Title: Age and education moderate the relationship between confidence in health and political authorities and intention to adopt COVID-19 health-protective behaviours

Total word count: 7,251

Number of tables: 5

Number of figures: 1

Running head: Confidence in authorities and COVID-19 protection

Abstract

Purpose

Responding to worldwide pandemics, such as the recent COVID-19, requires the general public to comply with recommended health-protective behaviours at early stages of the spread of the virus.

Methodology

The current study of 1,211 Australians aimed to investigate whether confidence in political and health authorities predicted intention to adopt health-protective measures. We also investigated whether age, gender and education level moderated the relationship between confidence in authorities and adoption of health-protective behaviours.

Findings

Confidence in authorities predicted intention to stay home among respondents younger than 54 years old. Confidence in authorities also predicted intention to download the COVIDSafe app, and this was significantly stronger among better educated and older respondents. Although confidence did not predict intention to wear a face mask, the interaction between confidence and education predicted adherence to mask-wearing recommendations.

Value

Our findings can inform the development of targeted communications to increase health-protective behaviours at early stages of future pandemics.

Background

The general public relied on authorities for information about the Coronavirus Disease 2019 (COVID-19), especially at early stages of the pandemic. This included information about the virus transmission and the effectiveness of proposed control measures (Faasse and Newby 2020). Although most governments and international health authorities have informed the public about measures that they can apply to reduce their own risk of infection, many communities worldwide faced significant challenges to encourage adoption of health-protective behaviours and, consequently, manage the pandemic (Clark, Davila, Regis et al. 2020). This is particularly true among some segments of the population, including the elderly and individuals who are less educated (Daoust 2020). In this context, it is crucial to better understand the drivers towards the adoption of health-protective behaviours as well as the role of socio-demographic variables, such age, gender and education, in adoption. When tackling a pandemic, such as COVID-19, early interventions based on the drivers towards the adoption of health-protective behaviours are crucial to stop the spread of the disease (Cowper 2020). This knowledge can inform the development of targeted communications at early stages of future pandemics.

Some of the recommended health-protective measures to prevent the transmission of COVID-19, such as wearing a face mask and physical distancing in public spaces, can be enforced by mandatory restrictions, including fines for breaches (Murphy, Williamson, Sargeant et al. 2020). However, the full adoption of health-protective behaviours depends on the willingness and support from the general public (Devine, Gaskell, Jennings et al.). Past research has shown that health public measures may be more likely to be adopted by those individuals who have higher levels of confidence and trust in their political leadership (Bangerter 2014). For instance, confidence in authorities was associated with greater adoption of health-protective behaviours to prevent the spread of the Swine Flu pandemic in 2009 and the African Ebola outbreak in 2016 (Blair, Morse and Tsai 2017, Rubin, Amlôt, Page et al. 2009). Further, confidence in the World Health Organisation (WHO) was associated with higher willingness to receive vaccination during the H1N1 pandemic (Aziz, Muhamad, Manaf et al. 2013). Therefore, it is relevant to investigate the association between confidence in political and health authorities and adoption of health-protective behaviours in the context of the COVID-19 pandemic.

Previous studies have shown that age, gender and education level may influence confidence in political and health authorities and, consequently, play a role in adherence to authorities' recommendations. Specifically, more education (or more years of formal schooling) is associated with higher confidence in authorities, and this may lead to higher willingness to adopt health protective measures (Anderson and Singer 2008, Kuo, Huang and Liu 2011, Pérez-Morote, Pontones-Rosa and Núñez-Chicharro 2020, Peters, Baker, Dieckmann et al. 2010). While recent evidence suggests that there are no gender differences in confidence in health authorities, it has been shown that women are more likely to adhere to health-protective behaviours to prevent the spread of COVID-19 (Galasso, Pons, Profeta et al. 2020). Further, previous studies have shown that older people are more likely to have higher levels of confidence in political authorities. However, they are less prone to use electronic government services, such as visits to the government website and use of e-mail to contact government departments (Goldfinch, Gauld and Herbison 2009, Pérez-Morote et al. 2020). In other words, despite older people having greater confidence in political authorities, they may be less likely to adopt some of the recommended health-protective measures to stop the transmission of COVID-19, particularly those that require the use of technological innovations (Mostaghel 2016). There is also evidence showing that gender plays a role in adherence to health-technology innovations. Although women are generally more sensitive to threat-related stimuli and, as a consequence of this, more likely to seek medical advice, they show less interest in health-technology devices and are less likely to use mobile health services (Fitzgerald, Anderson and Davis 1995, Guo, Han, Zhang et al. 2015, Pyenson 2017, Rhudy and Williams 2005). However, previous studies have not examined how education level, age and gender influence confidence in authorities and adoption of a range of health-protective measures to prevent the transmission of COVID-19.

A range of recommendations has been made in Australia since March 2020 to control the transmission of the coronavirus. These recommendations included practicing good hand hygiene, travel restrictions, and use of face masks in public spaces when unable to physically distance, particularly in indoor settings. The Australian government has also invested in contact tracing technologies in accordance with the WHO's recommendation of identifying, monitoring and following up with individuals infected with COVID-19 (Goggin 2020). These tracing technologies include the development of an App (COVIDSafe) on April 14th 2020 (Goggin 2020). The COVIDSafe app allows health authorities to alert people who have been a close contact of a confirmed case.

This study aimed to examine (i) whether confidence in political and health authorities predicted intention to adopt recommended health-protective behaviours; and (ii) whether age, gender and education level moderated the relationship between confidence in political and health authorities and health protective-behaviours. We hypothesised that (i) confidence in health and political authorities would predict adherence to protective measures; and (ii) age, gender and education would moderate (or strengthen) the relationship between confidence in health and political authorities and adherence. This study focused on the intention to adopt the following recommended health-protective behaviours: (i) download the COVID-safe app that helps identify people exposed to COVID-19 in Australia; (ii) wear a face mask in public spaces; and (iii) stay at home except for essential activities. To test our hypotheses, behavioural intention was used as a proxy of actual behaviour. Previous studies have shown that behaviour intention is a strong predictor of actual behaviour (Wdowik, Kendall, Harris et al. 2001). Our analyses controlled for past behaviour, including how often over the preceding week participants adopted recommended health-protective behaviours to reduce infection with COVID-19.

Data and Methods

This study was undertaken as part of a larger project [Survey of COVID-19 Responses to Understand Behaviour (SCRUB)]. The SCRUB project is a regular survey tracking how people are behaving in the context of the COVID-19 pandemic.

The data analysed in this study was collected between April 22nd and April 24th 2020. During the week that the study was conducted, there were 6,649 confirmed cases and 74 deaths recorded in Australia. Sixty-four percent of these cases were associated with individuals who contracted the virus outside Australia while 36% of them were locally acquired (Australian Government Department of Health 2020). In this context, the Australian Government Department of Health website stated that people were expected to adopt the following health-protective measures to reduce the spread of COVID-19: i) practise good hygiene; ii) practise physical distancing; iii) follow the limits for public gatherings; iv) understand how to self-isolate if they needed to; and v) isolate themselves if they were a confirmed case.

The target population for the survey were Australians aged between 18 and 90 years old. The survey was distributed via an online panel provider, who emailed eligible participants from their panel of members an invitation to complete the survey. The research was approved by the Monash University Human Research Ethics Committee (2020-23854).

Participants

In total, 1,206 adults living in Australia, aged between 18 and 89 years old, were recruited to complete the final version of the survey.

Measures

Table 1 below presents an overview of the questions used to assess confidence in political and health authorities, behavioural intentions, and past behaviour. Confidence in health and political authorities was measured with the response scale *1 - Very low confidence* to *7 - very high confidence*. Behavioural intentions were measured with the response scale *0 - Not at all likely* to 10 *extremely likely*. Past behaviour was measured with the response scale *1 - Never* to *5 - Always*.

[Please insert Table 1 here]

Data analysis

We tested the hypothesised relations among the variables using *R* 4.0.2 (R Core Team, 2020). As a preliminary step, we screened the main variables of interest (confidence in authorities and intention to adopt health-protective behaviours over the following six months) for missing patterns that could be imputed. Respondents with less than 5% of missing data had their values imputed using multiple imputation by chained equations (van Buuren and Groothuis-Oudshoorn 2011). Respondents with more than 5% of missing data were excluded from the subsequent analyses.

We used Confirmatory Factor Analysis (CFA) to compute factor scores and group our main variables of interest (confidence in authorities, intention to adopt health-protective behaviours in the following six months and past behaviour). This is the preferred method when factor score estimates will be used as predictor variables. A factor score estimate is a numerical value that represents a participant's relative standing on a latent factor (Skrondal and Laake 2001). The computed factor score estimates are standardised with a mean of zero and a standard deviation of one (Skrondal and Laake 2001). The factor score estimate for confidence in authorities was derived from all survey questions that assessed confidence in political and health authorities (i.e. How much confidence do you have that the following authorities can minimise the harm caused by COVID-19?). Further, the factor score estimate for past behaviour was derived from all survey questions that assessed past behaviour (i.e. In the past 7 days, how frequently have you taken the following actions to reduce the spread or prevent infection with COVID-19?). Please see Table 1 for details. These factor estimates were treated as observable variables and used as predictors in hierarchical regression models. Variables assessing intention to adopt protective-health measures over the following six months (wear a face mask in public spaces, download the COVIDSafe app and stay home) were treated as individual variables and included as dependent variables in hierarchical regression models.

For the CFA, parameters were estimated using the Weighted Least Squares Mean and Variance (WLSMV), which is specifically designed for ordinal data (Muthén and Asparouhov 2012). Reported goodness-of-fit indices included: Chi-square (χ^2), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square of Error Approximation (RMSEA) and the associated 90% confidence interval (90% CI). The significance value of chi-square is sensitive to large sample sizes and frequently produces a statistically significant result (Muthén and Asparouhov 2012). We accepted TLI and CFI values higher than 0.90 and RMSEA values lower than 0.08 (Sahoo 2019).

We computed the correlations between all variables using the Spearman's rank-order coefficient of correlation. We then conducted a series of hierarchical regression analyses to examine the ability of confidence in political and health authorities to predict intention to adopt health-protective behaviours (intention to stay home, intention to wear a face mask in public spaces, and intention to download the COVIDSafe app). In these analyses, we included demographic variables (first step), past behaviour (second step), confidence in authorities (third step), interaction between confidence and education level (fourth step), interaction between confidence and gender (fifth step), and interaction between confidence and age (sixth step) as predictors. Variables assessing intention to adopt health-protective behaviour (wear a face mask in public spaces, download the COVIDSafe app and stay home) were included as dependent variables in separate hierarchical regression models. Participants' state was statistically controlled for.

Significant interactions were further explored using the simple-slope analysis (Curran, Bauer and Willoughby 2006). This means that we examined significant interactions by selecting a value of the moderator (e.g. female) and then estimating the conditional effects of confidence in authorities on behavioural intention at different values of these moderators (e.g. females vs males). Age levels included mean scores, one standard deviation above and one standard deviation below the sample mean age. Further, we calculated the Johnson-Neyman interval to investigate in which of these age brackets the estimated relationship between confidence in authorities and intention to adopt health-protective behaviours was likely to be significant (Curran et al. 2006). The conditional effects of gender and education (categorical variables) on the relationship between confidence and behavioural intention was examined based on the levels of these moderator variables (e.g. the effect of confidence on the intention to wear a face mask in males vs the effect of confidence on the intention to wear a face mask in females).

Regression models were checked for the following assumptions: outliers, residuals normality, and additivity. We used the following criteria to identify outliers: Mahalanobis distance, Leverage and Cook's distance. Participants who met these criteria were excluded from further analysis. For additivity, we calculated the generalised variance-inflation factor as the regression models included both ordinal and continuous (factor score estimates) independent variables. The GVIF is a model diagnostic index that indicates if a variable presents multicollinearity with the other variables included in the regression model. A GVIF higher than 5 was considered an indication of multicollinearity (Curran et al. 2006).

Results

The final sample comprised data from 932 participants (Mean age = 49.46, SD = 17.14). There was no data to be imputed (i.e. no respondent with less than five percent of missing data in their respective row). The Little's MCAR test (Little 1988) was significant for the past behaviour items (χ^2 [34] = 68.63 $p < .001$) and for the confidence and authorities items (χ^2 [37] = 59.30 $p = .011$). This suggested that there was no data missing at random and, therefore, no need for data to be imputed. For the behaviour intention items, the Little's MCAR test was not significant (χ^2 [6] = 9.50 $p = .147$). However, the lowest missing percentage for a participant was 33.33%. Therefore, we conducted the analyses with only those participants who fully completed the survey.

[Insert Table 2 here]

[Insert Table 3 here]

Confirmatory Factor Analysis (CFA)

Confidence in health and political authorities: The model including all questions used to measure confidence in authorities provided a poor fit to the data (χ^2 [9] = 401.05, $p < .001$, CFI = .971, TLI = .952, RMSEA = .216 [90% CI .119, .235]). Allowing the following error terms to covary (confidence in state and confidence in national leaders, confidence in national leaders and confidence in state leaders, confidence in national leaders and confidence in state leaders, confidence in local leaders and confidence in state, confidence in local leaders and confidence in the WHO authorities) significantly improved model fit (χ^2 (4) = 21.72, $p < .001$, CFI = .999, TLI = .995, RMSEA = .069 [90% CI .042, .099]).

Adoption of health-protective behaviours over the last seven days: The model including all questions used to measure past behaviour provided a poor fit to the data (χ^2 [5] = 88.73, $p <$ .001, CFI = .940, TLI = .880, RMSEA = .134 [90% CI .110, .159]). Allowing the error terms of the items related to physical distance and stay home to covary significantly improved model fit (χ^2 [4] = 8.58, $p = .073$, CFI = .997, TLI = .992, RMSEA = .035 [90% CI .000, .068]).

Correlations

The correlation between all variables is presented in Table 4. The highest bivariate correlation was observed between the confidence score and intention to download the COVIDSafe app ($r = .26$, $p < .001$). The bivariate correlation between the confidence score and intention to stay home was also significant ($r = .13$, $p < .001$), as well as the bivariate correlation between the confidence score and intention to wear a face mask ($r = .09$, $p < .01$). However, all correlation values were low, suggesting that the confidence score shares only a small amount of variance with intention of adopting health-protective behaviours.

[Insert Table 4 here]

Regression Analyses

All regression models failed to meet residual normality according to the Shapiro-Wilk test [stay home (w = .96 p < .001); download the app (w = .97 p < .001); wear a face mask (w = .95 p < .001)] (see Table 5 for all coefficients). The factor score estimate for confidence in authorities was significantly associated with intention to stay home (b = 0.23, p < .001, ΔR^2 = .005) and with intention to download the COVIDSafe app (b = 1.00, p < .001, ΔR^2 = .071), but not with intention to wear a face mask (b = 0.18, p = .089, ΔR^2 = .001).

Intention to stay at home: In the model including intention to stay home as the dependent variable, the only significant interaction was between the factor score estimate for confidence in authorities and age (b = -0.20, p = .034, ΔR^2 = .004). Breaking down this interaction revealed that, when age was below one standard deviation from the mean, the slope value for confidence in authorities was 0.69 p < .001. For age values within the mean range, the slope value for confidence in authorities was 0.37 p = .010. When age was above one standard deviation from the mean, the slope value for confidence was 0.06 p = .770. The Johnson-Neyman interval suggests that the association between confidence in authorities and intention to stay home is only significant for respondents under 54 years of age. The interaction between confidence in authorities and gender was not significant (b = 0.26, p = .134, ΔR^2 = .001).

Intention to download the COVIDSafe app: In the model including intention to download the COVIDSafe app as the dependent variable, there was a significant interaction between the factor score estimate for confidence in authorities and education level (*b* = 0.51, *p* = .023, ΔR^2 = .004), and between the factor score estimate for confidence in authorities and age (*b* = 0.28, *p* = .028, ΔR^2 = .004). The interaction between the factor score estimate for confidence in authorities and gender was not significant (*b* = 0.14, *p* = .552, ΔR^2 = -.001). Breaking down the interaction between confidence in authorities and education level revealed that the slope for confidence was 1.01 ($p < .001$) for those respondents with a high school degree. For respondents with a university degree or higher, the slope for confidence was 2.05 ($p < .001$), suggesting that the association between confidence and the intention to download the app is twice as large for respondents with a university degree or higher compared to those respondents who are less educated. Breaking down the interaction between confidence in authorities and age revealed that the slope value for confidence was 1.10 ($p < .001$) when age was below one standard deviation from the mean. The slope value for confidence was 1.53 ($p < .001$) for age values that fell within the mean range. When age was at least one standard deviation above the mean, the slope value for confidence was 1.96 ($p < .001$). These results suggest that the association between confidence and intention to download the COVIDSafe app was significant for all age groups. However, this relationship was stronger for older respondents (above 1 SD in age, ~66.59 years) than for younger respondents (below 1 SD in age, ~32.42 years).

Intention to wear a face mask in public spaces: In the model including intention to wear a face mask in public spaces as the dependent variable, the only significant interaction was between the factor score estimate for confidence in authorities and education level (*b* = 0.45, *p* = .030, ΔR^2 = .004). Breaking down this interaction revealed that the slope value for confidence was 0.03 (*p* = .900) for respondents with a high school level degree or less. For respondents with a university degree or higher, the slope value for confidence was 0.61 (p = .010). These results suggest that the association between confidence in authorities and intention to wear a face mask in public spaces was only significant for respondents who were better educated (see Figure 1). The interaction between confidence in authorities and gender was not significant (b = 0.11, p = .603, ΔR^2 = -.001).

[Insert Table 5 here]

[Insert Figure 1 here]

Discussion

This study investigated if confidence in authorities, and its interaction with age, gender and education, predicted intention to adopt health-protective behaviours to reduce the spread of COVID-19. Consistent with our hypotheses, confidence in health and political authorities significantly predicted intention to adopt health-protective behaviours over the following six months. Specifically, confidence in health and political authorities predicted intention to stay home and intention to download the COVIDSafe app, but not to wear a face mask in public spaces. Age moderated the relationship between confidence in authorities and intention to stay home (i.e. among respondents with less than 54 years old, confidence in authorities was associated with higher intention to stay home over the following six months). Further, age and education level moderated the relationship between confidence in authorities and intention to download the COVIDSafe app (i.e. among older respondents and those with a university degree or higher, confidence in authorities was more strongly associated with intention to download the COVIDSafe app over the following six months). Although confidence did not predict intention to wear a face mask in public spaces, the interaction between confidence and education predicted adoption of mask-wearing (i.e. among participants with a university degree or higher, more confidence in authorities was associated with higher intention to wear a mask in public spaces). Further, gender did not moderate the relationship between confidence in authorities and health-protective behaviours. Altogether, our results suggest that the role of age and education in the relationship between confidence in authorities and adoption of health-protective behaviours varies according to the recommended measure (e.g. stay home, download the COVIDSafe app and wear a face mask in public spaces).

Findings regarding confidence in political and health authorities are consistent with previous studies linking confidence in authorities with greater adherence to a wide range of government recommendations and prosocial behaviours under conditions of uncertainty (Alkuwari, Aziz, Nazzal et al. 2011, Basolo, Steinberg, Burby et al. 2008, Guglielmi, Dotti Sani Giulia, Molteni et al. 2020, van der Weerd, Timmermans, Beaujean et al. 2011). These studies have shown that confidence in authorities is associated with higher levels of preparedness to natural hazards risks, less likelihood to own firearms, and higher levels of intention to receive vaccination during the influenza A (H1N1) pandemic (Basolo et al. 2008, Jiobu and Curry 2001, van der Weerd et al. 2011). During exceptional circumstances, such as those of COVID-19, confidence in authorities may comprise the willingness to collaborate with restrictive public health measures based on trust and expectations of the intentions and behaviours of others (Siegrist and Zingg 2014). Individuals who have more confidence in political and health authorities may be more likely to use advice from these entities to form their own judgment about appropriate measures to prevent the transmission of COVID-19, and act on the basis of this advice (Twyman, Harvey and Harries 2008). This is because confidence in government inspires trust, which leads to the belief that the actions and motives of another person or institution are honest, fair and based on ethical principles (Ahern and Loh 2020).

Our findings showed that confidence in political and health authorities predicted intention to wear a face mask only for those participants who have a university degree or higher. This is consistent with previous research showing that higher education is associated with higher likelihood to adopt protective behaviours, especially wearing a face mask in public spaces (Kuo et al. 2011, Taylor, Raphael, Barr et al. 2009). It is possible that more educated individuals have a better understanding of the effectiveness of face coverings to stem the spread of COVID-19 (Gallè, Sabella, Da Molin et al. 2020). Further, our findings showed that, among older respondents and those with higher education, confidence in authorities was more strongly associated with the willingness to download the COVIDSafe app. The download of the COVIDSafe app requires individuals to have access to a smart phone capable of accessing the internet and downloading applications, and possess the knowledge of how to use them (Gatto and Tak 2008). This finding of a divide in the intention of downloading the COVIDSafe app is significant especially in light of the growing literature on the concept of 'digital divide' (Willis and Tranter 2006). This concept posits that there are disparities in the use and access to digital media on age and education (Willis and Tranter 2006). Although older people are enthusiastic users of information and communication technologies, they may lack the confidence and knowledge to download and use mobile applications properly (Damodaran, Olphert and Sandhu 2014). It is possible that, among older individuals, confidence in authorities and the willingness to collaborate with these entities may facilitate the overcoming of the barriers to the adoption of the COVIDSafe app (Kaspar 2020). Conversely, previous research has shown that people with higher education are more likely to take up online e-government services because they have more familiarity and feel more confident about how to navigate government apps and websites (Goldfinch et al. 2009). This is consistent with previous research showing that people with higher education use computers more frequently and are more likely to use Internet technologies and apps for daily transactional activities, such as paying bills and managing bank accounts (Brown and Venkatesh 2005).

We found that confidence in authorities was associated with higher intention to stay home over the following six months among respondents below 54 years of age. It is likely that those respondents older than 54 years old who are willing to comply with stay-home recommendations do so for reasons other than confidence in political and health authorities. Recent research has shown that older people have a higher perceived risk of being infected with COVID-19 as they are considered the high-risk group to the novel coronavirus (He, Chen and Long, 2020). Future studies should investigate whether elderly people's willingness to stay home over the following six months is driven by their higher perceived risk of being infected.

Our findings should be considered in the context of some limitations. We measured behavioural intention instead of actual behaviour. Although several studies have shown that behaviour intention is a strong predictor of actual behaviour, the use of behavioural intentions may have resulted in an overestimation of the tested effects as intentions do not always translate into practices (Wdowik et al. 2001). Despite these limitations, our findings can inform population segmentation and, therefore, offer potential pathways for population-targeted communications to encourage health-protective behaviours to reduce the spread of COVID-19 and prevent future pandemics at early stages. It is also important to note that our findings can assist the development of personalised pro-vaccine messages to increase willingness of key population segments to receive the COVID-19 vaccine. Evidence-based communications based on a comprehensive understanding of people's motivations to receive the vaccine are critical to address vaccine hesitancy and foster vaccine confidence (Chou and Budenz 2020).

We concluded that confidence in health and political authorities, and its interaction with age and education level, predicted intention to adopt health-protective behaviours, including intention to stay home (except for essential activities), wear a face mask in public spaces and download the COVIDSafe app. This knowledge can help political and health authorities to prepare for and mitigate the impact of future outbreaks and other pandemics.

Conflict of interest

None to declare.

References

Ahern, Susannah and Erwin Loh. 2020. "Leadership During the Covid-19 Pandemic: Building and Sustaining Trust in Times of Uncertainty." *BMJ Leader*:leader-2020-000271. doi: 10.1136/leader-2020-000271.

Alkuwari, Mohamed Ghaith, Nagah A. Aziz, Zaher A. S. Nazzal and Saad A. Al-Nuaimi. 2011. "Pandemic Influenza a/H1n1 Vaccination Uptake among Health Care Workers in Qatar: Motivators and Barriers." *Vaccine* 29(11):2206-11. doi: 10.1016/j.vaccine.2010.08.093.

Anderson, Christopher J. and Matthew M. Singer. 2008. "The Sensitive Left and the Impervious Right: Multilevel Models and the Politics of Inequality, Ideology, and Legitimacy in Europe." *Comparative Political Studies* 41(4-5):564-99. doi: 10.1177/0010414007313113.

Australian Government Department of Health 2020. Camberra, Australia: Australian Government Department of Health. Retrieved December 17, 2020 (https://www.health.gov.au/).

Aziz, Noor Azah, Shanaz Muhamad, Mohd Rizak Abd Manaf and Mohd Zaini Abd Hamid. 2013. "Factors Influencing H1n1 Vaccination among Primary Health Care Workers: A Cross-Sectional Study." *International journal of preventive medicine* 4(6):664-70.

Bangerter, Adrian. 2014. "Investigating and Rebuilding Public Trust in Preparation for the Next Pandemic." *European Psychologist* 19(1):1-3. doi: 10.1027/1016-9040/a000173.

Basolo, Victoria, Laura J. Steinberg, Raymond J. Burby, Joyce Levine, Ana Maria Cruz and Chihyen Huang. 2008. "The Effects of Confidence in Government and Information on Perceived and

Actual Preparedness for Disasters." *Environment and Behavior* 41(3):338-64. doi: 10.1177/0013916508317222.

Blair, R. A., B. S. Morse and L. L. Tsai. 2017. "Public Health and Public Trust: Survey Evidence from the Ebola Virus Disease Epidemic in Liberia." *Soc Sci Med* 172:89-97. doi: 10.1016/j.socscimed.2016.11.016.

Brown, Susan A. and Viswanath Venkatesh. 2005. "Model of Adoption of Technology in Households: A Baseline Model Test and Extension Incorporating Household Life Cycle." *MIS Quarterly* 29(3):399-426. doi: 10.2307/25148690.

Chou, W. S. and A. Budenz. 2020. "Considering Emotion in Covid-19 Vaccine Communication: Addressing Vaccine Hesitancy and Fostering Vaccine Confidence." *Health Commun* 35(14):1718-22. doi: 10.1080/10410236.2020.1838096.

Clark, C., A. Davila, M. Regis and S. Kraus. 2020. "Predictors of Covid-19 Voluntary Compliance Behaviors: An International Investigation." *Glob Transit* 2:76-82. doi: 10.1016/j.glt.2020.06.003.

Cowper, Andy. 2020. "Covid-19: Are We Getting the Communications Right?". *BMJ (Clinical research ed.)* 368:m919. doi: 10.1136/bmj.m919.

Curran, Patrick J., Daniel J. Bauer and Michael T. Willoughby. 2006. "Testing and Probing Interactions in Hierarchical Linear Growth Models." Pp. 99-129 in *Methodological Issues in Aging Research., Notre Dame Series on Quantitative Methods.* Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Damodaran, L., C. W. Olphert and J. Sandhu. 2014. "Falling Off the Bandwagon? Exploring the Challenges to Sustained Digital Engagement by Older People." *Gerontology* 60(2):163-73. doi: 10.1159/000357431.

Daoust, J. F. 2020. "Elderly People and Responses to Covid-19 in 27 Countries." *PLoS One* 15(7):e0235590. doi: 10.1371/journal.pone.0235590.

Devine, Daniel, Jennifer Gaskell, Will Jennings and Gerry Stoker. "Trust and the Coronavirus Pandemic: What Are the Consequences of and for Trust? An Early Review of the Literature." *Political Studies Review* 0(0):1478929920948684. doi: 10.1177/1478929920948684.

Faasse, Kate and Jill Newby. 2020. "Public Perceptions of Covid-19 in Australia: Perceived Risk, Knowledge, Health-Protective Behaviors, and Vaccine Intentions." *Frontiers in Psychology* 11(2553). doi: 10.3389/fpsyg.2020.551004.

Fitzgerald, J. T., R. M. Anderson and W. K. Davis. 1995. "Gender Differences in Diabetes Attitudes and Adherence." *Diabetes Educ* 21(6):523-9. doi: 10.1177/014572179502100605.

Galasso, V., V. Pons, P. Profeta, M. Becher, S. Brouard and M. Foucault. 2020. "Gender Differences in Covid-19 Attitudes and Behavior: Panel Evidence from Eight Countries." *Proc Natl Acad Sci U S A* 117(44):27285-91. doi: 10.1073/pnas.2012520117.

Gallè, Francesca, Elita Anna Sabella, Giovanna Da Molin, Osvalda De Giglio, Giuseppina Caggiano, Valeria Di Onofrio, Stefano Ferracuti, Maria Teresa Montagna, Giorgio Liguori, Giovanni Battista Orsi and Christian Napoli. 2020. "Understanding Knowledge and Behaviors Related to Covid-19 Epidemic in Italian Undergraduate Students: The Epico Study." *International Journal of Environmental Research and Public Health* 17(10):3481. doi: 10.3390/ijerph17103481.

Gatto, Susan L. and Sunghee H. Tak. 2008. "Computer, Internet, and E-Mail Use among Older Adults: Benefits and Barriers." *Educational Gerontology* 34(9):800-11. doi: 10.1080/03601270802243697.

Goggin, Gerard. 2020. "Covid-19 Apps in Singapore and Australia: Reimagining Healthy Nations with Digital Technology." *Media International Australia*:1329878X20949770. doi: 10.1177/1329878X20949770.

Goldfinch, Shaun, Robin Gauld and Peter Herbison. 2009. "The Participation Divide? Political Participation, Trust in Government, and E-Government in Australia and New Zealand." *Australian Journal of Public Administration* 68(3):333-50. doi: https://doi.org/10.1111/j.1467-8500.2009.00643.x.

Guglielmi, Simona, M. Dotti Sani Giulia, Francesco Molteni, Ferruccio Biolcati, M. Chiesi Antonio, Riccardo Ladini, Marco Maraffi, Andrea Pedrazzani and Cristiano Vezzoni. 2020. "Public Acceptability of Containment Measures During the Covid-19 Pandemic in Italy: How

Institutional Confidence and Specific Political Support Matter." *International Journal of Sociology and Social Policy* 40(9/10):1069-85. doi: 10.1108/IJSSP-07-2020-0342.

Guo, X., X. Han, X. Zhang, Y. Dang and C. Chen. 2015. "Investigating M-Health Acceptance from a Protection Motivation Theory Perspective: Gender and Age Differences." *Telemed J E Health* 21(8):661-9. doi: 10.1089/tmj.2014.0166.

Jiobu, Robert M. and Timothy J. Curry. 2001. "Lack of Confidence in the Federal Government and the Ownership of Firearms." *Social Science Quarterly* 82(1):77-88. doi: https://doi.org/10.1111/0038-4941.00008.

Kaspar, Kai. 2020. "Motivations for Social Distancing and App Use as Complementary Measures to Combat the Covid-19 Pandemic: Quantitative Survey Study." *J Med Internet Res* 22(8):e21613. doi: 10.2196/21613.

Kuo, Pei-Chun, Jiun-Hau Huang and Ming-Der Liu. 2011. "Avian Influenza Risk Perception and Preventive Behavior among Traditional Market Workers and Shoppers in Taiwan: Practical Implications for Prevention." *PLoS One* 6(9):e24157. doi: 10.1371/journal.pone.0024157.

Little, Roderick. 1988. "A Test of Missing Completely at Random for Multivariate Data with Missing Values." *Journal of the American Statistical Association* 83(404):1198-202. doi: 10.2307/2290157.

Mostaghel, Rana. 2016. "Innovation and Technology for the Elderly: Systematic Literature Review." *Journal of Business Research* 69(11):4896-900. doi: https://doi.org/10.1016/j.jbusres.2016.04.049.

Murphy, Kristina, Harley Williamson, Elise Sargeant and Molly McCarthy. 2020. "Why People Comply with Covid-19 Social Distancing Restrictions: Self-Interest or Duty?". *Australian & New Zealand Journal of Criminology* 53(4):477-96. doi: 10.1177/0004865820954484.

Muthén, Bengt and Tihomir Asparouhov. 2012. "Bayesian Structural Equation Modeling: A More Flexible Representation of Substantive Theory." *Psychological Methods* 17(3):313-35. doi: 10.1037/a0026802.

Pérez-Morote, Rosario, Carolina Pontones-Rosa and Montserrat Núñez-Chicharro. 2020. "The Effects of E-Government Evaluation, Trust and the Digital Divide in the Levels of E-Government Use in European Countries." *Technological Forecasting and Social Change* 154:119973. doi: https://doi.org/10.1016/j.techfore.2020.119973.

Peters, Ellen, David P. Baker, Nathan F. Dieckmann, Juan Leon and John Collins. 2010. "Explaining the Effect of Education on Health: A Field Study in Ghana." *Psychological Science* 21(10):1369-76. doi: 10.1177/0956797610381506.

Pyenson, Lewis. 2017. "Machines as the Measure of Men: Science, Technology, and Ideologies of Western Dominance. By Michael Adas. (Ithaca, Ny: Cornell University Press, 2014. Pp. Xxii, 452. $26.95.)." *The Historian* 79(2):417-19. doi: 10.1111/hisn.12574.

Rhudy, J. L. and A. E. Williams. 2005. "Gender Differences in Pain: Do Emotions Play a Role?". *Gend Med* 2(4):208-26. doi: 10.1016/s1550-8579(05)80051-8.

Rubin, G. James, Richard Amlôt, Lisa Page and Simon Wessely. 2009. "Public Perceptions, Anxiety, and Behaviour Change in Relation to the Swine Flu Outbreak: Cross Sectional Telephone Survey." *BMJ (Clinical research ed.)* 339:b2651-b51. doi: 10.1136/bmj.b2651.

Sahoo, Malabika. 2019. "Structural Equation Modeling: Threshold Criteria for Assessing Model Fit." Pp. 269-76 in *Methodological Issues in Management Research: Advances, Challenges, and the Way Ahead*, edited by N. S. Rabi and M. Sumita: Emerald Publishing Limited.

Siegrist, Michael and Alexandra Zingg. 2014. "The Role of Public Trust During Pandemics: Implications for Crisis Communication." *European Psychologist* 19(1):23-32. doi: 10.1027/1016-9040/a000169.

Skrondal, Anders and Petter Laake. 2001. "Regression among Factor Scores." *Psychometrika* 66(4):563-75. doi: 10.1007/BF02296196.

Taylor, M., B. Raphael, M. Barr, K. Agho, G. Stevens and L. Jorm. 2009. "Public Health Measures During an Anticipated Influenza Pandemic: Factors Influencing Willingness to Comply." *Risk Manag Healthc Policy* 2:9-20. doi: 10.2147/rmhp.S4810.

Team, R. Core. 2020. “R: A Language and Environment for Statistical Computing.”

Twyman, Matt, Nigel Harvey and Clare Harries. 2008. "Trust in Motives, Trust in Competence: Separate Factors Determining the Effectiveness of Risk Communication." *Judgment and Decision Making* 3(1):111-20.

van Buuren, Stef and Karin Groothuis-Oudshoorn. 2011. "Mice: Multivariate Imputation by Chained Equations in R." *2011* 45(3):67. doi: 10.18637/jss.v045.i03.

van der Weerd, Willemien, Daniëlle R. M. Timmermans, Desirée J. M. A. Beaujean, Jurriaan Oudhoff and Jim E. van Steenbergen. 2011. "Monitoring the Level of Government Trust, Risk Perception and Intention of the General Public to Adopt Protective Measures During the Influenza a (H1n1) Pandemic in the Netherlands." *BMC Public Health* 11(1):575. doi: 10.1186/1471-2458-11-575.

Wdowik, M. J., P. A. Kendall, M. A. Harris and G. Auld. 2001. "Expanded Health Belief Model Predicts Diabetes Self-Management in College Students." *J Nutr Educ* 33(1):17-23. doi: 10.1016/s1499-4046(06)60005-5.

Willis, Suzanne and Bruce Tranter. 2006. "Beyond the 'Digital Divide': Internet Diffusion and Inequality in Australia." *Journal of Sociology* 42(1):43-59. doi: 10.1177/1440783306061352.

Table 1: Questions to assess confidence in political and health authorities and behavioural intentions

Construct of interest	Confidence in health and political authorities	Behavioural intentions	Past behaviour
Questions	How much confidence do you have that the following authorities can minimise the harm caused by COVID-19? • Local or city health authority • State, province, or regional health authority • National health authority • National political leaders • State political leaders • World Health Organisation	• How likely are you to download and install a government COVID-19 tracing app on my phone? • How likely are you to wear a face mask whenever in public for the next 6 months? • How likely are you to stay home (except for essential activities) for the next 6 months?	In the past 7 days, how frequently have you taken the following actions to reduce the spread or prevent infection with COVID-19? • Used a COVID-19 contact-tracing app when in public • Wear a face mask when in public • Wash hands for 20 seconds with soap and water OR alcohol-based hand sanitiser • Cover coughs and sneezes with elbow or a tissue • NOT touch face with unwashed hands • Keep physical distance from people in public, school, or workplace • Stay at home

Table 2: Demographic characteristics of the sample

	n	%
Gender		
Male	442	0.47
Female	490	0.53
Education level		
High School degree	472	0.51
College degree or higher	460	0.49
Health worker		
No	878	0.94
Yes	54	0.06
Chronic disease		
No	751	0.81
Yes	181	0.19
Children		
No	668	0.72
Yes	264	0.28
State		
New South Wales	252	0.27
Queensland	164	0.18
South Australia	76	0.08
Victoria	318	0.34
Western Australia	122	0.13

Table 3. Additional descriptive statistics for age, intention to stay home, intention to wear a face mask, and intention to download the COVIDsafe app

Variable	Mean	SD	Median	Min	Max
Age	49.46	17.14	49	18	89
Intention to stay home	6.9	2.76	7	0	10
ıtention to wear a face mas	3.43	3.29	3	0	10
ıtention to download the ap	4.36	3.66	5	0	10

Note: sd: standard-deviation; min: minimum; max: maximum

Table 4. Bivariate correlation among variables of interest.

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1 - Age	1	0.15***	-0.27***	-0.10**	0.25***	-0.11***	-0.32***	0.10**	0.09**	0	-0.12***	-0.10**
2 - Sex	0.15***	1	-0.06	-0.03	0	-0.03	0.03	-0.11**	-0.07*	-0.04	0.04	-0.04
3 - Children	-0.27***	-0.06	1	0	-0.13***	0.06	0.16***	0.05	0.03	0.04	0.11***	0.14***
4 - State	-0.10**	-0.03	0	1	-0.03	0.05	0.01	-0.12***	-0.02	-0.06	-0.12***	-0.06
5 - Chronic disease	0.25***	0	-0.13***	-0.03	1	-0.02	-0.12***	0.05	-0.03	0.13***	-0.04	-0.07*
6 - Health worker	-0.11***	-0.03	0.06	0.05	-0.02	1	0.09**	0	0.02	-0.02	-0.02	0.02
7 - Educational level	-0.32***	0.03	0.16***	0.01	-0.12***	0.09**	1	-0.14***	0	-0.11***	0.08*	0.16***
8 – Past behaviour factor estimate score	0.10**	-0.11**	0.05	-0.12***	0.05	0	-0.14***	1	0.16***	0.26***	0.19***	0.12***
9 – Confidence factor estimate score	0.09**	-0.07*	0.03	-0.02	-0.03	0.02	0	0.16***	1	0.13***	0.09**	0.26***
10 - Intention to stay home	0	-0.04	0.04	-0.06	0.13***	-0.02	-0.11***	0.26***	0.13***	1	0.23***	0.08*
11 - Intention to wear a face mask	-0.12***	0.04	0.11***	-0.12***	-0.04	-0.02	0.08*	0.19***	0.09**	0.23***	1	0.28***
12 – Intention to download the app	-0.10**	-0.04	0.14***	-0.06	-0.07*	0.02	0.16***	0.12***	0.26***	0.08*	0.28***	1

Note: * $p < .05$; ** $p < .01$; *** $p < .001$

Table 5: Hierarchical multiple regression examining the predictive value of confidence in authorities, age, gender and education level on adoption of health-protective measures

Variable	*b*	*se*	*t*	*p*	GVIF	Adj R^2	ΔR^2	AIC
Intention to stay home (n = 917)								
(Intercept)	7.19	0.22	32.13	0	-	0.029	-	4408.57
Age	-0.2	0.1	-2.01	0.045	1.32			
gender [male]	-0.05	0.18	-0.3	0.763	1.06			
education [Higher education]	-0.62	0.19	-3.31	0.001	1.15			
health_hcw [yes]	-0.03	0.39	-0.07	0.944	1.03			
chronic [yes]	0.9	0.23	3.92	0	1.09			
State [Queensland]	-0.09	0.27	-0.33	0.744	1.07			
State [South Australia]	-0.37	0.36	-1.04	0.301	1.07			
State [Victoria]	-0.11	0.23	-0.5	0.62	1.07			
State [Western Australia]	-0.84	0.3	-2.79	0.005	1.07			
Children [yes]	0.34	0.2	1.67	0.094	1.11			
Past behaviour factor estimate score	0.64	0.09	7.28	0	1.09	0.082	0.053***	4358.33
Confidence factor estimate score	0.23	0.09	2.61	0.009	1.05	0.087	0.005**	4353.43
Education level * confidence	-0.14	0.17	-0.79	0.428	-	0.087	ns	4354.79
Gender * confidence	0.26	0.17	1.5	0.134	-	0.088	0.001 ns	4354.51
Age * confidence	-0.2	0.09	-2.12	0.034	-	0.092	0.004 *	4351.94
Intention to download the app (n = 922)								
(Intercept)	4.3	0.3	14.29	0	-	0.035	-	4981.69
Age	-0.08	0.13	-0.58	0.562	1.33			
gender [male]	-0.35	0.24	-1.43	0.152	1.06			
education [Higher education]	0.94	0.25	3.72	0	1.15			
health_hcw [yes]	0.24	0.52	0.46	0.65	1.03			
chronic [yes]	-0.34	0.31	-1.09	0.275	1.09			
State [Queensland]	-0.43	0.36	-1.19	0.234	1.06			

State [South Australia]	-0.51	0.48	-1.08	0.283	1.06			
State [Victoria]	-0.47	0.3	-1.55	0.121	1.06			
State [Western Australia]	-0.8	0.4	-1.99	0.047	1.06			
Children [yes]	0.79	0.27	2.88	0.004	1.11			
Past behaviour factor estimate score	0.46	0.12	3.82	0	1.1	0.05	0.015***	4969.03
Confidence factor estimate score	1	0.12	8.66	0	1.06	0.121	0.071***	4897.94
Education level * confidence	0.51	0.23	2.27	0.023	-	0.125	0.004*	4894.71
Gender * confidence	0.14	0.23	0.6	0.552	-	0.124	ns	4896.35
Age * confidence	0.28	0.13	2.2	0.028	-	0.128	0.004*	4893.43
Intention to wear a face mask (n = 916)								
(Intercept)	3.87	0.27	14.36	0	-			
Age	-0.37	0.12	-3.07	0.002	1.32			
gender [male]	0.47	0.22	2.16	0.031	1.06			
education [Higher education]	0.12	0.23	0.51	0.607	1.16			
health_hcw [yes]	-0.51	0.46	-1.12	0.263	1.02			
chronic [yes]	0.15	0.28	0.55	0.583	1.08	0.048	-	4740.02
State [Queensland]	-1.09	0.32	-3.37	0.001	1.07			
State [South Australia]	-1.76	0.43	-4.08	0	1.07			
State [Victoria]	-1.12	0.27	-4.12	0	1.07			
State [Western Australia]	-1.5	0.36	-4.17	0	1.07			
Children [yes]	0.55	0.25	2.26	0.024	1.11			
Past behaviour factor estimate score	0.65	0.11	6.09	0	1.1	0.085	0.037***	4705.23
Confidence factor estimate score	0.18	0.11	1.7	0.089	1.06	0.086	0.001ns	4704.3
Education level * confidence	0.45	0.21	2.17	0.03	-	0.09	0.004*	4701.51
Gender * confidence	0.11	0.21	0.52	0.603	-	0.089	ns	4703.23
Age * confidence	-0.16	0.12	-1.42	0.157	-	0.09	0.001ns	4703.19

Note: se: standard error; GVIF: generalized variance inflation factor; AIC: Akaike information criterion; Reference levels for categorical variables were as follows: Gender [female], Education [high school]; health care worker [no], chronic illness [no], Australian state or territory [New South Wales], have children [no], Australian state [New South Wales]; * $p < .05$; ** $p < .01$; *** $p < .001$

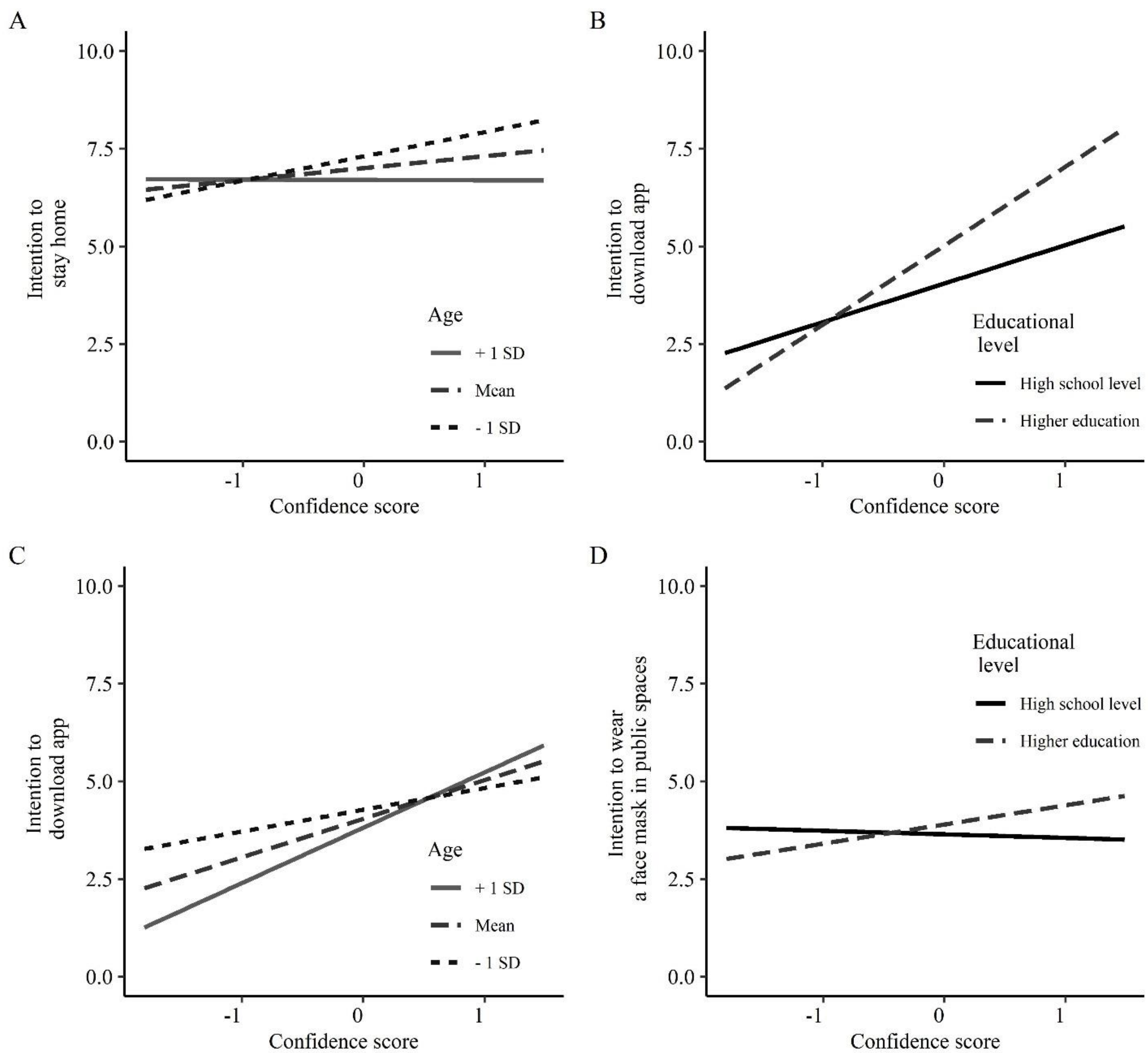

Figure 1: Regression lines for relations between (A) intention to stay home and confidence in authorities as moderated by age; (B) intention to download the app and confidence in authorities as moderated by educational level; (C) intention to download the app and confidence in authorities as moderated by age; and (D) intention to wear a face mask and confidence in authorities as moderated by educational level