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Assessing COVID-19 vaccine literacy: a preliminary online survey

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ABSTRACT

The Covid-19 infodemic can be countered by scientific evidences, clear and consistent communication and improved health literacy of both individuals in need of information and those providing it. A rapid online survey was carried out to evaluate vaccine literacy (VL) skills in the general population and perceptions about candidate Covid-19 vaccines, as well as behavior and beliefs about current vaccinations. Observed VL levels were sufficiently high and consistent with previous observations - where comparable self-reported tools were administered face-to-face and paper-and-pencil - the mean functional score being =2.92, while the interactive-critical one was =3.27, on a maximum of 4. Perceptions regarding future Covid-19 vaccines, along with beliefs about vaccination, were mostly positive and significantly associated with functional and interactive-critical VL scales. Despite obvious limitations, the study confirms that rapid surveys via web are a suitable method to evaluate and trail attitudes during infectious disease outbreaks, and to assess health literacy skills about vaccination, which can be useful to adapt medical communication strategies, for a better understanding of the value of immunization.

Introduction

The Covid-19 pandemic caused a dramatic health, social and economic impact. As of the time of this report, the level of uncertainty was still extremely high and exacerbated by an excess of contradictory information. Many laic media and web sites have delivered unceasingly real time numbers on new cases and deaths, also providing medical advices, although not entitled, often getting ahead of evidence. The amount and variety of news has led to a massive informative overload, generating a real infodemic (1, 2).

Providing the population with evident scientific data is beneficial and necessary, but not enough for a correct understanding. Documented data risk to be self-defeating if they are too many and the public is saturated with emotional rejections, as the mistrust toward decision-makers, or receives contradictory information (3). Moreover, debates among individuals and organizations strongly active on the web and social media, often induce conflicting opinions and negative beliefs, as in the current Covid-19 situation.

One of the most discussed topics is about candidate vaccines against SARS-CoV-2: the information from different sources is often conflicting in a realm, that of vaccination, already characterized by controversies and fake news. This survey aimed at evaluating not only perceptions and behavior toward vaccination, but also at assessing the abilities of the people to collect and understand information about vaccines,

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including the possible future Covid-19 ones. These abilities correspond to health literacy skills and entail people's knowledge, motivation and competence to find, understand and use health information (4), which is critical amidst a pandemic (5).

Methods

Primary objective of this cross-sectional study was to evaluate the feasibility of assessing the levels of health literacy skills about vaccination (vaccine literacy – VL) in the Italian adult general population, through a rapid survey administered via web. Supplementary objectives were to collect perceptions of the interviewees about candidate Covid-19 vaccines, their behavior about current adult immunization and beliefs about vaccination in general, along with evaluating correlation of these variables with VL levels.

This study used a design of online anonymous response to questions, allowing the respondents deciding to join or not. The questionnaire was prepared and distributed and the answers were collected using 'SurveyMonkey', an online service that consents to create web-based surveys that can be inserted in email messages, web pages, and shared through other online services. A web link collector generated the survey URL through which respondents could access the survey and send their answers. For its distribution, a convenient, non-probability sampling method was adopted. The URL was spread in annex to email messages sent on June 5, 2020 (a reminder was forwarded on June 13) to about fifty addressees chosen from the mailing list of Giovanni Lorenzini Foundation (Milan), including vaccine experts active on the web, representatives of citizen, patient and healthcare workers associations. The addressees were balanced according to three geographical areas, northern, central and southern Italy, corresponding to regions with different Covid-19 periodic prevalence, the highest being in northern Italy (6). Recipients were free to fill in the questionnaire and were asked to spread the link in their turn, without communicating back their list of addressees. The same link was posted to the public Facebook page of the Foundation. The questionnaire was composed of two web pages: in the first page, participants were provided with information about the rationale and the scope of the survey, i.e. to gather perceptions as well as modalities and abilities to collect, understand and use information about vaccination, including candidate Covid-19 vaccines. Respondents were asked to provide honest answers, were not given any incentives for participation and could reply only once to the survey. They were informed that proceeding to the second page of the survey and completing the questionnaire constituted consent. No targeted replies were purchased. Participants could send answers via PC, tablet or smartphone.

The survey was intended for Italian adult individuals 18 years of age and older, without any other exclusion criteria, interested in following on the media and looking for information about future Covid-19 vaccines, and/or other vaccines. It was composed, in total, of twenty-nine questions including main demographic data (age group, sex, native language, educational level, occupational status, geographical area of residence), and sources of information. Five closed questions (categorical variables) were about attitudes and perceptions regarding future Covid-19 vaccines. Three closed questions were on the behavior toward current immunizations practices (including if receiving or not past and future seasonal influenza vaccine). Moreover, two questions were included, aimed at evaluating on a four-points Likert scale recipients' beliefs regarding vaccinations: '*I am not favorable to vaccines because they are unsafe*' and '*There is no need to vaccinate, because natural immunity exists*', considered as ordinal variables (Annex 1).

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The VL levels were assessed adapting twelve questions from a self-reported questionnaire for adulthood vaccination (7) built on the so-called Ishikawa test for chronic non-communicable diseases (8), and whose content and construct had already been validated, showing a highly significant positive correlation with knowledge about vaccines and immunization (9). Four items of the questionnaire were aimed at assessing the functional VL and eight items the interactive-critical VL (Annex 1), according to Nutbeam's definition (10). From the psychometric point of view, functional VL questions were mainly about the language, involving the semantic system, while the interactive-critical questions regarded more the cognitive efforts, such as problem solving and decision making. The answers were supplied by the interviewee according to Likert scales with four possible choices (4-never, 3-rarely, 2-sometimes, 1-often, for the functional questions; 1-never, 2-rarely, 3-sometimes, 4-often, for the interactive-critical questions). The score was obtained from the mean value of the answers to each scale, comprised between 1 and 4, a higher value corresponding to a higher VL level. These variables were treated as numerical, as in previous studies where comparable instruments were employed (8, 9, 11, 12).

Statistical analysis was carried out using using MedCalc Statistical Software version 18.2.1 and XLSTAT software version 2014.5.03 (13, 14), by means of descriptive tables (summarizing percentages, means, SD, CI, medians) and non-parametric tests, as all results of the enquiry were not following a normal distribution (see results). Spearman's correlation coefficient was calculated to determine the relationships of VL scales with other ordinal/numerical variables; chi-squared, Kruskal-Wallis and Mann-Whitney tests were used for categorical and ordinal variables. The internal consistency of the VL scales was assessed through the Cronbach's alpha coefficient. A Principal Component Analysis (PCA) of the VL scales was conducted to assess whether the underlying factors and each item's load on the factors could be identified as anticipated. For each analysis, an alpha level = .05 was considered as significant.

The study was performed following the Declaration of Helsinki as revised in 2013 and the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) guidelines (15). The Scientific Board of Lorenzini Foundation approved the survey. No other advice was sought, considering all measures taken to respect anonymity (including the privacy policy adopted by SurveyMonkey) and the informed consent of participants, as well as the opportunity of collecting the answers instantly, right at the time when the first results of Phase I trials with the first SARS-CoV-2 vaccines were communicated by the media (end May).

Results

Eight-hundred eighty five (885) answers were collected during a full two weeks, starting June 6th 2020, mainly through the web link. Most of participants (N = 496) answered during the second week. Answers to functional and interactive-critical questions showed good/acceptable consistency (Cronbach's alpha = 0.8500 and 0.7672, respectively); dropping progressively each variable, lowest values observed were 0.7857 for the functional and 0.7274 for the interactive-critical scale. PCA showed two factors accounting for 49.49% of the variability. A Varimax-rotation showed that all functional VL items loaded on one component (F2) and all communicative/critical VL items loaded on the other component (F1) (Table 1, Figure 1).

Approximately half of the participants were males and 98% were native Italian speaking. Regarding their age, 23% were in the 18-30, 37% in the 31-50 and 31% in the 51-65 years age group, while only 9% were over 65. Information sources most frequently used by the respondents were internet (72 %), social media (47%) and TV (49%), followed by journal-newspapers (31%) and radio (11%); other sources accounted for 22%. About 44% of respondents had a secondary and 54% a tertiary educational degree; 53% were resident in central, 31% in northern and 16% in southern Italy. About 60% were employed (15% were healthcare workers), 6% were unemployed, 11% retired, 14% students, and the remaining participants had other occupations.

The mean score of functional VL was 2.92 ± 0.70 (median 3.0), while the interactive-critical VL score was 3.27 ± 0.54 (median 3.4), on a maximum of 4 (table 2). The functional VL score was 2.85 ± 0.72 for females and 2.99 ± 0.68 for males, (P <.05, two-tailed Mann-Whitney) while the interactive-critical scores were 3.28 ± 0.55 and 3.26 ± 0.52, respectively (non-significant difference). Although no cut-off value has been established for the VL tool employed in this survey, a 'limited' VL (mean score value ≤ 2.50) has been observed in 33% and 11% of the population, for the functional and interactive-critical scales, respectively.

Non-significant differences between age classes of participants were observed for the functional VL scale; interactive-critical VL mean score was significantly higher between 31 and 65 years of age (P < .001, Kruskal-Wallis) (Figures 2 and 3). Both functional and interactive-critical skills were associated with the educational levels (P <.001, Kruskal-Wallis) and with the area of residence of respondents, with the lowest levels of functional and interactive-critical VL in central Italy (P <.05 and P <.001, Kruskal-Wallis, respectively). Regarding the relationship between VL and the employment status, significant differences were observed between the different occupations for the functional and the critical scale (P <.001, Kruskal-Wallis), the highest score being among healthcare workers, as expected (VL functional score =3.21; interactive-critical score =3.45).

Observed attitudes and perceptions on future Covid-19 vaccines are summarized in table 3. No significant association was observed between functional VL and positive attitude/perceptions on future Covid-19 vaccines, except for question n. 3 ('*Will Health Authorities succeed in vaccinating the entire population?*') (P < .05, Kruskal-Wallis), while the association was significant between interactive-critical VL and all the five questions (P values between < .05 and <.001, Kruskal-Wallis).

Behaviors toward current vaccination practices are summarized in table 4. All associations between functional as well as interactive-critical VL scores and positive behavior (i.e. acceptance of current vaccinations, including flu) were significant. Intention to be vaccinated against Covid-19 was significantly higher than that of receiving next seasonal flu vaccine (P < .001, chi-squared), as well as that of being vaccinated against other infectious diseases (P < .001, chi-squared).

Frequencies of positive answers regarding perceptions about future Covid-19 vaccines and behavior toward current vaccines were significantly higher during the second week of data collection, along with higher educational and VL levels, as well as older age of the respondents.

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Regarding beliefs about vaccination, the vast majority of respondents disagreed completely with both statements: *'I am not favorable to vaccines because they are unsafe'* (83%) and *'There is no need to vaccinate because natural immunity exists'* (84%). Much fewer respondents were partially in disagreement (13% and 12%, respectively) and very few were partially in agreement (3% and 2%, respectively). Answers in total agreement were sporadic (10 and 12 out of 885 respondents, respectively).

Differently than previous experiences, functional and interactive-critical VL scores were significantly related between themselves (P <.001). Correlations between VL scores and other ordinal/numerical variables are reported in table 5: significant values were observed between both VL scales and educational levels, along with questions related to beliefs about vaccination, while significant correlation was observed with age only for the interactive-critical VL scale. Positive beliefs about vaccination were significantly correlated with education, not with age.

Discussion

When Covid-19 emerged rapidly, health literacy, already considered important for non-communicable diseases, has appeared relevant also for the prevention of infectious diseases. Information about vaccination is quite complex, its comprehension requiring certain abilities, more than just literary skills, i.e. being able to understand healthcare-specific language (16). These capacities are determined not only by individuals' skills but also by the complexities of the health care system that can increase the communication demands placed on the individuals (17). The concept of vaccine literacy has been built on the same idea of health literacy: it has been defined as 'not simply knowledge about vaccines, but also developing a system with decreased complexity to communicate and offer vaccines as sine qua non of a functioning health system' (18). Vaccine hesitancy has emerged for some years, generating refusal or delay in acceptance of vaccinations. This behavior results from a complex decision-making process that is influenced by different factors summarized into the so-called "3 Cs" and following models, including complacency, confidence and convenience (19, 20). In particular, vaccination convenience is a significant factor when physical availability, willingness-to-pay, accessibility, language and health literacy affect vaccine uptake. Yet, limited health literacy is not taken into account frequently, although it is considered an important component and even if it is accepted that the success of communication strategies is limited by the difficulties in interesting low-literate individuals.

Health literacy becomes even more important in the context of the Covid-19 pandemic, considering the large amount of contradictory news provided by scientific as well as laic sources, including those about candidate SARS-CoV-2 vaccines. Health literacy might help people recognize the reasons behind medical recommendations and consider the outcomes of their possible actions. It is even more topical to prepare individuals for situations that require rapid reaction such as during a pandemic. Infodemic generates an overload of information that may have negative impact on the behavior toward all recommended vaccinations. This entails the risk of further decreasing vaccine coverage rates, as the pandemic lock-down has already caused a reduction of the immunization practices (5, 21).

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To our knowledge. this is one of the first web surveys to assess health literacy skills about vaccination, possibly useful for the implementation of other larger studies, when Covid-19 vaccines will be close to be licensed and in order to define strategic communication plans. The mean VL scores for both the functional and interactive-critical scales resulted elevated enough (2.92 and 3.27, respectively) and similar to those observed from one study carried out prior to the current outbreak, where the same tool was administered paper-and-pencil to a selected population, attending the waiting rooms of public health offices (9). From that experience, the average functional VL score was higher than the interactive-critical, while results of this survey have shown the opposite, with a higher interactive-critical score, comparable to what had been reported in other publications, where analogous instruments were employed face-to-face to assess health literacy skills within populations of parents, about their sons' vaccination (11, 12). In particular, from both of these studies it was shown that individuals with higher levels of interactive and critical health literacy were less likely to fully comply with the vaccination protocol, while functional health literacy did not have a direct association with compliance. This paradox has been explained by the possibility that misleading information, especially on the internet, may be difficult to evaluate, even for people with high levels of health literacy.

Rapid development of Covid-19 pandemic has called for people to acquire and apply health information, and adapt their behavior at a fast pace (5). This has stimulated motivation and abilities to look for correct medical information: the large amount and variety of news induced some individuals to look for accurate and reliable information, to check the credibility of the sources and to discuss with other people, thus increasing their interactive and critical skills. Yet, this can also be related to the characteristics and educational level of the participants, mainly secondary and tertiary degreed. On the other hand, the functional skills were challenged by the complexity and technicality of many news and information, thus explaining the lower functional score, also in highly educated persons.

No significant correlation was observed between functional VL score and positive perceptions about future Covid-19 vaccines, except for one question, while the association was highly significant between all questions and the interactive-critical score. Relevant was the high percentage (>90%) of subjects intending to be vaccinated against Covid-19. Interestingly, this willingness was significantly higher in the second week of the survey, along with a significant increase in the number of respondents and their positive perceptions about future Covid-19 vaccines. This corresponded, time-wise, to the announcement (on June 14, 2020) of the agreement between Europe's Inclusive Vaccines Alliance (IVA) and a vaccine manufacturer to supply massive doses of vaccine, with deliveries starting by the end of the year. Yet, these observations can also be related to different demographics of participants during the second week of data collection, respect to the first one. However, the less positive attitude observed in the first part of the survey (13% of participants not favorable to being vaccinated) was in agreement with the results of another enquiry carried out in Italy on one-thousand subjects few weeks before, in May, where 15% were not at all or likely not favorable to receiving a Covid-19 vaccine (https://www.engagemindshub.com/).

Not consistent with common knowledge was the high percentage of participants who declared to have been vaccinated against influenza (about 40%), considering the low proportion of respondents over 65 years of age, as main target group of flu recommendations. Also, the low frequency of respondents willing

to receive the next flu shot seems to be contradictory, when compared to the high percentage of individuals favorable to be vaccinated against Covid-19, and also other infectious diseases. This, despite that Authorities, scientific bodies and media were strongly recommending seasonal influenza vaccination for different reasons, i.e. to reduce the burden of both epidemics expected next winter, to protect most fragile individuals and also because of the suggestion of a possible association between lower Covid-19 related mortality and morbidity and influenza vaccination (22, 23). These observations refer to an usual issue about the true understanding of the value of flu vaccination and suggests that the positive attitude towards immunization against Covid-19 and other infectious diseases is based more on emotional aspects linked to the present infodemic, than on a correct perception of the upcoming possible risk of simultaneous epidemic of Covid-19 and seasonal influenza. All this reinforces the need of improving medical communication.

Regarding beliefs about vaccination, the vast majority of participants disagreed completely with the negative statements about the relevance of vaccination. However, a proportion of them, even though small, were only in part in disagreement and some were partially in agreement. The strong correlation between the positive opinions about vaccination, the educational degree and the VL levels of respondents, confirms the importance of improving the VL skills through targeted interventions.

The convenience sampling adopted for this enquiry represents an evident limitation of the study. Other limitations are common to most of the online surveys, and are related to the scarce digital inclusion of people with low educational level and the elderly. In Italy, only 42% of individuals between 65 and 74 years of age surf the web (compared to almost 90% of the 18-50 years classes), and TV and print media are their main sources of access to information (24, 25). Another limit was that the survey was carried out at the time of the reopening (second and third weeks of June 2020), following the lock down due to the Covid-19 pandemic, whose emotional impact was still relevant. This might restrain generalization of the results. In addition, the data presented in this study are self-reported and partly dependent on the participants' honesty and web abilities, as for similar surveys online. However, these limitations did not prevent achieving the main objective of the study, i.e. the feasibility of assessing health literacy skills online. The findings from the survey provide valuable information about the VL levels of a sample of a relevant part of the Italian population, in addition to their perceptions of Covid-19 vaccines, behavior toward flu vaccines and beliefs about vaccination, in general.

Other similar studies are desirable, including larger groups of population, with the aim of improving knowledge about the relevance of health literacy skills of the public, in particular about the vaccinations during epidemics, and tailoring specific interventions to increase them where necessary, in addition to adapting health communication and counteracting vaccine hesitancy. Health literacy is relevant for people in need of information and services, as well as for health-care workers and all individuals who provide them and assure their accessibility for the population. In this pandemic, although difficult, it is still possible to enhance it (26).

Conclusions

Rapid online surveys are a practical method to assess and trail perceptions and attitudes during rapidly evolving infectious disease outbreaks. Along with health system's, individual preparedness is key for solving complex real-life problems. Ensuring that the public is informed properly about a condition like Covid-19 could reduce unnecessary anxiety, improve behavior and reduce disease transmission. Web surveys are also useful to prepare communication strategies: for their fruitful realization VL levels of the general population should be considered. This preliminary enquiry shows that self-reported online tools can provide realistic assessment of health literacy levels: VL skills detected were comparable to those observed in previous studies using similar instruments validated adopting direct questioning methodologies.

Authors' contribution

LR Biasio drafted the study protocol and the report, and carried out the statistical analysis; LR Biasio, G Bonaccorsi and C Lorini formulated the questionnaire and reviewed the results and the analysis; S Pecorelli reviewed the questionnaire and the rationale; all Authors reviewed and approved the final manuscript.
No competing interests declared by the Authors

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References

1. Zarocostas J. How to fight an infodemic. Lancet 2020; 395: 676.

2. Hua J, Shaw R - Corona Virus (COVID-19) "Infodemic" and Emerging Issues through a Data Lens: The Case of China - Int. J. Environ. Res. Public Health 2020, 17(7), 2309 - https://doi.org/10.3390/ijerph17072309

3. Biasio LR, Carducci A, Fara GM et al - (2018) Health literacy, emotionality, scientific evidence: Elements of an effective communication in public health, Human Vaccines & Immunotherapeutics, 14:6, 1515-1516, DOI: 10.1080/21645515.2018.1434382

4. Sørensen K, Van Den Broucke S, Fullam J et al - Health literacy and public health: A systematic review and integration of definitions and models - BMC Public Health. 2012;12:80 - http://www.biomedcentral.com/1471-2458/12/80

5. Paakkari L, Okan O - COVID-19: health literacy is an underestimated problem - Lancet Public Health 2020 Published Online April 14, 2020 https://doi.org/10.1016/S2468-2667(20)30086-4

6. Signorelli C, Scognamiglio T, Odone A - COVID-19 in Italy: Impact of Containment Measures and Prevalence Estimates of Infection in the General Population – Acta Biom 2020 Apr 10;91(3-S):175-179 - doi: 10.23750/abm.v91i3-S.9511

7. Health Literacy about Vaccination of adults in ITalian (HLVa-IT) - downloadable at Health Literacy Tool Shed - https://healthliteracy.bu.edu/hlva-it (last accessed June 30 2020)

8. Ishikawa H, Takeuchi T, Yano E. Measuring functional, communicative, and critical health literacy among diabetic patients. Diabetes Care. 2008 May;31(5):874–9.
9. Biasio LR, Giambi C, Fadda G et al - Validation of an Italian tool to assess vaccine literacy in adulthood vaccination: a pilot study - Ann Ig May-Jun 2020;32(3):205-222.doi: 10.7416/ai.2020.2344

10. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. Health Promot Int. 2000;15(3):259–67

11. Del Giudice P, Pasquin F, Degani et al - Misurare l'alfabetizzazione vaccinale - Atti 51° Congresso Nazionale SItI, 2018, Riva del Garda, p.183 - http://www.igienistionline.it/docs/2018/41abstract.pdf

12. Aharon AA, Nehama H, Rishpon S, Baron-Epel O - Parents with high levels of communicative and critical health literacy are less likely to vaccinate their children, Patient Educ Couns (2016), http://dx.doi.org/10.1016/j.pec.2016.11.0

13. MedCalc Software bvba, Ostend, Belgium, 2015; https://www.medcalc.org

14. XLSTAT Version 2014.5.03, Addinsoft 1995-2014 (2014); https://www.xlstat.com/en/solutions

15. Eysenbach G - Improving the Quality of Web Surveys:The Checklist for Reporting. Results of Internet E-Surveys (CHERRIES) - J Med Internet Res 2004; 6(3):e34 - doi: 10.2196/jmir.6.3.e34

16. Rowlands G - Health literacy Ways to maximise the impact and effectiveness of vaccination information - Human Vaccines & Immunotherapeutics 10:7, 2130–2135; July 2014

17. Brach C, Benard P. Dreyer BP, Schillinger D - Physicians' Roles in Creating Health Literate Organizations: A Call to Action - J Gen Intern Med. 2014 Feb; 29(2): 273–275 - doi: 10.1007/s11606-013-2619-6

18. Ratzan SC. Vaccine literacy: a new shot for advancing health. J Health Commun. 2011 Mar;16(3):227–9

19. MacDonald NE, the SAGE working group on vaccine hesitancy: Definition, scope and determinants. Vaccine 2015; 33 (34):4161-4; PMID:25896383 http://dx.doi.org/10.1016/j.vaccine.2015.04.036

20. Betsch C,, Bohm R and Chapman GB - Using Behavioral Insights to Increase Vaccination Policy Effectiveness - PIBBS 2015, Vol. 2(1) 61–7 https://doi.org/10.1177/2372732215600716

21. Santoli JM, Lindley MC, DeSilva MB, et al. Effects of the COVID-19 Pandemic on Routine Pediatric Vaccine Ordering and Administration — United States, 2020. MMWR Morb Mortal Wkly Rep 2020;69:591–593. DOI: http://dx.doi.org/10.15585/mmwr.mm6919e2

22. Arokiaraj, Mark Christopher, Correlation of Influenza Vaccination and the COVID-19 Severity (April 10, 2020). SSRN: https://ssrn.com/abstract=3572814 or http://dx.doi.org/10.2139/ssrn.3572814

23. Belongia E, Osterholm M - COVID-19 and flu, a perfect storm Science 12 Jun 2020: Vol. 368, Issue 6496, pp. 1163 - DOI: 10.1126/science.abd2220

24. Censis - I media e la costruzione dell'identità - 16° RAPPORTO SULLA COMUNICAZIONE https://www.censis.it/comunicazione/i-media-e-la-costruzione-dell%E2%80%99identit%C3%A0 (last accessed June 30 2020)

25. ISTAT Cittadini e ICT Anno 2019 - https://www.istat.it/it/files//2019/12/Cittadini-e-ICT-2019.pdf (last accessed June 30 2020)

26. Geldsetzer P - Use of Rapid Online Surveys to Assess People's Perceptions During Infectious Disease Outbreaks: A Cross-sectional Survey on COVID-19 - J Med Internet Res 2020 | vol. 22 | iss. 4 | e18790 | p. 1 - http://www.jmir.org/2020/4/e18790/

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ANNEX 1 – Tools employed to assess skills, perceptions, attitudes, behavior and beliefs

Variable	Measure and Items	Assessment (score)
VL functional skills	**When reading or listening to information about future Covid-19 vaccines or current vaccines:** 1. Did you find words you didn't know? 2. Did you find that the texts were difficult to understand? 3. Did you need much time to understand them? 4. Did you or would you need someone to help you understand them?	Ordinal/numerical – 4 points Likert scale • Often (1) • Sometimes (2) • Rarely (3) • Never (4)
VL interactive/ critical skills	**When looking for information about future Covid-19 vaccines or current vaccines:** 1. Have you consulted more than one source of information? 2. Did you find the information you were looking for? 3. Have you had the opportunity to use the information? 4. Did you discuss what you understood about vaccinations with your doctor or other people? 5. Did you consider whether the information collected was about your condition? 6. Have you considered the credibility of the sources? 7. Did you check whether the information was correct? 8. Did you find any useful information to make a decision on whether or not to get vaccinated?	Ordinal/numerical – 4 points Likert scale • Often (4) • Sometimes (3) • Rarely (2) • Never (1)
Covid-19 vaccines perceptions and attitudes	**About future Covid-19 vaccines:** 1. Will be possible to produce safe and efficacious vaccines? 2. Will you get vaccinated, if possible? 3. Will Health Authorities succeed in vaccinating the entire population? 4. Would you pay a fee to be vaccinated? 5. Should children be vaccinated too?	Categorical YES/NO
Current vaccines behavior	**About current vaccines:** 1. Have you been vaccinated against flu last season? 2. Will you get vaccinated against flu this year? 3. Do you plan to be vaccinated against other infectious diseases?	Categorical YES/NO
Beliefs about vaccination	**How much do you agree with the following statements:** 1. '*I am not favorable to vaccines because they are unsafe*' 2. '*There is no need to vaccinate because natural immunity exists*'	Ordinal 4 points Likert scale • Totally (1) • A little (2) • Partially (3) • Not at all (4)

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Table 1: VL functional (1-4) and interactive-critical items (5-12) loading on component F2 and F1

ITEM	F1	F2
1	0.0035	**0.5873**
2	0.0110	**0.7366**
3	0.0019	**0.7529**
4	0.0059	**0.6789**
5	**0.4103**	0.0015
6	**0.3546**	0.0628
7	**0.4676**	0.0124
8	**0.3335**	0.0002
9	**0.2586**	0.0009
10	**0.2912**	0.0003
11	**0.4536**	0.0229
12	**0.4666**	0.0234

Table 2: VL functional and interactive-critical scores of the total, male and female populations

	Functional mean score (SD) [95% CI]	**Interactive-critical mean score (SD) [95% CI]**	**Functional Median (25 - 75 P)**	**Interactive-critical Median (25 - 75 P)**
Total (N = 885)	**2.92** (0.70) [2.87 - 2.97]	**3.27** (0.54) [3.23 - 3.30]	**3.00** (2.50 - 3.50)	**3.38** (3.00 - 3.66)
Male (N = 442)	2.99 (0.68) [2.92 - 3.05]	3.26 (0.52) [3.21 - 3.31]	3.00 (2.50 - 3.50)*	3.38 (3.00 - 3.63)
Female (N = 443)	2.85 (0.72) [2.77 - 2.92]	3.28 (0.55) [3.22 - 3.38]	3.00 (2.25 - 3.25)*	3.38 (3.0 - 3.75)

*P < .05, Mann Whitney

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Table 3: attitudes and perceptions about announced Covid-19 vaccines

	YES	NO
1. Will it be possible to produce safe and efficacious vaccines?	89%	11%
2. Will you get vaccinated, if possible?	92%	8%
3. Will Authorities succeed in vaccinating the entire population?	66%	34%
4. Would you pay a fee to be vaccinated?	84%	16%
5. Should children be vaccinated too?	87%	13%

Table 4: Acceptance of current vaccines for adults

	YES	NO
1. Have you been vaccinated against flu last season?	41%	59%
2. Will you get vaccinated against flu this year?	66%	34%
3. Do you plan to be vaccinated against other infectious diseases?	73%	27%

Table 5: Spearman rank correlation coefficients (r) and significance levels between ordinal and numerical variables observed in the survey

		EDUCATIONAL LEVEL	AGE GROUP	BELIEF 1st question	BELIEF 2nd question
FUNCTIONAL VL	Correlation coefficient Significance Level P N	0.120 P < .001 871	0.011 n.s. 885	0.196 P < .001 885	0.140 P < .001 885
INTEACTIVE-CRITICAL VL	Correlation coefficient Significance Level P N	0.159 P < .001 871	0.089 P < .05 885	0.234 P < .001 885	0.196 P < .001 885
EDUCATIONAL LEVEL	Correlation coefficient Significance Level P N		0.129 P < .001 871	0.110 P < .05 871	0.103 P < .05 871
AGE GROUP	Correlation coefficient Significance Level P N			-0.042 n.s. 885	0.033 n.s. 885

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FIG 1 - PCA correlation circle: projection of functional (ITEM 1 – ITEM 4) questions and interactive/ critical (ITEM 5 – ITEM 12) questions on two factors (F1 and F2), representing 49.49 % of the total variability. Variables close to each other = significantly positively correlated; orthogonal variables = not correlated.

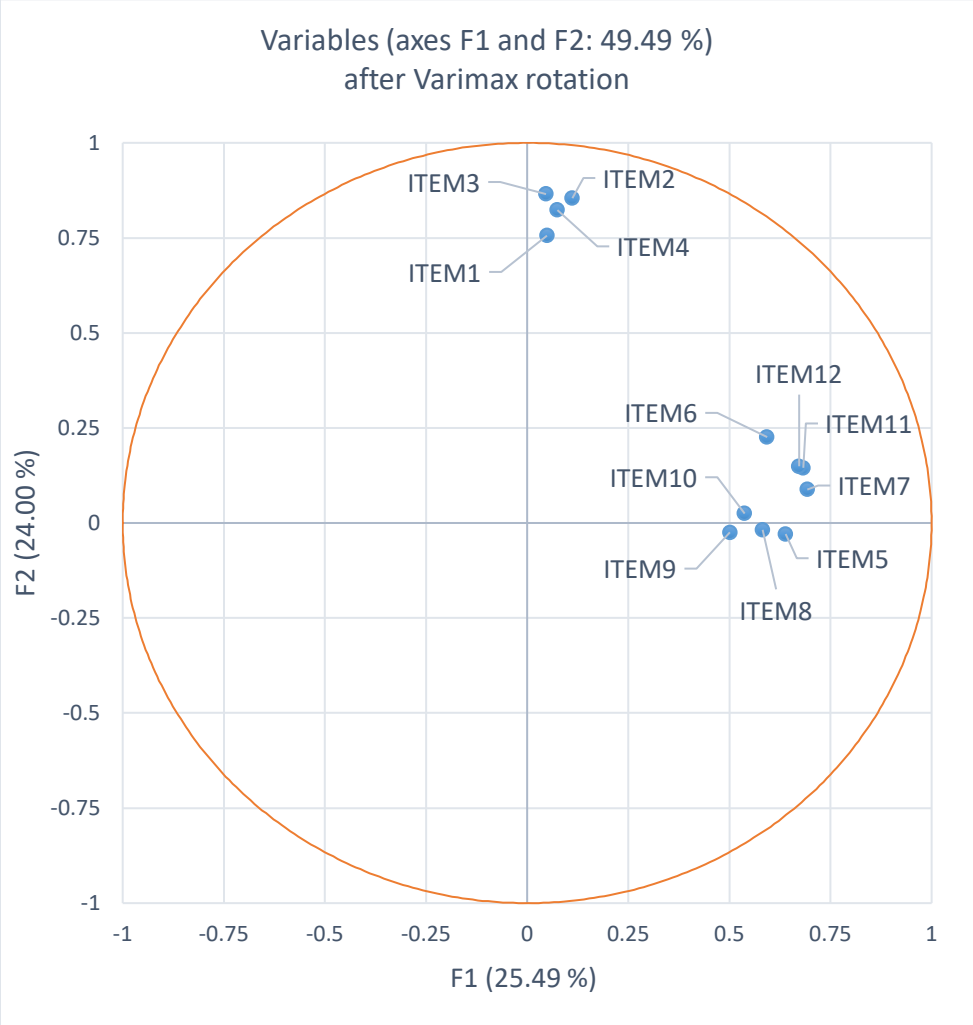

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Figure 2: observed functional VL scores, visualized as mean and 95% C.I. (error bars), according to age groups: 1=18-30; 2=31-50; 3=51-65; 4=over 65

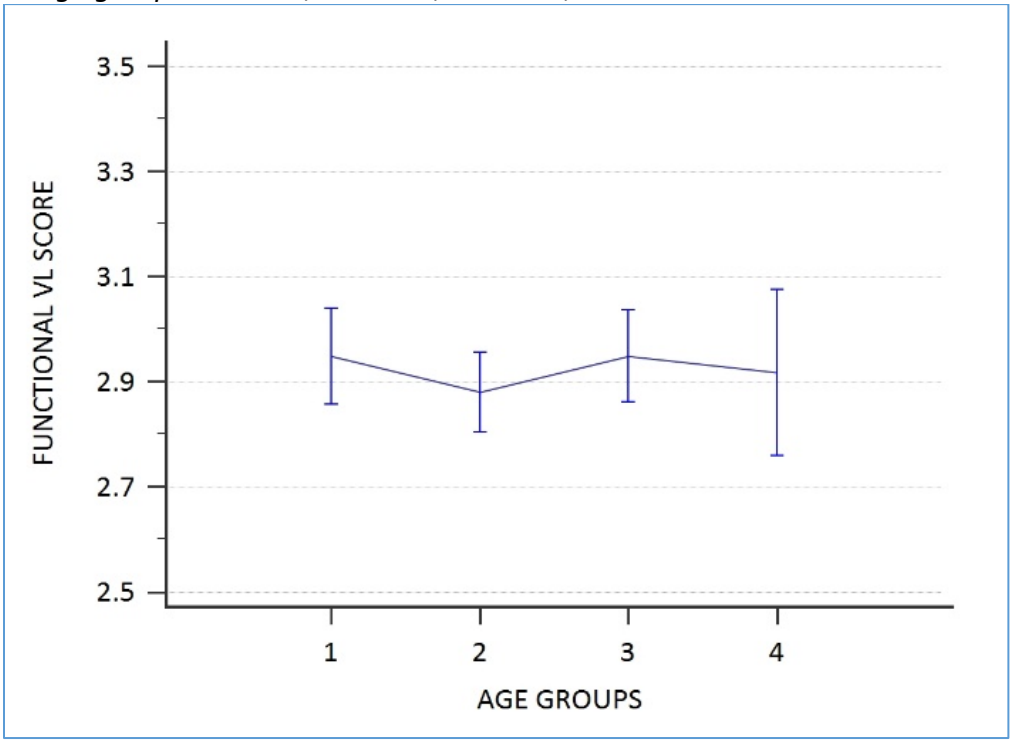

Figure 3: observed interactive-critical VL scores, visualized as mean and 95% C.I. (error bars), according to age groups: 1=18-30; 2=31-50; 3=51-65; 4=over 65.