a correlation between 0.60 and 0.80) (H4). In an exploratively way, we also analyzed the relationship of VFS-6 with participants' age. Vaccine fear seemed positively correlated with age but with a negligible effect size ($r_{(cognitive)} = 0.11$; p. <0.001; $r_{(somatic)} = 0.14$; p. <0.001; $r_{(total)} = 0.13$; p. <0.001). Subsequently, we assessed whether people with a higher vaccination fear were less inclined to get vaccinated through Welch's t-test. On average among vaccinated people, we observed lower vaccination fear levels than in not vaccinated individuals (H3). More specifically, cognitive dimension ($t_{(240.06)}= 21.85$; p. <0.001; d = 1.76), somatic dimension ($t_{(184.74)}= 9.37$; p. <0.001; d = 0.69), and vaccine fear total score ($t_{(215.21)}= 17.73$; p. <0.001; d = 1.51) appeared significantly higher in unvaccinated individuals. In our case, based on benchmarks suggested by Cohen (1988), we had two large differences and one medium-large

difference. Eventually, we tested possible sex-related differences in vaccine fear scores following our fifth hypothesis (H5). We observed how females, on average, appeared more afraid of vaccination in the cognitive ($t_{(606.91)}$= -3.07; p. = 0.002; d = -0.20) and somatic components ($t_{(733.30)}$= -4.59; p. <0.001; d = -0.29), as well as concerning the total score ($t_{(672.80)}$= -4.03; p. <0.001; d = -0.26). However, the effect size related to such differences appeared quite small.

The reliability analysis of the VFS-6 model was performed by calculating both McDonald's omega and Cronbach's alpha given the consensus in the psychometric literature that the latter can be a sub-optimal choice (Dunn, et al., 2014; Hayes & Coutts, 2020; Watkins, 2017). Nonetheless, since coefficient alpha is a special case of omega when alpha's assumptions are satisfied (McDonald, 1999), we relied on alpha interpretation rules to discuss SMC reliability. Both VFS-6 factors showed an optimal reliability (VFS-$6_{(cognitive)}$ ω = .86; α= .85; VFS-$6_{(somatic)}$ ω = .87; α= .84) (DeVellis, 1991; Nunnally & Bernstein, 1994).

4. Discussion

The main goal of our research was to translate and validate the 6-Items Vaccination of Fear Scale (VFS-6) for the Italian population. Having a valid and reliable measure of vaccination fear can help model vaccination behavior more effectively and thus foster vaccination, which is currently the most cost-efficient way to deal with COVID-19 (OWIDM, 2022; WHO, 2019), limiting negative outcomes in terms of mental health (Caffieri & Margherita, 2021; Ciccarelli et al., 2022; Filindassi et al., 2022; Gori et al., 2022; Guazzini et al., 2022a; Moroianu et al., 2021; Ranieri et al., 2021; Rollè et al., 2022) and avoiding overloading hospital facilities (Di Trani et al., 2022; Maniaci et al., 2022; Rahnea-Nita et al., 2021). The findings supported the reliability and validity of the translated VFS-6 and its use for assessing vaccination fear in the Italian population. The translation of instruments is an important way to include non-English speakers in surveys and investigations or to conduct cross-national research (Sha & Immerwahr, 2018). This could also maximize the likelihood that each instrument's version is culturally and linguistically appropriate for its target population (Goerman & Caspar, 2010). CFA confirmed the factor structure found by Malas & Tolsá (2021). Both factors, VFS-6 cognitive and VFS-6 somatic, showed optimal reliability.

Related to the hypothesis, our findings appeared in line with the previous literature. Fear is a much-researched psychological construct (Settineri & Merlo, 2020) that is particularly related to anxiety (APA, 2013). Thus, we assumed a positive correlation between vaccine fear and vaccine anxiety (hypothesis 4) was indeed found. In line with the literature we also observed how

vaccination fear was positively correlated with fear of side effects, receiving harm from vaccination, and no benefit, while it was not correlated with fear of needles/injections (hypothesis 1, Mellers & McGraw, 2001; Malas & Tolsá, 2021), thus confirming that fear of adverse reactions caused by the vaccine are frequent arguments to reject vaccination (Hortal & Di Fabio, 2019).

Scholars considered fear of vaccination an important factor in vaccine hesitancy dynamics worldwide (Jiménez-Corona & Ponce-de-León, 2011; Killgore, et al., 2021; Larson et al., 2015; MacDonald, 2015; Rief, 2021; Tsheten et al., 2022). Our results suggested that vaccine fear is strongly and positively correlated with vaccine hesitancy scores (hypothesis 2) and people who have a high score of vaccination fear are less inclined to get vaccinated (hypothesis 3). Finally, we analyzed the socio-demographic information, founding that on average females are more likely to have higher levels of vaccination fear (hypothesis 5), as already shown in the literature (Killgore et al., 2021; Malas & Tolsá, 2021; Tahir et al., 2021).

Vaccination has proven to be one of the most cost-efficient ways to avoid diseases, and its refusal has proven to be a significant threat to global health (WHO, 2019). Due to this fact, it is important to have a tool for measuring vaccine fear in order to reduce the avoidance and hesitancy of vaccination. In this sense, the VFS-6 appeared as a particularly useful tool given that it represents a standardized tool with robust psychometric properties, good reliability, and internal consistency (Malas & Tolsá, 2021) that can be used to monitor and make decisions on intervention plans (Ahorsu et al., 2020; Pakpour & Griffiths, 2020) to prevent and treat through appropriate intervention vaccination fear, and it can be useful in the process of understanding fear of vaccines, vaccine hesitancy and on acceptance rates (Malas & Tolsá, 2021).

5. Limitations and conclusion

Our study research had some limitations. First, our results are correlational and no causation can be inferred. Moreover, due to a non-probability sampling technique, the results are hardly representative of the whole Italian population. Generalizability is also potentially hindered by the recruitment channel used. Although Internet access and social media use are quite ubiquitous in Italy (Statista Research Department, 2021), we were not able to get answers from digitally-excluded people (Robotham et al., 2016). Covid-19 vaccination was also a particularly sensitive issue in our country and therefore dynamics of social desirability could have influenced the responses of the participants. Eventually, the increase in the familywise error rate across the reported statistical analyses was not controlled.

Despite these limitations, considering our results, it is clear that fear of vaccination is an essential dimension to understanding and modeling people's vaccination behavior. Our results can be used to design prevention programs to help overcome vaccination fear and promote preventive behaviors like vaccination. In this historical period, it seems even more important to have a tool to measure the fear of vaccination and VFS-6 is a reliable and valid tool.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

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References

1. American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). https://doi.org/10.1176/appi.books.9780890425596
2. Baumeister RF, Bratslavsky E, Finkenauer C, Vohs KD. Bad is stronger than good. Rev Gen Psychol. 2001;5(4):323–70. https://doi.org/10.1037/1089-2680.5.4.323
3. Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine, 25,* 3186–3191. https://doi.org/10.1097/00007632-200012150-00014
4. Bendau, A., Plag, J., Petzold, M. B., & Ströhle, A. (2021). COVID-19 vaccine hesitancy and related fears and anxiety. *International immunopharmacology,* 97, 107724. https://doi.org/10.1016/j.intimp.2021.107724
5. Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological bulletin*, *107*(2), 238. https://doi.org/10.1037/0033-2909.107.2.238
6. Bentler, P. M. (1995). *EQS structural equations program manual* (Vol. 6). Encino, CA: Multivariate software.
7. Betsch, C., Schmid, P., Heinemeier, D., Korn, L., Holtmann, C., & Böhm, R. (2018). Beyond confidence: Development of a measure assessing the 5C psychological antecedents of vaccination. *PloS one*, 13(12), e0208601. https://doi.org/10.1371/journal.pone.0208601
8. Bodner, E., Bergman, Y. S., Ben-David, B., & Palgi, Y. (2021). Vaccination anxiety when vaccinations are available: The role of existential concerns. *Stress and Health*. https://doi.org/10.1002/smi.3079
9. Caffieri, A., & Margherita, G. (2021). The psychological impact of COVID-19 on women's wellbeing during pregnancy and postpartum one year after pandemic outbreak in Italy. A Systematic review. *Mediterranean Journal of Clinical Psychology*, *9*(2). https://doi.org/10.13129/2282-1619/mjcp-3026
10. Cerda, A. A., & García, L. Y. (2021). Hesitation and refusal factors in individuals' decision-making processes regarding a coronavirus disease 2019 vaccination. *Frontiers in public health,* 9. https://doi.org/10.3389/fpubh.2021.626852
11. Ciccarelli, M., Nigro, G., D'Olimpio, F., Griffiths, M. D., Sacco, M., Pizzini, B., & Cosenza, M. (2022). The associations between loneliness, anxiety, and problematic gaming behavior during the COVID-19 pandemic: The mediating role of mentalization. *Mediterranean Journal of Clinical Psychology*, *10*(1). https://doi.org/10.13129/2282-1619/mjcp-3257
12. Cheung, G. W., & Rensvold, R. B. (1999). Testing factorial invariance across groups: A reconceptualization and proposed new method. *Journal of management*, *25*(1), 1-27. https://doi.org/10.1177/2F014920639902500101
13. Cohen, J. (1998). *Statistical Power Analysis for the Behavioural Sciences* (2nd edition). https://doi.org/10.4324/9780203771587

14. Comrey, A. L. (1988). Factor-analytic methods of scale development in personality and clinical psychology. *Journal of consulting and clinical psychology*, *56*(5), 754. https://doi.org/10.1037/0022-006X.56.5.754

15. Cudeck, R. (1993). of Assessing Model Fit. *Testing structural equation models*, *154*, 136.

16. DeVellis, R. F. (1991). Guidelines in scale development. *Scale development: Theory and applications*, 51-91.

17. Di Giacomo, D. (2020). Public Health emergencies and quarantine: virtual patient engagement as challenge and opportunity for Mental Health strategy. *Mediterranean Journal of Clinical Psychology*, *8*(2). https://doi.org/10.6092/2282-1619/mjcp-2533

18. Di Trani, M., Pippo, A. C., & Renzi, A. (2022). Burnout in Italian hospital physicians during the COVID-19 pandemic: the roles of alexithymia and defense mechanisms. *Mediterranean Journal of Clinical Psychology*, *10*(1). https://doi.org/10.13129/2282-1619/mjcp-3250

19. Dubé, E., Laberge, C., Guay, M., Bramadat, P., Roy, R., & Bettinger, J. A. (2013). Vaccine hesitancy: an overview. *Human vaccines & immunotherapeutics*, 9(8), 1763-1773. https://doi.org/10.4161/hv.24657

20. Dunn, T. J., Baguley, T., & Brunsden, V. (2014). From alpha to omega: A practical solution to the pervasive problem of internal consistency estimation. *British journal of psychology*, *105*(3), 399-412. https://doi.org/10.1111/bjop.12046

21. Elbur, A., Alharthi, A., Aljuaid, A., & Hasan, N. (2016). Knowledge of Middle East respiratory syndrome coronavirus (MERS-CoV) and its management: a survey among Saudi people in Taif; Kingdom of Saudi Arabia. *IOSR J Pharm*, *6*(8), 33-39. https://doi.org/10.9790/3013-068023339

22. Elgendy, M. O., & Abdelrahim, M. E. (2021). Public awareness about coronavirus vaccine, vaccine acceptance, and hesitancy. *Journal of Medical Virology, 93*(12), 6535-6543. https://doi.org/10.1002/jmv.27199

23. Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behaviour research methods*, *41*(4), 1149-1160. https://doi.org/10.3758/BRM.41.4.1149

24. Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: A flexible statistical power analysis program for the social, behavioural, and biomedical sciences. *Behaviour research methods*, *39*(2), 175-191. https://doi.org/10.3758/BF03193146

25. Filindassi, V., Pedrini, C., Sabadini, C., Duradoni, M., & Guazzini, A. (2022). Impact of COVID-19 First Wave on Psychological and Psychosocial Dimensions: A Systematic Review. *COVID*, *2*(3), 273-340. https://doi.org/10.3390/covid2030022

26. Freeman D, Loe BS, Chadwick A, Vaccari C, Waite F, Rosebrock L, Jenner L, Petit A, Lewandowsky S, Vanderslott S, et al. COVID-19 vaccine hesitancy in the UK: the Oxford Coronavirus explanations, attitudes, and narratives survey (OCEANS) II. *Psychol Med.* 2020;11:1–34. https://doi.org/10.1017/S0033291720005188

27. Goerman, P. L., & Caspar, R. A. (2010). A preferred approach for the cognitive testing of translated materials: Testing the source version as a basis for comparison. *International Journal of Social Research Methodology, 13,* 303–316. https://doi.org/10.1080/13645570903251516

28. Gori, A., Topino, E., Craparo, G., Grotto, R. L., & Caretti, V. (2021). An empirical model for understanding the threat responses at the time of COVID-19. *Mediterranean Journal of Clinical Psychology*, *9*(1). https://doi.org/10.6092/2282-1619/mjcp-2916

29. Guazzini, A., Pesce, A., Gino, F., & Duradoni, M. (2022a). How the COVID-19 Pandemic Changed Adolescents' Use of Technologies, Sense of Community, and Loneliness: A Retrospective Perception Analysis. *Behavioral Sciences*, *12*(7), 228. https://doi.org/10.3390/bs12070228

30. Guazzini, A., Pesce, A., Marotta, L., & Duradoni, M. (2022b). Through the Second Wave: Analysis of the Psychological and Perceptive Changes in the Italian Population during the COVID-19 Pandemic. *International Journal of Environmental Research and Public Health*, *19*(3), 1635. https://doi.org/10.3390/ijerph19031635

31. Hammour, K. A., Farha, R. A., Manaseer, Q., & Al-Manaseer, B. (2022). Factors affecting the public's knowledge about COVID-19 vaccines and the influence of knowledge on their decision to get vaccinated. *Journal of the American Pharmacists Association,* 62(1), 309-316. https://doi.org/10.1016/j.japh.2021.06.021

32. Hayes, A. F., & Coutts, J. J. (2020). Use omega rather than Cronbach's alpha for estimating reliability. But…. *Communication Methods and Measures*, *14*(1), 1-24. http://dx.doi.org/10.1080/19312458.2020.1718629

33. Hoffman, Y., Palgi, Y., Goodwin, R., Ben-Ezra, M., & Greenblatt-Kimron, L. (2021). A storm in a teacup: older adults' low prevalence of COVID-19 vaccine side-effects and their link with vaccination anxiety. *International Psychogeriatrics*, 1-3. https://doi.org/10.1017/s1041610221001071

34. Hortal, M., & Di-Fabio, J.L. (2019). Rechazo y gestión en vacunaciones: sus claroscuros. Revista Panamericana de Salud Pública, 43. https://dx.doi.org/10.26633%2FRPSP.2019.54

35. Hsiao, Y. Y., & Lai, M. H. (2018). The impact of partial measurement invariance on testing moderation for single and multi-level data. *Frontiers in Psychology*, *9*, 740. https://doi.org/10.3389/fpsyg.2018.00740

36. Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*, *6*(1), 1-55. https://doi.org/10.1080/10705519909540118

37. Il Sole 24 ore. (2022, January 10). I dati dei vaccinati al 10 gennaio 2022. *Il Sole 24 Ore.* https://stream24.ilsole24ore.com/video/italia/i-dati-vaccinati-10-gennaio-2022/AEw1u76?refresh_ce=1

38. Italian Government. (2022, January 10). Conferenza stampa del Presidente Draghi. *Governo.It.* https://www.governo.it/it/articolo/conferenza-stampa-del-presidente-draghi/18950

39. Jiménez-Corona, M. E., & Ponce-de-León-Rosales, S. (2011). Influenza vaccine and healthcare workers. *Archives of Medical Research, 42*(8), 652-657. https://doi.org/10.1016/j.arcmed.2011.12.006

40. Jöreskog, K. G. (1969). A general approach to confirmatory maximum likelihood factor analysis. *Psychometrika*, *34*(2), 183-202. https://doi.org/10.1007/BF02289343

41. Karafillakis E, Simas C, Jarrett C, Verger P, Peretti-Watel P, Dib F, De Angelis S, Takacs J, Ali KA, Pastore Celentano L, et al. HPV vaccination in a context of public mistrust and uncertainty: a systematic literature review of determinants of HPV vaccine hesitancy in Europe. *Hum Vaccines Immunother*. 2019;15(7–8):1615–27. https://doi.org/10.1080/21645515.2018.1564436

42. Karlsson LC, Soveri A, Lewandowsky S, Karlsson L, Karlsson H, Nolvi S, Karukivi M, Lindfelt M, Antfolk J. Fearing the disease or the vaccine: the case of COVID-19. Pers Individ Dif. 2021;172 (1):110590. https://www.sciencedirect.com/science/article/pii/S0191886920307819

43. Killgore, W. D., Cloonan, S. A., Taylor, E. C., & Dailey, N. S. (2021). The COVID-19 Vaccine Is Here—Now Who Is Willing to Get It?. Vaccines, 9(4), 339. https://doi.org/10.3390/vaccines9040339

44. Kotta, I., Kalcza-Janosi, K., Szabo, K., & Marschalko, E. E. (2021). Development and Validation of the Multidimensional COVID-19 Vaccine Hesitancy Scale. H*uman vaccines & immunotherapeutics,* 1-10. https://doi.org/10.1080/21645515.2021.2007708

45. Larson HJ, Jarrett C, Schulz WS, Chaudhuri M, Zhou Y, Dube E, Schuster M, MacDonald NE, Wilson R. Measuring vaccine hesitancy: the development of a survey tool. *Vaccine*. 2015;33 (34):4165–75. https://doi.org/10.1016/j.vaccine.2015.04.037

46. MacDonald, N. E. (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine, 33*(34), 4161-4164. https://doi.org/10.1016/j.vaccine.2015.04.036

47. Malas, O., & Tolsá, M. D. (2021). Vaccination Fear Scale (VFS-6): Development and Initial Validation. *Mediterranean Journal of Clinical Psychology*, 9(2). https://doi.org/10.13129/2282-1619/mjcp-2971

48. Maniaci, G., La Cascia, C., Giammanco, A., Maria, C., Ferraro, L., Tripoli, G., ... & La Barbera, D. (2022). Latent burnout profiles in a sample of frontline healthcare professionals after the peak of the Italian COVID-19 pandemic. *Mediterranean Journal of Clinical Psychology*, *10*(1). https://doi.org/10.13129/2282-1619/mjcp-3292

49. McDonald, R. (1999). *Test Theory: A Unified Treatment* (1st Edition). https://doi.org/10.4324/9781410601087

50. Meade, A. W., Johnson, E. C., & Braddy, P. W. (2008). Power and sensitivity of alternative fit indices in tests of measurement invariance. *Journal of applied psychology*, *93*(3), 568. https://doi.org/10.1037/0021-9010.93.3.568

51. Mellers, B.A., & McGraw, A.P. (2001). Anticipated emotions as guides to choice. Current directions in psychological science, 10(6), 210-214. https://psycnet.apa.org/doi/10.1111/1467-8721.00151

52. Moroianu, L. A., Moroianu, M., Toma, A., Barbu, R. E., Ardeleanu, V., & Nitoi, L. C. (2021). Psychopathology in patients diagnosed with SARS COV 2: A brief report. *Mediterranean Journal of Clinical Psychology*, *9*(1). https://doi.org/10.6092/2282-1619/mjcp-2982

53. Nunnally, J. C., & Bernstein, I. H. (1994). Validity. *Psychometric theory*, *3*(1), 99-132.

54. Ornell, F., Schuch, J. B., Sordi, A. O., & Kessler, F. H. P. (2020). "Pandemic fear" and COVID-19: Mental health burden and strategies. *Brazilian Journal of Psychiatry,* 42(3), 232–235. https://doi.org/10.1590/1516-4446-2020-0008

55. OWID (2022, February). Shared of people vaccinated against Covid 19. Recovered the 9th of February 2022 from https://ourworldindata.org/covid-vaccinations?country=OWID_WRL

56. OWID. (2022, February). Número acumulado de casos de coronavirus en el mundo desde el 22 de enero de 2020 hasta el 6 de febrero de 2022. In Statista. Recovered the 09th of February 2022 from https://es-statista-com.recursos.uloyola.es/estadisticas/1104227/numero-acumulado-de-casos-de-coronavirus-covid-19-en-el-mundo-enero-marzo/

57. Pakpour, A.H., & Griffiths, M.D. (2020). The fear of COVID-19 and its role in preventive behaviors. *Journal of Concurrent Disorders,* 2(1), 58-63. http://irep.ntu.ac.uk/id/eprint/39561/

58. Rahnea-Nita, G., Badiu, D. C., Popescu, C. G., Grigorean, V. T., Serban, D., Smarandache, C. G., ... & Stoian, A. R. (2021). The impact of Coronavirus disease 2019 pandemic on the treatment of cancer patients: the first steps in this fight. *Mediterranean Journal of Clinical Psychology*, *9*(2). https://doi.org/10.13129/2282-1619/mjcp-3011

59. Ranieri, J., Guerra, F., Cilli, E., Caiazza, I., Gentili, N., Ripani, B., ... & Di Giacomo, D. (2021). Buffering effect of e-learning on Generation Z undergraduate students: A cross-sectional study during the second COVID-19 lockdown in Italy. *Mediterranean Journal of Clinical Psychology*, *9*(2). https://doi.org/10.13129/2282-1619/mjcp-3051

60. Rief W. Fear of adverse effects and COVID-19 vaccine hesitancy: recommendations of the treatment expectation expert group. *JAMA Health Forum*. 2021;2(4):e210804. https://doi.org/10.1001/jamahealthforum.2021.0804

61. Rollè, L., Trombetta, T., Calabrese, C., Vismara, L., & Sechi, C. (2022). Adult Attachment, Loneliness, Covid-19 Risk Perception and Perceived Stress During Covid-19 Pandemic. *Mediterranean Journal of Clinical Psychology*, *10*(1). https://doi.org/10.13129/2282-1619/mjcp-3286

62. Robison, S., & Skiles, M. P. (2008, March). Development of a Measure of Vaccine Hesitancy. In The 42nd National Immunization Conference.

63. Robotham, D., Satkunanathan, S., Doughty, L., & Wykes, T. (2016). Do we still have a digital divide in mental health? A five-year survey follow-up. *Journal of medical Internet research*, *18*(11), e6511. https://doi.org/10.2196/jmir.6511

64. Rodriguez VJ, Alcaide ML, Salazar AS, Montgomerie EK, Maddalon MJ, and Jones DL. Psychometric properties of a vaccine hesitancy scale adapted for COVID-19 vaccination among people with HIV. *AIDS Behav. 2021*; 1–6. https://doi.org/10.1007/s10461-021-03350-5

65. Saied, S. M., Saied, E. M., Kabbash, I. A., & Abdo, S. A. E. F. (2021). Vaccine hesitancy: Beliefs and barriers associated with COVID-19 vaccination among Egyptian medical students. *Journal of medical virology*, *93*(7), 4280-4291. https://doi.org/10.1002/jmv.26910

66. Settineri, S., & Merlo, E. M. (2020). Fear of contamination. *Mediterranean Journal of Clinical Psychology, 8*(1). https://doi.org/10.6092/2282-1619/mjcp-2424

67. Sha, M., & Immerwahr, S. (2018). Survey translation: Why and how should researchers and managers be engaged? *Survey Practice, 11,* 1–10. https://doi.org/10.29115/SP-2018-0016

68. Sotiriadis, A., Dagklis, T., Siamanta, V., Chatzigeorgiou, K., & Agorastos, T. (2012). Increasing fear of adverse effects drops intention to vaccinate after the introduction of prophylactic HPV vaccine. *Archives of Gynecology and Obstetrics,* 285(6), 1719-1724. https://doi.org/10.1007/s00404-011-2208-z

69. Statista Research Department. (2021, September). *Internet usage in Italy - statistics & facts*. Recovered the 09th of March 2022 from https://www.statista.com/topics/4217/internet-usage-in-italy/#dossierKeyfigures

70. Tahir, A. I., Ramadhan, D. S., Taha, A. A., Abdullah, R. Y., Karim, S. K., Ahmed, A. K., & Ahmed, S. F. (2021). Public fear of COVID-19 vaccines in Iraqi Kurdistan region: a cross-sectional study. *Middle East Current Psychiatry*, 28(1), 1-8. https://doi.org/10.1186/s43045-021-00126-4

71. Tucker, L. R., & Lewis, C. (1973). A reliability coefficient for maximum likelihood factor analysis. *Psychometrika*, *38*(1), 1-10. https://doi.org/10.1007/BF02291170

72. Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational research methods*, *3*(1), 4-70. https://doi.org/10.1177/2F109442810031002

73. Vlaeyen, J. W., Crombez, G., & Linton, S. J. (2016). The fear-avoidance model of pain. *Pain, 157*(8), 1588-1589. https://doi.org/10.1097/j.pain.0000000000000574

74. Watkins, M. W. (2017). The reliability of multidimensional neuropsychological measures: From alpha to omega. *The Clinical Neuropsychologist*, *31*(6-7), 1113-1126. https://doi.org/10.1080/13854046.2017.1317364

75. WHO (2019). Ten threats to global health in 2019. Geneva, Switz: World Health Organization; Available from: https://www.who.int/news-room/spotlight/ten-threats-to-global-health-in-2019 [Accessed 2022 Feb]

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