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Information Certainty Influences the Attitudes of Students and Teachers Towards COVID-19

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Abstract

The COVID-19 pandemic struck Spain severely from the beginning. Prevention via information that fosters knowledge, reasonable concern, control, and personal care is the most effective means to slow down the pandemic. In this intervention field study, first, we assessed actual knowledge, concern, control, and care about the COVID-19 in 111 Spanish university teachers and students. Subsequently, we randomly assigned them to two groups. One group ($n = 53$) received *uncertain* information about prevention measures, whereas the other group ($n = 58$) received *certain* information. Analysis of covariance, using baseline measures as covariates, revealed that the group receiving the certain information reported an immediately increased perceived control and personal care about the pandemic. These findings suggest that measures that are known to be effective in COVID-19 prevention, if communicated with certainty (i.e., solid evidence), could influence people's attitudes, possibly through the schematic organisation of new information.

Keywords: adults; coronavirus; epidemic; morbidity; virus

The outbreak of the new coronavirus disease 2019 (COVID-19) on 11 March 2020 was declared a pandemic by the World Health Organization's Director-General (WHO, 2020). Spain was one of the most affected nations. Treatment is limited and vaccination at the time of writing was in its early stage. Prevention is the best way to combat the pandemic (Heymann & Shindo, 2020). Preventive measures are communicated via the media. If trusted, they can shape attitudes, which could influence behaviours (Petty & Briñol, 2008). Perceived credibility of media information concerning COVID-19 is associated with higher adherence to preventive measures (Lep et al., 2020).

Information about the COVID-19 pandemic is continuously changing with the increasing medical and scientific knowledge. However, only a part of the information becomes supported and strengthened (i.e., common symptoms), while other parts are either rebutted or expanded. The factual information has a more significant impact and may shape people's behaviour through schemas (Axelrod, 1973). Briefly, a schema is a unit of a piece of mentally stored knowledge or information. Schemas range from weak to strong. While the former is difficult to access in the memory (as it has no enduring impact), the more robust schemas, with a high impact on the person, are easily accessible for retrieval (Axelrod, 1973).

New life events like the COVID-19 pandemic have no antecedent schemas. Instead, people's attitudes, defined here as general evaluations of the specific situation (pandemic), are *borrowed* from an existing (i.e., influenza) schema and shaped with time via new information (Axelrod, 1973) to develop into specific schemas adapted to the novel situation. The threat of COVID-19 involves information ranging from perceived as uncertain to highly convincing or trusted. Based on Axelrod's (1973) schema theory, certain information form new and enduring schemas, while uncertain information may dissipate or diversify into restructured schemas. Research evidence suggests that certain and uncertain pieces of information are processed in different brain areas (Ploghaus, Becerra, Borras, & Borsook, 2003). Therefore, cognitive processing of information as certain or uncertain determines the person's attitude and behavioural response.

During a pandemic, the preventive attitudes, potentially translating into actual behaviours, are influenced by the level of trust in national measures (Van der Weerd, Timmermans, Beaujean, Oudhoff, & van Steenbergen, 2011). In addition, the new information also shapes these attitudes (Roskos-Ewoldsen, Klinger, & Roskos-Ewoldsen, 2007). The credibility or *certainty* of the new information predicts the public's general attitude and compliance with preventive measures associated with COVID-19 (Lep et al., 2020), which are crucial in controlling the pandemic (Heymann & Shindo, 2020).

The current study's objective was to test how attitudes towards COVID-19 are affected by certain information conveying solid support for its content and uncertain information that is not well supported. Based on the schema theory (Axelrod, 1973), we assumed that people have weak attitudinal schemas concerning COVID-19. We then hypothesised that *certain* information (convincing or having a significant impact) is *momentarily* more effective in influencing attitudes than uncertain information (unconvincing or having a lower impact).

Methods

We calculated the required sample size with the G* Power (v.3.1) software (Faul, Erdfelder, Buchner, & Lang, 2009). Input: four repeated measures, medium effect size (f) = .25, α = .05, r = .50, and power $(1 - \beta)$ = .90. This calculation yielded a minimum required sample size of 108. We conducted the study with the ethical approval of the Research Ethics Committee of the Autonomous University of Madrid (Registration No. CEI-106-2060).

Consenting students and teachers (n = 111, 63% women, M_{age} = 25.04, SD = 9.44, range 18–64 years) rated on single-item Likert scales, ranging from 0 (not at all) to 10 (very much), their perceived: (1) *concern*, (2) *knowledge*, (3) *control*, and (4) personal *care* about the COVID-19 pandemic in Spain in a lecture hall with distanced seating. The actual questions, translated from Spanish, were (1) Please indicate your level of personal concern about the coronavirus; (2) Please indicate the level of personal coronavirus knowledge; (3) Please indicate your perceived level of control that you have to avoid getting the coronavirus, and (4) Please indicate the level of personal care that you believe you have to prevent infection by the coronavirus. These questions were deemed highly pertinent based on recent research (De La Vega, Ruíz-Barquín, Boros, & Szabo, 2020).

While single-item scales are simplistic, they are practical in field studies (Riordan et al., 2018). Further, an excellent model fit demonstrated these questions' structural relationships to the latent variable investigated (attitudes towards Covid-19; see the Results section). After baseline measures, participants randomised into two groups went to two identical and adjacent lecture halls. One group (n = 53) received general information via inadequate support (Appendix) about the measures in fighting COVID-19 with a tentative conclusion: '*These measures are quite general, and it is not known how effective they are*'. The other group received similar information (Appendix) with solid support and a certain conclusion: '*These measures are very specific, clear and effective*'. The information given to both groups was presented visually, and participants had as much as they needed to read it. Subsequently, they rated the four measures again. This field experiment lasted about 15 min.

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Table 1 Descriptive Statistics and Results of Univariate Tests of the Differences Between Two Groups in Four Measures

Dependent measures	Groups[a]	Mean ± *SD*	*F*	*p*	η^2_p
Concern	Certain information	5.19 ± 2.29	0.90	.345	.009
	Uncertain information	4.96 ± 1.92			
Knowledge	Certain information	6.66 ± 1.89	3.21	.076	.030
	Uncertain information	6.34 ± 1.79			
Control	Certain information	7.26 ± 1.33	6.26	.014	.058
	Uncertain information	6.70 ± 1.35			
Care	Certain information	7.62 ± 0.81	50.02	<.001	.329
	Uncertain information	6.53 ± 0.93			

Note: [a]The degrees of freedom for the univariate *F* test are 1, 102; *SD* = standard deviation; η^2_p = effect size (partial ETA squared).

Results

The structural relationship of the four dependent measures to the latent construct, which was conceptualised as attitude about COVID-19, was tested with the structural equation modelling. The model fit was excellent ($\chi^2_{(1)} = .09$, $p > .05$, Comparative Fit Index (CFI) = 1.00, Tucker Lewis index (TLI) = 1.06, Root Mean Square Error of Approximation (RMSEA) = .001 [90% CI = .001 − .169], Standardized Root Mean Square Residual (SRMR) = .005).

The intervention effects were analysed with a multivariate 2 (groups) by 4 (measures) analysis of covariance (ANCOVA; see also the Endnote), where age, gender, university function (such as a teacher or student), and baseline measures were the covariates. The ANCOVA yielded a statistically significant multivariate effect for groups (Pillai's trace = .391, $F[4, 99] = 15.91$, $p < .001$, and effect size [η^2_p] = .391). Apart from the baseline measures, only age was a statistically significant covariate. The univariate tests revealed that the group receiving certain information scored higher on *perceived control* and *personal care* than those receiving uncertain information (Table 1). The difference in *perceived knowledge* approached, but it did not reach the accepted level of statistical significance (Table 1). Age was a significant covariate in perceived control only ($F[1, 102] = 3.97$, $p < .05$, $\eta^2_p = .037$).

We also calculated difference scores by subtracting the baseline from post-intervention values and classified them into three directional categories: decrease (lower score than the baseline), no change (identical scores to the baseline), and increase (higher score than the baseline). Finally, to examine group differences in the *frequencies of the direction* of changes in the dependent measures, we performed χ^2 tests. These tests indicated that the two groups differed in all four dependent measures (Table 2).

Discussion

In accord with our hypothesis, the findings suggest that existing attitudes towards COVID-19 could be influenced more by certain than uncertain information. More respondents reported increased knowledge and decreased concern in the uncertain than the certain group, while more individuals reported increased control and personal care in the certain than uncertain information group (Table 2). Perceived control and personal care, which differentiated the groups after the intervention (Table 1), were essentially unchanged (68% and 85%, respectively) in the uncertain information group. In contrast, they increased in the certain information group (45% and 71%, respectively).

The mechanism by which a piece of information is certain or uncertain to a person is complex. It can be described as the metacognitive thought involving self-confidence in one's thought, ranging from certainty to uncertainty (Petty & Briñol, 2008). Two people might have similar thoughts about a piece of information, but one person might feel greater credibility in it than the other. The

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Table 2 Frequency (and Percent) of Decrease, No Change and Increase in the Ratings of Four Measures in Two Groups Receiving Either Uncertain or Certain Information and the Statistical Difference Between Them Based on Chi-Square

	Uncertain information group ($n = 53$)			Certain information group ($n = 58$)				
Measures	Decrease	No change	Increase	Decrease	No change	Increase	χ^2	p
Knowledge	2 (4%)	25 (47%)	26 (49%)	2 (3%)	41 (71%)	15 (26%)	6.62	.037
Concern	14 (26%)	34 (64%)	5 (9%)	5 (9%)	51 (88%)	2 (3%)	8.74	.013
Control	5 (9%)	36 (68%)	12 (23%)	1 (2%)	31 (53%)	26 (45%)	7.99	.018
Care	2 (4%)	45 (85%)	6 (11%)	1 (2%)	16 (28%)	41 (71%)	40.04	<.001

Note: Percentages are rounded to integers and, therefore, they may not add up to exactly 100% in all instances (i.e., ±1% calculation error).

former has a greater impact considering the self-validation hypothesis (Petty & Briñol, 2008). So, message certainty that influences COVID-19 attitudes, as shown here and in related research (Lep et al., 2020), may not be a direct function of the information per se. However, solid, credible information can be the foundation of metacognitive thoughts that could alter or solidify mental schemas and the subsequent attitudes and behaviours.

The apparent implication of the current results is that messages aimed at COVID-19 prevention should preferably be communicated with solid and credible arguments, which could affect people's attitudes crucial in prevention. However, this form of delivery might not ensure attitude changes based on the elaboration likelihood model (Petty & Cacioppo, 1986), which considers that any information can affect attitudes in several ways through complex interactions during processing. Credible information can be processed centrally (thought about *message's arguments*) and peripherally (based on existing cue-schemas, like 'joy' or 'pain'). Both can change attitudes, but the former is enduring and while the latter might be short-lived.

Message transmission, aimed at influencing the audience, is referred to as framing (Scheufele & Tewksbury, 2007), which stresses issues that make the audience think about its effects. Framing tries to target the cognitive (central), rather than the affective (peripheral) component in the dual processing of attitudes (Epstein & Pacini, 1999). Framing is a sort of manipulation, and its content may not be valid, but its mode of presentation (certainty) makes it sound factual and, hence, could affect personal attitudes (Szabo, 2020). Certainty promotes credibility, which plays a role in the schema classification of the new information (Greer, 2003). Credibility, in turn, might affect attitudes in the function of the involvement level and central or peripheral processes (Petty & Cacioppo, 1986; Stiff, 1986). Thus, variability in the effect of certainty of information in the function of COVID-19 risk groups may be expected, and future studies should address this question. Still, solid COVID-19 information should be communicated with a frame of certainty (Olausson, 2009) to enhance the perceived legitimacy and impact the majority's compliance with the preventive measures.

Limitations

A limitation of the study is that the results cannot be generalised because of the cultural and social homogeneity of the participants. Future works should examine how people in different societies and socioeconomic groups respond to certain and uncertain information. Further, the observed changes in attitudes may not translate into preventive behaviours, which are probably worth further investigation. Finally, this work did not examine possible delayed effects or the observed changes' persistence, which should be scrutinised in future inquiries.

Endnote

Given the excellent model fit of the four dependent measures, we summed them to obtain pre- and post-overall attitude scores that we subjected to univariate ANCOVA using age, gender, university function, and the pre-attitude score as covariates again. This test was also statistically significant ($F[1,\ 105] = 6.16$, $p = .015$, $\eta^2_p = .055$), indicating that the certain information group scored higher ($M = 26.72$; $SD = 4.13$) than the uncertain information group ($M = 24.52$; $SD = 4.14$) after the intervention. However, we prefer to report the multivariate ANCOVA because it reflects which measures were specifically affected.

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Author contributions.

All authors contributed to the study's conception and design. Material preparation and data collection were performed by R.d.L.V. and R.R.-B. Data analyses were performed by A.S. and S.B. The first draft of the paper was written by A.S., and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Appendix

Text of the two types of information provided to the participants.

Spanish

a) Argumento con respaldo pobre:

El Coronavirus, es una enfermedad que se caracteriza por síntomas difusos como la fiebre moderada-alta, tos repetitiva, dolor de garganta y, en algunos casos, complicaciones relacionadas con problemas previos a nivel cardio-pulmonar y cardio-respiratorio. Las medidas establecidas hasta el momento son bastante generales y no se sabe hasta qué punto son efectivas para el control del coronavirus. Entre ellas se incluye el lavado adecuado de las manos, el empleo de mascarilla protectora en la cara y el mantenimiento de la distancia de seguridad entre personas de, al menos, 1.5 metros.

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English (translation)

a) Argument with inadequate support (uncertain information):

The coronavirus is a disease that is characterised by diffuse symptoms such as moderate-high fever, repetitive cough, sore throat, and, in some cases, complications related to previous problems at the cardiopulmonary and cardiorespiratory levels. The measures established so far are pretty general, and it is unknown to what extent they are effective in controlling the coronavirus. These include proper handwashing, using a protective face mask, and maintaining a safe distance between people of at least 1.5 m.

Spanish

b) Argumento con respaldo sólido:

El Coronavirus, según la OMS (2020), es una enfermedad que se caracteriza por síntomas claros como la fiebre moderada-alta, tos repetitiva, dolor de garganta y, en algunos casos, complicaciones relacionadas con problemas previos a nivel cardio-pulmonar y cardio-respiratorio. Las medidas establecidas son muy específicas, claras y eficaces para el control del coronavirus. En concreto, estudios de la Griffith University, desarrollados por el Dr. Mc Colleman, director también del instituto de investigación y desarrollo de enfermedades infecciosas (McColleman et al., 2020; fictive reference to add scientific value to the instruction), han demostrado que las medidas más eficaces son: el lavado adecuado de las manos, el empleo de mascarilla protectora en la cara y el mantenimiento de la distancia de seguridad entre personas de, al menos, 1.5 metros.

English (translation)

b) Argument with a solid support (*certain information*):

According to the WHO (2020), the coronavirus is a disease characterised by clear symptoms such as moderate-high fever, repetitive cough, sore throat, and, in some cases, complications related to previous problems at the cardiopulmonary and cardiorespiratory levels. The established measures are very specific, clear, and effective for the control of the coronavirus. Specifically, studies at Griffith University conducted by Dr. McColleman, director of the infectious diseases research and development institute (McColleman et al., 2020; fictive reference to add scientific value to the instruction), have shown that the most effective measures are: proper washing of the hands, the use of a protective mask on the face, and the maintenance of a safety distance between people of at least 1.5 m.

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