Social cohesion at the outset of COVID-19 predicts later vaccination intentions

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Abstract

Vaccination intentions are widely regarded as individual decision, resting upon individuals' attitudes and beliefs about the disease and their own health. In this research, we provide evidence that group factors, and more precisely, social cohesion — a multidimensional concept that encompasses one's sense of connectedness to, and interrelations within, a group — can help us understand COVID-19 vaccination intentions. Using a representative sample of 3026 Australians, we first found evidence for the multidimensional structure of social cohesion, as a concept that includes positive social relations, social identification, and trust in government. Second, social cohesion assessed early in the COVID-19 pandemic predicted greater vaccination intention and lower perceived risk of vaccination four months later, after controlling for a series of demographic (i.e., sex, age, income) and health-related factors (i.e., subjective health; perceived risk; having been diagnosed with COVID-19). These results suggest that investments in social cohesion could have substantial and unexpected downstream benefits.

Key-words: social cohesion, social identification, trust, trust in government, COVID-19, Coronavirus, vaccination intentions.

Social cohesion as a collective factor that predicts later vaccination intentions

Vaccination is one of the most effective ways of preventing the acquisition and spread of virulent diseases, including COVID-19. Importantly, vaccines do not only save individual lives, but they also protect the health of entire nations, regions, and groups. Vaccines create herd immunity (Fine et al., 2011) when a majority of individuals are vaccinated and, in so doing, reduce the capacity of a virus to spread effectively through a community. This protects those individuals for whom the virus poses a particularly serious health risk (e.g., the elderly) and those who cannot take the vaccine for health reasons (e.g., age restrictions; allergies). Thus, the process of vaccination not only has personal consequences for the individual, but also *collective* consequences for the broader community. Given the urgency associated with maximising COVID-19 vaccine uptake, as well as the high likelihood of future pandemics (Dobson et al., 2020), it is essential to examine potential points of intervention to increase compliance with this health behaviour.

Along these lines, in the current study, we examine whether perceiving one's national community to be *socially cohesive* — a concept that incorporates one's sense of connectedness to, and interrelations within, a group (Chan et al., 2006; Jeannotte et al., 2002) — predicts individuals' personal intentions to receive a vaccination four months later. As such, we examine a possible route by which a highly personal choice — intending to have a vaccine — might be influenced by one's psychological orientation toward the collective. Thus, this work extends our understanding of how group or collective psychology matters for what are often considered individual health behaviours. Importantly, unlike most previous health-related research, which for convenience has often operationalised social cohesion as trust between individuals, we conceptualise and measure social cohesion as a multifaceted concept comprising positive social relations, social identification, and trust in government (Dragolov et al., 2016), and test this proposed factor structure.

Social Cohesion and Health Behaviours

A group is socially cohesive when its members have positive and high-quality social connections with other members, and as a result, experience a sense of unity and “togetherness” that favours collaboration and cooperation (Bernard, 1999; Bottoni, 2018; Chan et al., 2006; Dragolov et al., 2016; Orazani et al., 2021). These ideas resonate with concepts such as social identity, social solidarity, and group cohesion, and indicate that, to fully capture social cohesion, it is essential to consider the *quality* of the group (the positive relations that exist within it) as well as the degree to which the group is self-relevant (i.e., social identification; Cárdenas et al., 2021; Bowe et al., 2021).

A growing body of research has found that social cohesion predicts both individuals’ willingness to engage in health behaviours and their actual health behaviours (Kim & Kawachi, 2017). For example, empirical studies have demonstrated that social cohesion is associated with a wide variety of positive health behaviours, including greater physical activity (Jongeneel-Grimen et al., 2014), less smoking (Alcalá et al., 2016), and less alcohol consumption (Kuipers et al., 2012). Although there have been few attempts to interrogate the theoretical underpinnings of this relationship, social cohesion is believed to increase individuals’ (a) awareness of the normative health behaviours of group members (Samuel et al., 2013), and (b) access to social support offered by the group and its members (Alcalá et al., 2016; Thoits, 2010).

Research underpinned by the social identity approach (Tajfel & Turner, 1979; Turner et al., 1987) has also demonstrated the implications of the group for health outcomes. Individuals who identify strongly with a particular group are motivated to engage in health behaviours that are valued and promoted by that group (Jetten et al., 2017). For example, young adults who identified strongly as university students were more likely to binge drink when they believed that their fellow students (i.e., group members) did so (Willis et al., 2021),

and more likely to conform to the eating behaviours of fellow group members, for both quantity and choice of food consumed (Cruwys et al., 2012; Liu et al., 2019; but see Banas et al., 2016). In terms of positive health behaviours, elderly people attended more fall-prevention classes when they strongly identified as a member of their class (Steckhan et al., 2021), runners who strongly identified as a ‘parkrunner’ participated in more parkruns (Stevens et al., 2019), and gay men engaged in safe sex more commonly to the extent that they identified with the gay community (Boldero et al., 1999; see also Falomir-Pichastor et al., 2009). Similarly, identification as a nurse predicted greater flu vaccination rates among nurses, with high identifiers being more likely to consider vaccination part of their professional responsibility (Falomir-Pichastor et al., 2009). Thus, abundant evidence shows that health-related behaviours that are endorsed, promoted, and valued by the group will be enacted if members identify with the group.

However, previous health research in both social cohesion and social identification traditions have not examined the multiple facets of social cohesion. Indeed, even though social cohesion is a multidimensional concept, most health in this tradition has focused on a single dimension, and most often on elements of positive interactions between group members (e.g., trust, helping attitude, and cooperation; e.g., Alcalá et al., 2016; Jongeneel-Grimen et al., 2014; Kuipers et al., 2012). For example, in one study, believing that neighbours were willing to be helpful, could be trusted, shared norms, and thought that the neighbourhood was a close-knit community predicted greater frequency of participation in youth’s physical activities two years later (Cradock et al., 2009). Similarly, because of its theoretical origin, the social identity approach has emphasized either the number of social groups a person belongs to, or the degree of identification with the groups (Jetten et al., 2017). This unidimensional approach to social cohesion in health research stands in contrast to its rich theoretical underpinnings which emphasize its multidimensional nature (Bernard,

1999; Bottoni, 2018; Chan et al., 2006; Dragolov et al., 2016; Orazani et al., 2021). For instance, Dragolov and colleagues' (2016) model of social cohesion includes three domains: positive social relations, a sense of connectedness, and a focus on the greater good.

Meanwhile, Bottoni's (2018) proposed model of social cohesion included positive social interactions, positive relations in the group, and general trust and attitudes towards institutions, all of which loaded into a second-order latent variable that captured a more general sense of social cohesiveness.

In this research, consistent with existing models on social cohesion, we conceptualise social cohesion as a multidimensional concept consisting of three subdimensions (Bernard, 1999; Bottoni, 2018; Chan et al., 2006; Dragolov et al., 2016; Orazani et al., 2021). The first is positive social relations within the group (i.e., quality of national social relations). This is one of the hallmarks of social cohesion models and features prominently in most empirical research (Colic-Peisker & Robertson, 2015; Sampson et al., 1997). The second dimension is social identification. This refers to one's subjective attachment to a group, and their internalization into their sense of self. Social identification enables the group and its interests to become self-relevant and important to individuals (Turner et al., 1994) and has overlap with concepts of belonging (Chan et al., 2006) and connectedness (Dragolov et al., 2016; Hunter et al., 2017). However, the concept of social identification is derived from a strong theoretical framework (i.e., the social identity approach; Tajfel & Turner, 1979; Turner et al., 1987) that details the role of group psychology and processes in human behaviour. The third dimension is trust in institutions, and more specifically trust in government. Trust in government reflects confidence towards the basic national institutions and procedures through which representatives make and enforce decisions for "us" (Bernard, 1999; Bottoni, 2018., Chan et al., 2016; Dragolov et al., 2016). Trust in government has been found to be positively associated with individuals' willingness to comply with the law, while, in contrast,

those who do not trust their government tend to be suspicious of the decisions, actions, and guidelines drawn by the government to convince citizens to behave in a certain way (Scholz & Lubell, 1998; Marien & Hooghe, 2011).

Given these theoretical underpinnings, positive social relations within the group (i.e., quality of national social relations), strong social identification (i.e., national identification) with the group, and high confidence in institutions (i.e., trust in national government) may come together under a general social cohesion factor to predict vaccination intentions in the context of a national health crisis due to COVID-19.

There is already evidence that social cohesion is a particularly strong predictor of people's engagement in health behaviours that, like vaccination, not only impact individuals but also protect the entire group. For example, it has been shown to predict other key pandemic-related behaviours, including engaging in physical distancing (Cardenas et al., 2021) and adhering to lockdowns (Stevenson et al., 2021). This is the case particularly true for trust in government (e.g., Grimalda, & Tanzler, 2018; Whetten et al., 2005). Indeed, in pandemic contexts, when quick and stringent decisions are made by governments, a lack of trust in one's government in particular can translate into a refusal to comply with health directives and policies that they introduce to control or mitigate the pandemic. Indeed, trust in government and in public health officials has been shown to play an important role in motivating people to take necessary actions to contain a pandemic (Poland, 2010; see also Francis et al., 2018). These dynamics were apparent during the 2014 Ebola epidemic in Sierra Leone, where a lack of trust in the government caused citizens to disregard several government health recommendations that they mandated to stop the spread of the disease. For example, citizens refused to leave sick loved ones in a clinic, dispose of bodies with non-traditional yet safe burials, and come forward for treatment when they showed Ebola symptoms (Blair et al., 2017; Christensen et al., 2020).

Evidence also indicates that trust in the government might affect people's vaccination intention and behaviours. During the H1N1 pandemic, greater trust in the government predicted greater willingness to receive the vaccine (Quinn et al., 2012). Similarly, Justwan et al. (2019) found that trust in the medical experts that inform government decisions and government health institutions was associated with greater measles vaccination. Indeed, enhancing trust in the government has been identified as one of the most important foci for efforts to curb COVID-19 in countries belonging to the Organisation for Economic Co-operation and Development (or OECD; OECD, 2021).

There is also evidence that the other two dimensions of social cohesion are important for vaccination intentions and behaviour. A retrospective study found that a variable comprising neighbourhood positive social relations and neighbourhood identification was associated with a greater likelihood of having received the flu vaccine in the past two years (Kim & Kawachi, 2017; see also Falomir-Pichastor et al., 2009). Moreover, Jung and colleagues (2013) found that parents who perceived that their neighbourhood had positive social relations (helping neighbours, being a close-knit community, can be trusted) were more likely to vaccinate their children against H1N1 than those who perceived that their neighbourhood had more negative social relations. In short, these studies illustrate that (a) (psychological) group membership, and (b) quality positive relations within the group and institutions foster behaviours to protect and care for group members – two driving messages in successful vaccination campaigns (e.g., Australian Government Department of Health, 2021a, 2021b).

In terms of COVID-19 vaccination intention, research to date has mostly focused on individual factors, such as age, gender, perceived threat of COVID-19, efficacy and safety of the vaccine, and political orientation (Freeman et al., 2020; Fridman et al., 2021). This disregards the seemingly critical influence that collective factors, such as social cohesion, might play. Nevertheless, there is emerging evidence that social cohesion is also important in

the context of COVID. Trust in government, predicts more positive attitudes towards the COVID-19 vaccine worldwide (Lazarus et al., 2020). There is also initial evidence that British participants who identified more with their local community also had greater vaccination intentions (Wakefield & Khause, 2021). However, to date, no attempt has been made to examine the link between social cohesion and COVID-19 vaccination in a way that recognises the multifaceted nature of social cohesion.

The Current Study

The goal of this research was therefore to examine whether social cohesion predicted greater COVID-19 vaccination intention. Importantly, we sought to do this in a way that recognises the multifaceted nature of social cohesion, and thus incorporated measures of positive social relations, social identification and trust in government. Moreover, to provide a rigorous test of this relationship we examined it across time. Specifically, we examined whether social cohesion in May 2020 — shortly after the onset of the COVID-19 pandemic in the country where data were collected (Australia), and before the World Health Organization (WHO) had announced the launch of a coordinated international trial of different COVID-19 vaccines (WHO, 2020) — predicted vaccination intentions in September/October 2020. This later point in time was after phase III trials had been completed for several vaccines and these were awaiting approval by pharmaceutical regulators (e.g., Pfizer, 2020). Thus, our longitudinal study tested the influence of social cohesion over time. Moreover, the dominant discourse in Australia with regard to vaccination leans heavily towards their effectiveness and safety. Anti-vaccination tendencies are low in Australia but not non-existent, with concerns that 10-20% of adults may be against vaccination or find it difficult to overcome barriers to get vaccinated (e.g., Trent et al., 2021). Given the high rates of vaccination necessary to protect against severe illness and mortality, understanding key drivers of vaccination intention is critical.

We hypothesized that positive relations, social identification, and trust in the government would load onto a single latent construct of social cohesion (H1). We also hypothesized that greater social cohesion at Wave 1 would predict greater vaccination intentions (willingness to get vaccinated and lower perceived risk of vaccination) at Wave 2 (four months later), after controlling for demographic variables (H2).

Methods

Participants and Procedure

The 3030 participants were a nationally representative sample of Australian residents (based on age, sex, ancestry, and income). The panel were recruited via Qualtrics Services, who employ various double-opt-in market research panels and blend them to minimize panel bias. Potential participants were contacted via email or through their research participation portal and were compensated with the standard rate of the recruitment agency. Participants' demographic information was collected at Wave 1. The sample comprised 47.3% men, 52.5% women and 0.2% other, and were aged between 18 and 87 years ($M = 47.78$ $SD = 17.61$). The six participants who reported "Other" gender were removed from the analyses due to insufficient numbers to create an "Other" analytical category¹. The final sample was thus $N = 3024$ at Wave 1, of whom 1723 were retained at Wave 2. Most participants were born in Australia (73%) and reported Australian (59.08%) or English (22.29%) ancestry. The Human Research Ethics Committee at the first author's institution approved this research (protocol #2020/216).

Wave 1 surveys were completed between the 9th and 27th May 2020, during Australia's first nationwide COVID-19 lockdown and at a time when the Australian state and

¹ While we could not conduct statistical analyses, a descriptive examination suggests that those who reported "Other" in gender appeared to have greater willingness to receive the vaccine ($M = 6.50$, $SD = 0.71$) than men ($M = 5.37$, $SD = 1.83$) and women ($M = 4.76$, $SD = 1.95$). This was despite also appearing to perceive the vaccine to be more risky ($M = 4.00$, $SD = 1.41$) than men ($M = 2.93$, $SD = 1.84$) and women ($M = 3.37$, $SD = 1.86$).

federal governments were beginning to reduce the strict restrictions that had been imposed during March and April 2020 (e.g., most shops and restaurants had re-opened for a small number of patrons). Wave 2 surveys were completed between September 16th and October 16th 2020. During this period, most Australian states had eliminated community transmission of COVID-19 and had minimal restrictions in place (mostly surrounding the number of individuals allowed in indoor venues such as theatres and restaurants), and some domestic travel was allowed (ACT Government, 2020). The exception to this was the state of Victoria, where a second wave of COVID-19 cases caused a severely restrictive lockdown from July to late October 2020 in parts of the state (ABC News, 2020).

Measures

Details of the measures described below can be found in the Supplementary Materials.

Social Cohesion

Social Relations. The quality of social relations in Australia was assessed with nine items (derived from Dragolov et al., 2016; Sampson et al., 1997), which asked participants the extent to which people in Australia were helpful, trust each other, generally do not get along with each other (reversed item), form a close-knit community, get along with people from different national or ethnic backgrounds, respect practices from other national or ethnic groups, and respect national rules and laws. These items were answered on a seven-point Likert-scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree; $\alpha = .88$).

Trust in Government. Three items measured trust in the Australian federal government (Hetherington, 1998). Specifically, participants were asked the extent to which they agreed with the following statements (using a Likert-scale ranging from 1 [Strongly Disagree] to 7 [Strongly Agree]): “I trust the economic strategies of the federal government”;

“My faith in the federal government is strong”; and “I trust the way the federal government communicates information” ($\alpha = .93$).

Social Identification with Australians. Social identification as an Australian was assessed in line with previous social cohesion surveys (Markus, 2019) and social identity scales with three items asking participants the extent to which they (a) identified with Australians (from Postmes et al., 2013), (b) have a sense of belonging in Australia, and (c) take pride in the Australian culture and way of life (the latter two derived from Markus, 2019). Together, these items map onto Cameron’s (2007) tripartite social identification scale (centrality, ingroup ties and ingroup affect). Items were answered on 7-point Likert-scales ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). The scale showed high reliability ($\alpha = .80$).

Vaccination Intentions

Willingness. Participants’ willingness to get vaccinated was assessed with a single item that asked, “If a vaccine for COVID-19 was available today, I would get it as soon as possible,” which was answered using a Likert-scale that ranged from 1 (Strongly Disagree) to 7 (Strongly Agree).

Perceived Risk. The perceived risk of being vaccinated to prevent COVID-19 was assessed using a single item assessed on a scale ranging from 1 (Not risky at all) to 7 (Extremely risky): “How risky for your health is the following activity: Getting the COVID-19 vaccine as soon as it is available”.

Control variables

Two sets of potentially confounding factors were included as covariates in the analysis: demographic factors and health factors. Previous research has indicated that people who are older (Sherman et al., 2021), male (Zintel et al., 2021), earn a higher income (Ruiz et al., 2021), and who are politically left-leaning (Ruiz et al., 2021) have more greater COVID-

19 vaccination intentions². Therefore, these demographic characteristics were controlled for to partial out the variance attributable to them. Participants reported their age, sex (Male = 1; Female = 2), weekly individual income (ranging from 1 = Negative income to 15 = 3000 AUD or more), and political orientation (1 = Very left leaning to 7 = Very right leaning; e.g., Graham et al., 2009) at Wave 1.

In addition, health perceptions — including individuals' subjective health (Kadoya et al., 2021), perceived risk of the disease (Jing et al., 2021), and having been sick with COVID-19 (family or oneself; Lazarus et al., 2021) — have been associated with COVID-19 vaccination attitudes. To partial out their potential influence, we controlled for these three variables measured at Wave 1. Subjective health was measured by asking participants “In general, would you say your health is” (1 = Excellent, to 5 = Poor; Cruwys et al., 2019). Participants also reported whether they had been diagnosed with COVID-19 (1 = Yes, 2 = No) and their generalised risk perception related to COVID-19 (perceived risk of walking with nine targets).

Analysis Strategy

We first employed confirmatory factor analysis (CFA) to examine the measurement models of social cohesion. Specifically, we tested whether social relations, trust in government, and social identification loaded onto their respective latent factor, and whether this, in turn, loaded onto the broader second-order latent variable of social cohesion (H1). To investigate whether this latent structure was superior to other measurement models, we also examined whether the hypothesized model fit the data better than two alternative models: one in which all the items of social relations, trust in government, and social identification loaded

² We initially controlled for country of birth (Australia vs other) and whether others around oneself had been confirmed cases of COVID-19. However, adding these variables in the model resulted in a non-positive definite first-order derivative product matrix and were therefore excluded. However, follow-up regression analyses suggested that these two variables did not predict later vaccination attitudes (see Cárdenas et al., 2021).

onto a single latent variable, and a second one in which social relations, trust in government, and social identification were kept independent (or orthogonal).

We then conducted a regression employing structural equation modelling (SEM) to examine whether social cohesion, the second order latent factor, predicted vaccination intention and the perceived risk associated with the vaccine four months later (both observed variables as these were single items), after accounting for the control variables (H2). In line with recommendations that model fit should be assessed using multiple fit indices (e.g., Hu & Bentler, 1999; MacCallum, Browne & Sugawara, 1996), the CFA and SEM models were judged as acceptable if the Comparative Fit Index (CFI) was close to .90, the Standardised Root Mean Square Residual (SRMR) was close to .05 (or .08 for marginal fit), and the Root Mean Squared Error of Approximation (RMSEA) was $<.08$ (or $<.10$ for marginal fit). The χ^2 value tends to remain significant even for models with very good fit in large samples such as ours, but χ^2 difference was used to compare models such that smaller values were indicative of better fit (Hu & Bentler, 1999).

Results

Preliminary Analyses and Descriptive Statistics

An attrition rate of 43% was observed at Wave 2. To test for potential patterns in this missing data, Little's MCAR analysis was first conducted. This showed that the data were not missing completely at random, $\chi^2(421) = 836.39, p < .001$. We also examined whether participants who responded to Waves 1 and 2 differed from those who did not complete both waves with regard to our Wave 1 variables and items (with a Bonferroni correction for 22 comparisons, significance set at $p < .002$). Three of these comparisons were significant (see Supplementary material for details). Compared to individuals who were lost to follow-up, those who participated in both waves tended to be older, less likely to have been diagnosed with COVID-19 and had worse subjective health, all at Wave 1. Given these patterns of

missing data, and based on recent recommendations designed to include the maximum number of respondents and thus maintain the sample's representativeness (Newman, 2014), we used maximisation estimation (Full Information Maximum Likelihood) in MPLUS.

Table 1 shows the correlations between the different latent and observed variables. We see, for example, that the different elements of social cohesion were positively and significantly correlated with one another, providing initial support for H1. In addition, in line with H2, the second-order social cohesion variable was positively associated with willingness to get vaccinated and negatively associated with perceived risk of the vaccine.

Measurement Model

To test H1 — that social relations, trust in government, and social identification are part of an underlying social cohesion variable — a measurement model was tested using Confirmatory Factory Analysis, in which three first-order latent variables were created: social relations, trust in government, and social identification. These three latent variables were set to load on a second-order latent variable that represents social cohesion. This initial model had acceptable fit, $\chi^2(87) = 2103.16$, $p < .001$, CFI = .93, RMSEA = .087 (.084 to .091), SRMR = .050, though the RMSEA was somewhat higher than typical standards for a marginal fit. In addition, the standardised loadings for all items were above .30 and significant, except for the only item of the social relations scale that was reversed coded: In Australia "... people generally do not get along with each other" (factor loading = .19; $R^2 = .04$). Given its low loading and explained variance, this item was dropped from subsequent analyses. In addition, modification indices indicated a need for correlated error terms for the first and second social relations items (In Australia "...people are willing to help others"; "...people trust each other"). Given the similar wording and focus of the two items, this change was made. The final model demonstrated good fit on all indices, $\chi^2(73) = 1271.75$, $p < .001$, CFI = .96, RMSEA = .074 (.070 to .077), SRMR = .048, and acceptable loadings of

the latent first order latent variables (see Table 2). In addition, the second order latent variable explained significant variance within each of the first order latent variables ($R^2_{\text{Positive relations}} = .35, p < .001$; $R^2_{\text{Trust in government}} = .55, p < .001$; $R^2_{\text{Social identification}} = .63, p < .001$).

Two alternative models were tested to ensure that the hypothesized model fit the data better than plausible alternatives. First, we examined a model with a single latent factor on which all items of social relations, trust in government, and social identification loaded. This model demonstrated poor fit, $\chi^2(76) = 10202.42, p < .001$, CFI = .64, RMSEA = .210 (.206 to .213), SRMR = .128, and our hypothesized model significantly fit better the data, based on chi-square difference tests, $\chi^2_{\text{diff}}(3) = 8930.67, p < .001$. A second model was tested in which the three dimensions of social cohesion were set to be orthogonal (i.e., did not covary). This model also demonstrated poor fit, $\chi^2(76) = 2981.41, p < .001$, CFI = .89, RMSEA = .112 (.109 to .116), SRMR = .23, particularly when compared to our hypothesized model, $\chi^2_{\text{diff}}(3) = 1709.66, p < .001$. Thus, the alternative models were significantly worse than the hypothesized model. Overall, we found support for H1, with social relations, trust in government, and social identification loading strongly and significantly on the second-order social cohesion latent variable.

Structural Equation Model

H2 — that social cohesion at Wave 1 would predict greater COVID-19 vaccination intentions at Wave 2 — was tested with a structural equation model, in which social cohesion at Wave 1 was set to predict vaccination willingness and risk of vaccination at Wave 2, while also accounting for (i.e., regressing) demographic and health factors. This model had acceptable fit, $\chi^2(190) = 1941.60, p < .001$, CFI = .94, RMSEA = .05 (.053 to .057), SRMR = .044. As shown in Table 3, and in line with previous research, older participants, men and those who were politically oriented towards the left had greater vaccination intentions (greater willingness and lower risk). Of the health-related factors, subjective health and

generalised risk perception were associated with greater willingness to get vaccinated (but not risk). Importantly, and in line with H2, social cohesion at Wave 1 significantly predicted greater willingness to receive the COVID-19 vaccine as soon as it was available ($\beta = .33$, $p < .001$) as well as lower perceived risk of receiving the COVID-19 vaccine as soon as it was available ($\beta = -.14$, $p < .001$), at Wave 2 (see Figure 1). Indeed, social cohesion was the strongest predictor among all the variables included in the models.

Discussion

This study sought to assess the link between social cohesion (conceptualised and measured as positive social relations, social identification, and trust in government) and COVID-19 vaccination intentions (willingness to get vaccinated and perceived risk of the vaccine) four months later. In line with H1, we found that trust in the national government, positive social relations, and social identification were positively and strongly associated with one another and, more importantly, that these three dimensions loaded onto a (second-order) latent factor. This suggests that, although social identification, positive social relations, and trust in the group's institutions have distinct elements, together, they capture a broader concept — social cohesion. These results are in line with theories of social cohesion research, from Durkheim's (1984, first published in 1893) original concepts of mechanical and organic solidarity to most recent reconceptualisations of the term (Chan et al., 2006). They also align with more recent research demonstrating that the multidimensional nature of social cohesion can be captured with latent factors (e.g., Botoni, 2018).

Even though social cohesion has historically been conceptualised as being composed of multiple dimensions, research — particularly in health contexts — has almost exclusively measured social cohesion in terms of trust and similar positive interactions between group members (e.g., Alcalá et al., 2016; Cradock et al., 2009; Jongeneel-Grimen et al., 2014). In this study, we brought the original conceptualisation of social cohesion to the study of health

outcomes. In line with H2, our results showed that an umbrella conceptualisation of social cohesion predicted greater willingness to get vaccinated and lower perceived risk associated with the vaccine four months later. Many extant models of health behaviour emphasize the role of individual factors (e.g., attitudes and self-efficacy, Sheeran et al., 2016) in predicting behaviour, while research on COVID-19 vaccination has mostly focused on the role of demographic characteristics such as age and sex (Freeman et al., 2020; Fridman et al., 2021; but see Wakefield & Khause, 2021). During pandemics, previous research has focused on the trust in government dimension of social cohesion (Blair et al., 2017; Lazarus et al., 2020; Quinn et al., 2012). Extending prior theory and research, and consistent with emerging research (Cruwys et al., 2021; Wakefield & Khause, 2021) and other pandemic related health behaviours (e.g., physical distancing, hand hygiene; Cárdenas et al., 2021; Stevenson et al., 2021), our results indicate that multiple dimensions of social cohesion (a group-level predictor) come together and may play a role in shaping people's vaccination intentions.

Overall, our results underscore the key role that social factors, particularly the quality of one's groups, play in shaping individuals' health behaviours. This is in line with a large body of the social identity approach to health, which has consistently demonstrated that belonging to social groups that hold value and meaning protects one's physical and mental health (e.g., Cameron et al., 2018; Junker et al., 2019; Khan et al., 2020; Wakefield et al., 2016), and plays a greater role in shaping health outcomes than individual characteristics such as age, gender, education, and political orientation (e.g., Greenaway et al., 2015; see Haslam et al., 2018 for a review). Along these lines, our research specifically illustrates the need to consider the groups that individuals are members of in a holistic way to understand their ramifications for people's health behaviours. That is, our findings indicate that the *quality* of people's group memberships, and whether they belong to groups that have

legitimate systems and in which members have positive relations with one another all matter for their health behaviours.

From a practical perspective, our results also illustrate that building social cohesion *early* during crises such as pandemics may have important downstream consequences, with social cohesion predicting vaccination attitudes four months later. While social cohesion “is fragile and requires long-term investment” (Ntontis & Rocha, 2020, p. 105) to be built and maintained throughout long-term crises, it is also a critical factor to overcome such crises. Previous research has found that, during crises, social cohesion can be built through messaging that reminds individuals that “we are all in this together” as a group (Haslam et al., 2020). In turn, the group, its systems, and its leaders have a responsibility to prioritise the well-being of the group above their own individual needs and take concrete actions in these directions, in order to build a stockade of social cohesion (Drury et al., 2021). In addition, individual group members also have agency during crises and can contribute to social cohesion by volunteering and participating in coordinated social support (Bowe et al., 2021). With regard to planning for future crises, it is promising that evidence suggests it is possible to build a reservoir of social cohesion *before* emergencies occur, and that this can help buffer their negative impact. For instance, in the UK, constituents of local authorities who invested in community-building programs in the years prior to the pandemic showed greater social cohesion, well-being, and optimism during the pandemic than constituents of authorities who failed to make such investments (Lalot et al., 2021). In particular, special efforts may be required among those who feel disenfranchised, left behind, or simply “not in this together”. Applied to the present context, if these individuals refuse vaccination, they are not only putting others and themselves at physical risk, they are also less likely to be perceived and treated as ingroup members when vaccination is mandatory and/or normative, which may further deepen their disengagement from society.

Limitations and Future Research

This study had several strengths, including its large, nationally representative sample, large number of control variables, and two-timepoint design. However, no research is without limitations. In particular, like most research that employs multiple waves of data, sample attrition occurred such that 43.2% of the Wave 1 sample failed to complete our Wave 2 survey. In line with recommendations (Newman, 2014), missing data were handled using Full Information Maximum Likelihood, but lower rates of missing data would have been preferable. In addition, we examined willingness to get vaccinated and perceived risk of vaccination, two often measured indicators of vaccination intentions. However, testing whether social cohesion predicts vaccination behaviour would be an important next step. Moreover, replicating this research in places with greater vaccine hesitancy would be important to examine the role that social cohesion plays when conflicting vaccination norms exist.

In addition, our research focused on three dimensions of social cohesion which are consistent features of social cohesion theoretical models (positive social relations, social identification, and trust in government; Bernard, 1999; Bottoni, 2018; Chan et al., 2006; Dragolov et al., 2016; Orazani et al., 2021). Other dimensions could, however, have been included. For example, social cohesion models often include individuals' behavioural involvement in the community such as volunteering and participating in mutual aid groups. Assessing such behavioural engagement would be of particular interest during the pandemic, where disparities were exacerbated (Perry et al., 2021), allowing forms of mutual aid to emerge across communities. Similarly, the legitimacy of the groups' institutions was exclusively assessed with trust in government. However, given the unprecedented powers that Western governments' enacted to manage the pandemic (e.g., mandating lockdowns), trust in public and democratic institutions could also predict vaccination attitudes.

Conclusion

Overall, this research illustrates the importance of considering collective psychology, i.e., the individual *as group member*, when considering how to promote individual health behaviours such as vaccination. Using two waves of data, our research demonstrated that social cohesion early in the pandemic predicted more positive vaccination attitudes four months later, above and beyond demographic and individual health factors. Thus, local and national governments who invest in social cohesion can expect such investments to bear fruit including in the context of future health crises.

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Figure 1. Predictive model with β s; *** $p < .001$.

Table 1
Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Willingness to receive the COVID-19 vaccine W2	-	-.48***	.18***	.24***	.23***	.30***	.20***	-.15***	.07**	-.03	-.04	.03	.08**
2. Perceived risk of receiving the COVID-19 vaccine W2		-	-.09***	-.12***	-.11***	-.15***	-.21***	.11***	-.04	.02	-.10*	-.02	.08**
3. Positive social relations in Australia W1			-	.47***	.44***	.59***	.14***	-.01	.04**	.19***	-.02	-.11***	.00
4. Social identification with Australia W1				-	.59***	.80***	.19***	-.01	.05**	.25***	-.02	.14***	-.01
5. Trust in the Australian government W1					-	.74***	.18***	-.01	.05**	.24***	-.02	-.13***	-.01
6. Social cohesion in Australia W1						-	.24***	-.01	.07**	.32***	-0.03	-.18***	-.01
7. Age							-	-.15***	-.01	.08***	.16***	.18***	-.17***
8. Sex (1= Male; 2= Female)								-	-.24***	-.11***	.04*	-.01	.01
9. Weekly Income W1									-	.10***	-.06**	-.16***	-.02
10. Political orientation W1										-	-.10***	-.06**	.02
11. COVID-19 diagnosis W1											-	.08***	-.08***
12 Subjective Health W1.												-	.04*
13. Generalised risk perception related to COVID-19 W1													-

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 2

Factor loadings (and standard error) of the measurement model

	Social Relations	Trust in Government	Social Identification
Social Relations			
People in Australia...			
... are willing to help others	.69 (.01)***		
... trust each other	.74 (.01)***		
... form a close-knit community	.65 (.01) ***		
... from different national or ethnic backgrounds get along well together	.78 (.01)***		
... work together to solve problems	.84 (.01)***		
... have civil conversation with those who have different views to their own	.83 (.01)***		
... respect practices from other national or ethnic groups, even when they disagree with these practices	.80 (.01)***		
... respect national rules and laws	.74 (.01)***		
Trust in Government			
I trust the way the federal government communicates information		.88 (.01) ***	
I trust the economic strategies of the federal government		.91 (.00) ***	
My faith in the federal government is strong		.92 (.00) ***	
Social Identification			
I take pride in the Australian way of life and culture			.89 (.01) ***
I have a sense of belonging in Australia			.88 (.01) ***
I identify as Australian			.52 (.01) ***
Social Cohesion (2nd order Factor)	.59***	.74***	.79***

Note. *** $p < .001$. The first and second item of social relations covaried (.44 [.02], $p < .001$)

Table 3

Predictive model

Predictive variables	COVID-19 vaccine intention at W2		Perceived risk of receiving the COVID-19 vaccine at W2	
	Standardised Estimate (Standard Error)	<i>p</i> value	Standardised Estimate (Standard Error)	<i>p</i> value
Social cohesion	.33 (.03)	< .001	-.14 (.03)	< .001
Age	.13 (.03)	< .001	-.14 (.03)	< .001
Sex (1= Male; 2= Female)	-.14 (.03)	< .001	.09 (.03)	< .001
Weekly Income W1	.04 (.02)	.133	-.03 (.03)	.291
Political orientation W1	.17 (.03)	< .001	.08 (.03)	.002
COVID-19 diagnosis W1	-.06 (.04)	.089	-.07 (.04)	.068
Subjective Health W1	.06 (.03)	.017	-.02 (.03)	.555
Generalised risk perception related to COVID-19 W1	.10 (.02)	< .001	.05 (.02)	.059
<i>R</i> ²	.17		.08	

Notes. All predictors were covaried in the model. Significant standardised covariances are: willingness to receive the vaccine and perceived risk = -.45 (.02), $p < .001$; social cohesion and age = .24 (.02), $p < .001$; social cohesion and weekly income W1 = .07 (.02), $p = .002$; social cohesion and political orientation = .32 (.02), $p < .001$; social cohesion and subjective health = -.17 (.02), $p < .001$; sex and age = -.15 (.02), $p < .001$; weekly income W1 and sex = -.24 (.02), $p < .001$; political orientation and age = .08 (.02), $p < .001$; political orientation and sex = -.11 (.02), $p < .001$; political orientation and weekly income W1 = .10 (.02), $p < .001$; COVID-19 diagnosis and age = .16 (.08), $p < .001$; COVID-19 diagnosis and sex = .04 (.02), $p = .15$; COVID-19 diagnosis and weekly income W1 = -.06 (.02), $p = .001$; COVID-19 diagnosis and political orientation = .10 (.02), $p < .001$; subjective health and age = .18 (.02), $p < .001$; subjective health and weekly income W1 = -.16 (.02), $p < .001$; subjective health W1 and political orientation = -.06 (.02), $p = .002$; subjective health W1 and COVID-19 diagnosis W1 = .08 (.02), $p < .001$; general perceived risk W1 and age = -.17 (.02), $p < .001$; general perceived risk W1 and COVID-19 diagnosis W1 = -.08 (.02), $p < .001$.