Testing delay in an environment of low COVID-19 prevalence: A qualitative study of testing behaviour amongst symptomatic South Australians

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ABSTRACT

Introduction: South Australia has to date (October 2021) been highly successful in maintaining an aggressive suppression strategy for the management of the COVID-19 pandemic. However, continued success of this strategy is dependent on ongoing testing by people with symptoms of COVID-19 to identify, trace and quarantine emergent cases as soon as possible. This study sought to explore community members' decisions about having COVID-19 testing in an environment of low prevalence, specifically exploring their decision-making related to symptoms.
Materials and methods: This study drew on a qualitative case study design, involving five focus groups, conducted in May 2021, with 29 individuals who had experienced COVID-19-like symptoms since the commencement of testing in South Australia. Participants detailed their last COVID-19-like illness episode and described their decision-making regarding testing. Data collection methods and analysis were theoretically informed by the capability, opportunity, and motivation behaviour (COM-B) model.
Findings: Participants' belief that COVID-19 symptoms would be 'unusual', severe, and persistent caused them to either reject or delay testing. Participants generally employed 'watch and wait' and social distancing behaviour rather than timely presentation to testing. Concern about economic loss associated with isolating after testing, and the potential for illness transmission at testing centres further prevented testing for some participants.
Conclusions: In a low COVID-19 prevalence environment, individuals rely on pre-existing strategies for interpreting and managing personal illness (such as delaying help seeking if symptoms are mild), which generally conflict with public health management advice about COVID-19. In low prevalence environments therefore public health authorities must give the public a reason to test *beyond* considerations of personal risk, and clearly communicate the need for ongoing COVID-19 surveillance *despite* the low prevalence environment.

1. Introduction

In the global context, Australia has to date been highly successful in the management of the coronavirus disease 2019 (COVID-19) pandemic, in some states maintaining elimination for many months despite the virus crippling health systems internationally (Department of Queensland Health, 2021). Indeed, at the time of writing (Oct 1, 2021) Australia has recorded 4.16 thousand cases per million people, compared with 130.54 and 115 thousand cases per million people in the USA and UK respectively (Ritchie et al., 2020). Recent outbreaks in New South Wales and Victoria however, have resulted in a shift in goal from total elimination of COVID-19 to an aggressive suppression of case numbers until appropriate

vaccination coverage can be achieved (Carmody et al., 2021). Nonetheless, the 'test, trace, isolate and quarantine' system involving high public testing rates, isolation of cases and tracing of contacts remains the cornerstone of the public health response. Looking beyond this current phase of Australia's National Plan to transition Australia's National COVID-19 Response (Australian Government, 2021) (Step A: Vaccinate, Prepare and Pilot), Step B overtly states the need for ongoing testing, track and trace. The final steps C and D both include the goal to minimise community cases (Australian Government, 2021), which assumes ongoing testing surveillance. Indeed, with the stepwise lifting of restrictions and return of international travel outlined in the national plan the likelihood and size of outbreaks increases (McVernon et al., 2021), and given there will be unvaccinated community members, the need for monitoring through ongoing community testing will persist (Queensland Health, 2021). Further, lessons learned from the COVID-19 pandemic will be important for preparedness for future pandemics sure to come (Thoradeniya & Jayasinghe, 2021).

One of the keys to the success of track and trace systems is early and fast testing (Stokel-Walker, 2021). The earlier cases of COVID-19 are confirmed, the quicker health officials can identify contacts and contain potential chains of transmission. Disturbingly, in Australia there have recently been multiple reports of individuals taking up to 10 days from onset of symptoms to get tested (Australian Broadcasting Corporation, 2021; Beers, 2021), and then returning a positive result. Health authorities in Victoria and New South Wales have repeatedly expressed frustration over public delays to testing hampering the public health response and limiting the supportive care cases can receive (Cockburn, 2021; Murray-Atfield & Johnson, 2021). The window for reliability of polymerase chain reaction (PCR) testing is narrow, approximately 7–10 days from symptom onset (Zimmer, 2020) leading to higher rates of false-negative results past this point. Thus, the effectiveness of the test, trace, isolate and quarantine strategy and the overall public health response is dependent on ongoing public engagement with symptomatic testing programs, particularly *early* test seeking.

Despite this, empirical research exploring barriers and delays to testing is surprisingly limited (Sim & Embrett, 2021). In Australia, severe acute respiratory syndrome coronavirus 2 PCR testing (hereafter 'testing') is the primary form of testing utilised by state governments and involves a nasal and throat swab. For symptomatic community members (here 'symptoms' and 'illness' refer specifically to COVID-19-like symptoms/illness), testing is available at designated testing clinics, pop-up testing sites (which often include drive through access), hospitals, and general practitioners' clinics. This however is the case more than a year into the pandemic and reflects substantial improvements in access to testing over this time. Older Australian research (Bonner et al., 2020) and international work found not knowing where or how to get tested was the most important reason for delays to testing (Clipman et al., 2020; Graham et al., 2021; Sim & Embrett, 2021). This may no longer be the case given increased experience with and exposure to testing for the public and health systems. Reports from the US describe delays due to the cost of testing (Clipman et al., 2020), however, in Australia testing is free. Research from Jordan showed barriers to testing including concerns about discrimination at work and privacy (Shahrour et al., 2021).

In theoretically locating the behaviour of delays to testing, Sim and Embrett (2021) categorise barriers into planning, process and outcomes delays. They suggest delays to testing arise due to individuals' knowledge about access and symptoms (planning delays), the characteristics of testing (process delays) and the consequences of testing results (outcomes delays) (Sim & Embrett, 2021). Bonner (Bonner et al., 2020) use the capability, opportunity, and motivation behaviour (COM-B) model (Michie et al., 2011) to describe the barriers to testing found in their Australian survey study. Both (Bonner et al., 2020; Sim & Embrett, 2021) describe barriers to testing including access issues, disruption, economic loss and discomfort associated with testing, and social stigma, with Bonner et al. (2020) finding the COM-B model to usefully delineate these. While mentioned as a 'planning' aspect of testing by Sim and Embrett

(2021), the assessment of symptoms as a critical first step in determining the need for testing is only lightly touched upon in the extant testing literature. Local South Australian data however, suggest individuals' assessments of their symptoms play an important role in determining their intention to test, with 53% of respondents to the South Australian Population Health Survey suggesting they did not seek testing because they believed that their symptoms were due to another known condition, and 44% did not think they had COVID-19 (R. Huppatz, personal communication, January 5, 2021). Sim and Embrett's scoping review (Sim & Embrett, 2021) ultimately calls for more empirical research to understand how to motivate voluntary testing, with little focus on symptom assessment in low-COVID-19 prevalence environments in the current literature. As such, this study addresses this gap in our understanding of public testing behaviour by exploring community members' decisions to have COVID-19 testing in a low prevalence environment, specifically examining their decision-making related to symptoms. We describe the reasoning used by the community members when making the choice about whether to have COVID-19 testing when symptomatic, particularly elucidating the way the presentation of systems in a low prevalence environment is critical in this.

2. Materials and methods

2.1. Setting

This research took place in Adelaide, South Australia, Australia, with major research activities (recruitment and sampling, data collection, and data analysis) performed across May and June 2021. Prior to data collection (staring May 27, 2021), South Australia had only recorded 4 deaths and 752 cases of COVID-19 infection, most of which were acquired overseas or interstate (565 and 26 cases, respectively) and had been contained within quarantine (O'Brien, 2021). With the exception of the period following a localised COVID-19 outbreak in mid-November 2020 (i.e. the 'Parafield Cluster'), South Australian testing rates had mostly remained under 400 tests per 100,000 persons since commencement of population testing within South Australia in March 2020 (R. Huppatz, personal communication, January 5, 2021). At the time of data collection for the present research (27 May to June 3, 2021), South Australia's neighbouring state of Victoria had just announced a COVID-19 outbreak (May 27, 2021) and lock-down measures (May 28, 2021), with consequent closure of the South Australian – Victorian state border. At the time, Australia had only recorded 30,063 cases of COVID-19 infection in total, and only 2.5 individuals in every 100 had been fully vaccinated in South Australia (O'Brien, 2021).

2.2. Design

This qualitative research study drew upon a multiple case study methodology, using semi-structured focus groups to capture individual accounts of, and contexts for, decision-making relating to testing (Carey, 2012). The case study approach allows for the collection of individual perspectives within their context (Snagster-Gormley, 2017), while situating this within focus groups cultivates discussion, ideas, and investigates experiences to a point of theoretical saturation (Breen, 2006). This design was implemented by requesting each participant describe in detail the last time they experienced COVID-19 symptoms and how they reached the decision to (not) test, and only then inviting discussion from the group related to this. This design therefore plays to the strengths of both methods, with individual case studies enabling fully contextualised accounts of behaviour (Hentz, 2017), and after, focus group discussion promoting social location of this decision-making and therefore further reflection and explanation of beliefs and values underpinning decision-making (Cyr, 2019). For the purpose of the present study, the cases provide opportunity to understand testing behaviour in the context of a low prevalence environment.

2.3. Study population

South Australian adults (>18 years) who experienced any COVID-19-like symptom(s) since the commencement of testing in South Australia (March 25, 2020) were invited to participate. COVID-19-like symptoms were defined using the SA Health COVID-19 information sheet (SA Health, 2021) and included symptoms of fever or chills, cough, sore throat, runny nose, shortness of breath, loss of taste and smell, or nausea, diarrhoea and vomiting (SA Health, 2021); participants were eligible if they had any one symptom. Purposeful maximum variation sampling was used to obtain a sample varying in gender, age, Index for Socio-economic Advantage and Disadvantage (IRSAD) status (a summary value reflecting economic and social conditions of people and households within a given area), highest educational attainment level, country of birth, and all languages spoken at home. Exclusion criteria included people who had testing whilst asymptomatic, or those who experienced COVID-19-like symptoms that were managed outside of South Australia. Finally, non-English speaking participants were excluded due to a lack of translator services.

Participants were recruited for the focus groups by a market research company, Ava Research (https://avaresearch.com.au/). Ava Research distributed details of the research to South Australian residents within their nationwide database of persons who had previously registered their interest in participating in research. Ava Research was then responsible for providing study information to registrants, sampling for maximum variation according to the stated socio-demographic variables, completing participant screening, distributing letters confirming research participation, and sending participant reminder messages prior to scheduled focus groups. Participants were permitted to choose which scheduled and available group they would participate in, meaning that the sample within each group was non-stratified. Participants were reimbursed $80 (Australian dollars) for expenses involved in participating in the research, including their time. Written informed consent was provided by all participants on the day of their focus group. The research project was approved by the *blinded for review* Research Ethics Committee (Project Number 4459) and the *blinded for review* Human Research Ethics Committee (project number 2021/HRE00116).

2.4. Data collection

Five 1-h face-to-face focus groups were carried out by the same facilitator and moderator between 27 May and June 3, 2021. Focus groups were conducted until data saturation was achieved. A facilitator guide was used and can be found as a supplementary file (Supplement 1). Extending the work of Bonner et al. (2020), questions within the facilitator guide were developed to cover the COM-B domains of capability, opportunity, motivation, and behaviour, and structured into two broad themes: symptoms experienced, and what influenced the decision to (not) test. The COM-B Model was developed by Michie et al. after a systematic review to identify frameworks of behaviour change interventions (Michie et al., 2011). Based on this review, a proposed new framework was developed, and the COM-B system is at the centre of this framework (Michie et al., 2011).

In this study, each participant was asked to fully describe the last time they experienced COVID-like symptoms, with the facilitator prompting for additional information not initially covered using the facilitator guide. At the end of each individual's complete description of their last illness episode and related decision-making, an open group question was posed asking participants to compare and contrast this with their own situation. Participants were also given the opportunity to elaborate on their earlier responses after hearing what others had reported. This generated data that both reflected real experiences of illness, but also responded to more abstract attitudes and beliefs about COVID-19 testing, and more broadly the pandemic response. The facilitator guide was revised after completion of the first focus groups to include the questions "did getting tested change how you think or feel about COVID testing?"

and "later, did you think twice about your decision not to get tested?". Discussions were closed after 1 h and any further participant thoughts were encouraged to be sent by email to the primary researcher to be added as an appended field note. Confidentiality of discussions could not be assured given the focus group method used, however, we verbally requested that confidentiality be maintained after concluding participation. Focus groups were voice recorded using a digital recorder and transcribed by a professional service in compliance with confidentiality protocols.

2.5. Analysis

The facilitator and a second researcher (*blinded for review*) conducted the formal analysis which was managed using NVivo (QSR International, Doncaster). Analysis followed the method outlined by Meyer and Ward (2014) for incorporating social theory in qualitative research. Preliminary analysis involved listening to the audio recordings of all focus groups while theoretical memo-writing (Layder, 1998) to summarise key concepts and themes raised by each participant within their individual narrative, and within and across focus groups. The concepts and themes from the theoretical memos formed the basis for the preliminary code list, and this list was revised through discussion between the two researchers throughout the analysis. Individual transcripts were read and coded by two researchers independently. Formal analysis first involved pre-coding in an open manner utilising the preliminary code list and allowing key features of the data itself to come to the fore generating new codes (Meyer & Ward, 2014). This first step was followed by conceptual and thematic categorisation, where these features of data were organised into groups reflecting similar themes. Finally, theoretical categorisation involved organising these groups according to the initial theoretical model (Meyer & Ward, 2014), in this case the COM-B model. Where these headings did not comfortably fit within COM-B, further open analysis of the data sections was completed to generate insights and ensure that other themes were not missed. The developing analysis was presented on multiple occasions to the wider research team in visual, verbal and written forms, enabling critique of process and outcome and ensuring rigorous and robust data collection and analyst triangulation (Fade, 2003).

3. Results

3.1. Overview

The socio-demographic characteristics of the 29 participants who attended the five focus groups can be found in Table 1. Although sampling was not geographically limited within South Australia, the sample contained no participants from rural or remote areas and most participants resided centrally within the Adelaide Metropolitan Area, reflected in a skew towards higher IRSAD values within the sample.

The decision-making participants appeared to demonstrate regarding their choice to (not) test when symptomatic was reflexive and recursive. Here we have conceptually separated key focal points of this decision making into discrete questions which participants appeared to be considering in their decision making, although the questions were not necessarily always overtly spoken. In Fig. 1 these questions are presented in the order that most commonly reflected the order of thinking demonstrated by participants. Delays to testing were frequently reported at the first and last questions.

The fundamental starting point for participants' decision-making about how to deal with their episode of illness included (1) symptoms, illness severity and progression that they experienced and (2) how this interacted with their knowledge and beliefs about COVID-19. Here participants were responding to the uncertainty presented by their symptoms. In Fig. 1 we have summarised this symptoms assessment with the question 'Does it look like COVID-19?'. Following this core aspect of decision-making was a consideration of how 'close' the threat of COVID-19 is for them personally, and therefore their perception of 'Could it

Table 1

Socio-demographic characteristics of study participants.

Characteristics	# Participants (n = 29)
Gender	
Female	17
Male	12
Age (yrs)	
18-25	7
26-34	3
35-42	7
43-50	5
51-60	6
>60	1
IRSAD[a] Quintile	
1	5
2	2
3	11
4	11
5	0
Highest level of educational attainment	
Year 12 or below	5
TAFE/VET qualification	8
University Degree	16
Employment status	
Not employed	2
Informal work	4
Part-time/casual	4
Full-time	8
Self-employed	7
Full-time student	4
Annual household income before tax ($AUD)	
<30,000	8
30,000–59,999	4
60,000–89,999	7
90,000–119,999	5
120,000–150,000	2
>150,000	3
Country of Birth	
Australia	17
UK	4
India	3
Canada	2
Singapore	2
Switzerland	1
Language(s) spoken	
English	29
Chinese/Mandarin	2
German	1
Greek	1
Tamil	1
Telugu	1
Vietnamese	1

[a] Index for Relative Socio-economic Advantage and Disadvantage, with values derived from the 2016 Australian Census of Population and Housing, https://www.abs.gov.au/ausstats/abs@.nsf/mf/2033.0.55.001

feasibly be COVID-19?'. Here the 'closeness' of the threat was considered in the physical sense of their proximity to active COVID-19 cases, and it was here that participants assessed the risk of COVID-19 posed by their environment and social contacts. To ensure a coherent diagram the next questions around whether individuals are concerned about the potential impact of COVID-19 infection on themselves and/or others (ie the risk of severe illness) have been positioned linearly following the symptom and threat assessment aspects in the figure, and this is where these sit in the decision-making around a specific illness episode. However, participants described these considerations occurring outside of the thinking relating to discrete illness episodes also, being updated based on gains in information about COVID-19 and its impacts through news media, social media, and social networks; they are broad beliefs and values rather than situation specific questions. In all, this decision process resulted in individuals either having an intention to test, no intention to test and/or intention to socially isolate (instead of or alongside testing). If individuals intended to test, the 'costs' of testing were then considered, and resulted in the ultimate testing outcome.
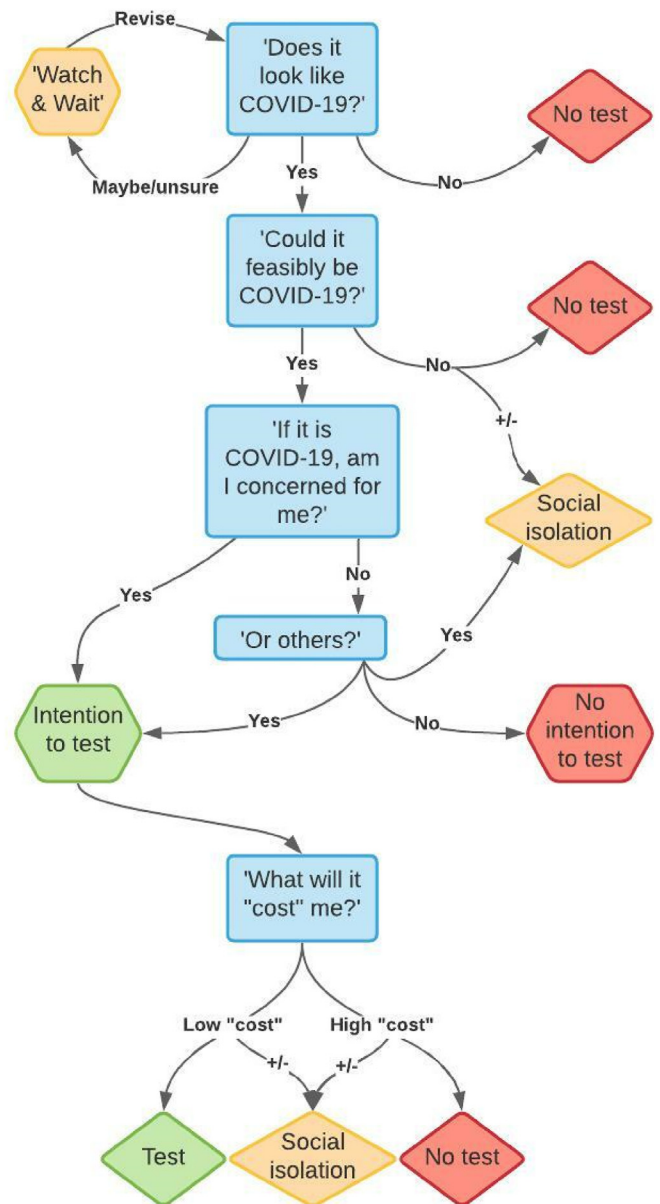

Fig. 1. A model of the decisional logic involved in virologic testing behaviour for SARS-CoV-2.

The findings will be organised to first report the testing behaviour of the sample, and then describe more fully each of the sections of Fig. 1 in turn.

3.2. Testing behaviour

Nineteen participants (66%) had not been tested when most recently symptomatic, while nine (31%) had, and one (3%) did not say whether they had or not. Some participants had not been tested for their most recent symptoms, but had previously, and vice versa. Several participants reported they had been tested as this was a requirement to return to work, but otherwise would not have sought testing. This confirms that participants' choice to get tested (or not) was situation specific and influenced by processes other than risk perception.

As shown in Fig. 1, social isolation was seen by many to be a legitimate alternative method of risk management more proportionate to the low prevalence, and therefore perceived low threat of COVID-19, in South Australia. Chelsea demonstrated this in the quote,

I chose not to get tested because there was absolutely nothing going on in South Australia, and if that had've happened today (when there are recent cases) it might've been a bit of a different situation but, yeah, that was my personal choice when there was … the risk was extremely low. I just stayed home. – F, 35–42 years old (yrs)

Participants interchangeably used the terms social isolation, social distancing, quarantine and 'staying home', and viewed it as both a complementary behaviour in line with recommendations, but also a behaviour which competed with or reduced/removed/replaced the need for testing. Kate summarised the broad sentiments of the participants well,

I think that's the more important thing than getting tested, is that you're not spreading whatever virus it is. Because they're all a risk to some people … if you're planning on staying home until you are symptom-free, and isolating, then I don't think it's a problem not to go and get tested. – F, 35–42 yrs.

3.3. Decision-making about testing

3.3.1. 'Does it look like COVID-19?' - symptoms assessment

Fig. 2 details the symptoms assessment described by participants and provides an account of how participants sought to reduce the uncertainty created by their symptoms. Participants reported assessing their symptoms against their own patterns of personal illness, their known recent illness contacts, and their understanding of COVID-19 illness presentation to arrive at a decision about whether their illness 'looked like' COVID-19. While most participants conducted this symptom assessment without seeking medical advice, a minority did. Sometimes this was about their concern for their own wellbeing due to the severity of the illness, and other times they explicitly stated they sought advice about testing.

As shown by the yellow arrow in Fig. 2 and circular pathway in Fig. 1, delays in seeking testing most frequently arose in this step. The outcome of the symptoms assessment was not static, but was updated with more
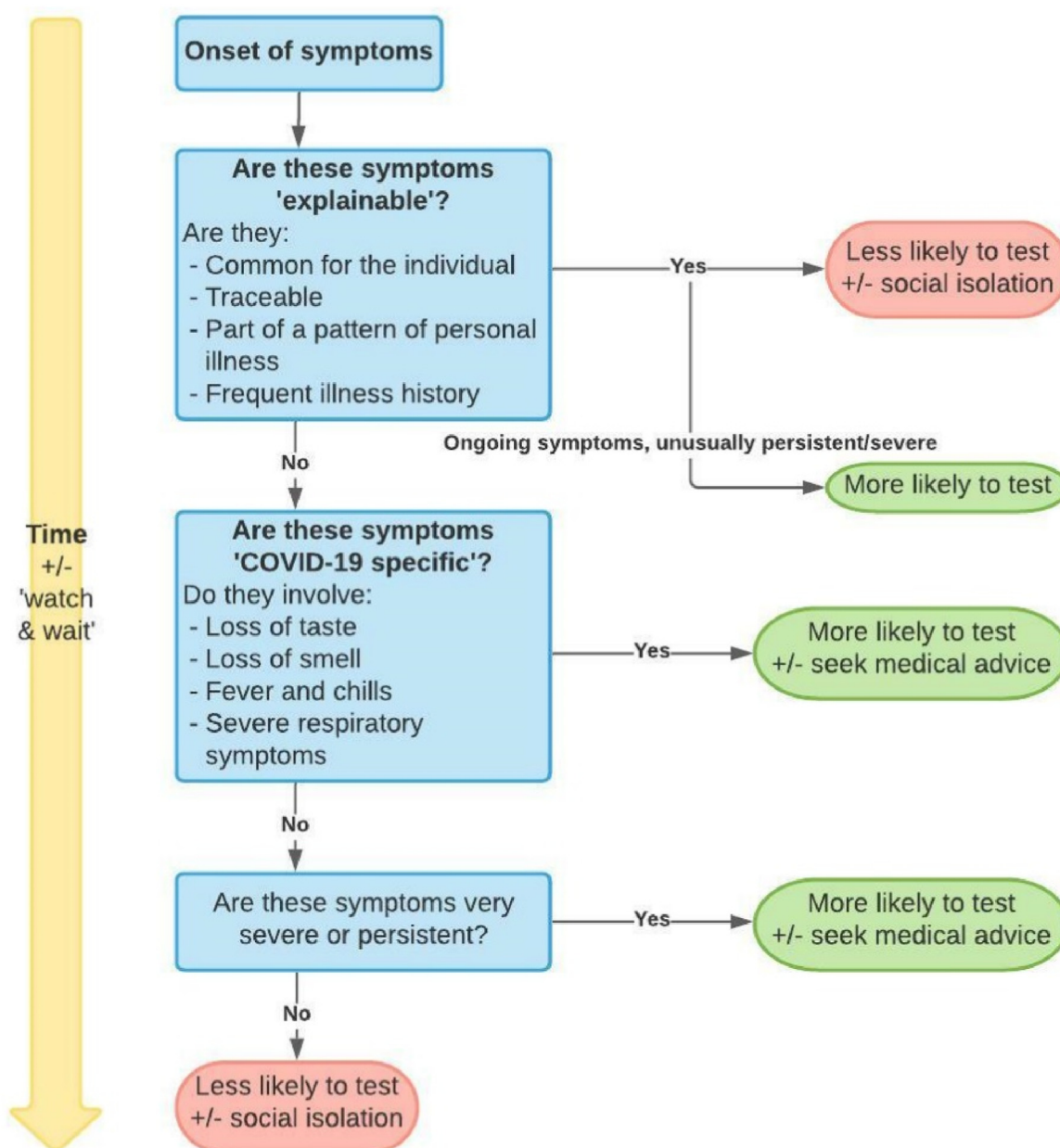

Fig. 2. A model of the logic involved in interpreting COVID-19-like symptoms.

information, typically related to changes in severity or symptom persistence, 'If you're feeling like "Okay, the symptoms are lasting for two days, three days, maybe stay at home, monitor it. If it gets worse, then go and get tested" – F, 18–25 yrs. Therefore, throughout the symptoms assessment participants enacted 'watch and wait' strategies that delayed testing;

> I was just waiting to see, and it didn't get worse, I didn't get any fever or chills or … so, I … and I have it all the time, as well. Sometimes you're just a bit rundown, and I think that was the major decision why I didn't get tested – M, 51–60 yrs.

3.3.1.1. Explainable symptoms. The first aspect of the symptoms assessment involved determining whether the symptoms were 'explainable', and therefore not requiring testing. Explainable symptoms were those commonly experienced by the participant, 'if it's something normal to you, even though it's on there, unless it's worse than normal or different to normal, you kind of go "Oh, that's just that", so you just brush it off sometimes.' – F, 35–42 yrs. For these participants explainable symptoms included general lethargy, hay fever symptoms, loss of voice due to shouting, runny nose due to breathing cold air, being 'under the weather' due to being wet and cold at night, coughing due to quitting smoking, and congestion due to dairy consumption and seasonal changes. Overall, participants actively sought to resolve the uncertainty about their symptoms by constructing a runny nose, sore throat, cough, and lethargy as explainable and therefore not warranting testing.

Symptoms were also explainable if they were traceable; that is, their onset could be linked to contact with someone who they knew to be unwell. This was especially so if they knew this contact had been tested and received a negative test result, like Peter,

> And I spoke to my daughter, you know, we get together as a family most weeks, and she said she had the exact same thing. So, it was probably something that circulated through the family. And she's got children, as well, and she'd had them tested, and every time they were tested they came back negative, so I thought "ah, well if, you know, if I've got … if we've all got the same thing, I'm alright as well". Um, yeah, so … but I had all the symptoms, but I've never been tested – M, 51–60 yrs.

But this reasoning also presented when the participant did not know of their ill contact's COVID-19 status. For example, explainable symptoms could be linked to settings known to result in high infection transmission, such as playgroups and day care centres.

I keep telling my daughter when we go to playgroup on Fridays "Don't lick the play food!" … Come Sunday, my daughter's got a runny nose and she's sick again. And I've seen this happen two or three times, and then she gets a runny nose and then I get a runny nose, so that's how I got my cold … So, my whole theory about not getting the test done for my daughter and myself was "I know she's got a cold because she licked the play food [at playgroup]" – F, 26–34 yrs.

A minority of participants went so far as to suggest unnecessary testing was occurring because others lacked common sense and awareness about their patterns of personal illness, ' … people are trying to do things [testing] obliviously because they are not aware of what they have. And so, I think when it comes down to it, we have to just be vigilant about monitoring ourselves, first and foremost' – M, 35–42 yrs.

3.3.1.2. COVID-19 specific symptoms. The next step in the symptom assessment involved participants comparing their symptoms with those they believed to be COVID-19 specific (Fig. 2). Knowledge about the presentation of COVID-19 varied, but most participants believed it would always present with specific symptoms that included loss of smell, loss of taste, and shortness of breath, 'I've never had COVID, but I guess in my mind I was thinking "If it was COVID, then straight away I shouldn't taste anything"- M, 35–42 yrs. It was frequently mentioned that all these

symptoms would need to be present together in addition to sore throat, fever, cough, and runny nose for participants to be concerned,

> … these things that I'm always prone to [shortness of breath, loss of taste and smell], and I do get hay fever as well, and so, because they're all sort of fairly routine things, it would have to be sort of a critical mass of all of that together and getting, like, three stages worse that I usually experience, and then I would think "Oh, ——! Maybe I'd better go get tested" [laughs] – F, 18–25 yrs.

3.3.1.3. Symptom severity and persistence. As suggested above, the severity and persistence of symptoms was an important part of the symptoms assessment and could create additional uncertainty where it had been previously resolved. While even explainable symptoms that persisted longer than usual could result in consideration of testing, there was a strong belief held by participants that COVID-19 presents with severe illness, and illnesses presenting with mild symptoms would not be COVID-19. Several participants also described concerns that they were not ill enough to warrant the use of limited health resources; they would be 'wasting people's time' or not taken seriously presenting for testing with mild symptoms; 'I didn't think I was sick enough to go' – F, 35–42 yrs. Multiple participants reported having these beliefs created or reinforced after seeking medical advice. For example, when one female participant's (43–50 yrs) General Practitioner (GP) discouraged testing after she sought care for an upper respiratory infection with fever, she took this as feedback as to when to seek testing in future, 'So, I think I rationalised in my mind that it's not … COVID must be more severe for me to get tested'. Conversely, delays to testing were also reported by participants who said they were so severely ill they were physically unable to leave the house for testing, despite wanting to be tested.

In summary, an assessment of whether their symptoms were explainable, traceable or matched their perception of COVID-19 initiated individuals' decision-making about seeking testing. This was iterative and usually included 'watch and wait' strategies that delayed testing. It ultimately ended in a decision to not test or to further consider the likelihood of their illness being COVID-19 in the presence of continuing uncertainty caused by the type, high severity, or unusual persistence of symptoms.

3.3.2. 'Could it feasibly be COVID-19?' – threat perception

If uncertainty about their illness could not be resolved through the symptoms assessment, individuals shifted focus to a threat assessment to determine whether they could plausibly have contracted COVID-19. This included considerations of both the prevalence, and therefore the perceived threat, of COVID-19 in the state, and their own personal vulnerability to infection.

3.3.2.1. Temporal and spatial perceptions of threat. Temporal and spatial perceptions of the threat of COVID-19 were critical in participants' decision-making. It was repeatedly stated and supported amongst the groups that the likelihood of an illness being COVID-19 in South Australia was low due to the low prevalence; 'Like … the chances were extremely low, like, probably one in a million. Probably even lower than that … ' – F, 35–42 yrs. COVID-19 was seen as a 'global' rather than 'local' threat, 'I thought, you know, "Oh, I won't have COVID. It's all in the other states and other parts of the world, so it's not so much here"' – F, 26–34 yrs. This perception strongly determined participants intention to (not) be tested, particularly early in the illness.

> SA Health, they want the numbers up, they want to make sure there's no cases, I understand that, but they also have to use logic, you know? If I cough or, you know, "Do I have the virus or not?", the logic tells me I don't. So that's why I wouldn't go – M, 51–60 yrs.

This worked the opposite way, strongly increasing intention to test, and test earlier, if participants felt they had come into close proximity

with a case or a hotel quarantine worker, if there was a cluster in the state, or if they or a close contact had been interstate;

> I had a few symptoms and they were really quite mild, um, but at the time my housemate was working at the quarantine hotels. So, um … [All participants laugh] … whereas normally I'd go "You know what, it's probably nothing", but at that point I was like "Mm … nah, it's too much of a risk" so, yeah, ultimately just went to a drive-through and got tested super easily – F, 18–25 yrs.

3.3.2.2. Personal vulnerability and vaccination. In addition to temporal and spatial perceptions of threat related to the prevalence of COVID-19 in the state, participants who thought of themselves as socially isolated and deliberately practised high levels of hygiene typically did not believe themselves vulnerable to contracting COVID-19, and so demonstrated no intention to test even when symptomatic. One female participant (>60 yrs) provided an example when, in response to being asked whether she had ever contemplated getting tested, she said 'I don't think so, because we were very careful in terms of isolating and being very precautionary. So, I think because we've been so proactive … [I] never thought that I would, um, need testing'. Participants were specific about the actions taken that they considered would reduce their vulnerability. These included not travelling interstate/overseas, not taking public transport, not frequenting busy areas, and reducing contact with grandchildren.

Related to this was the belief held by approximately half of the participants that if they had been vaccinated they would no longer be vulnerable to contracting COVID-19; 'I would assume if you're vaccinated against it you wouldn't get it, so why would you need a test to see?' – F, 26–34 yrs, and 'I'd expect that the vaccine wouldn't let me get COVID. I would expect that's its whole purpose, so I wouldn't-test if I was vaccinated' – F, 43–50 yrs. Other participants did understand that they could still contract COVID-19 if vaccinated, and therefore did intend to test if symptomatic when vaccinated.

For most participants the low prevalence, and therefore perceived low threat, of COVID-19 at the time of this research and previously in South Australia resolved lingering uncertainty and ended the decision-making about whether to seek testing. If participants felt there was no real threat of COVID-19 in the state, or they themselves were personally not vulnerable, they did not delay testing, they simply had no intention to test at all. As previously mentioned, some thought that socially isolating was the more proportionate response, while others reported simply going about their daily lives.

3.3.3. 'If it is COVID-19, am I concerned for me?' – personal risk assessment

Beliefs about COVID-19 as a highly dangerous and virulent virus motivated testing, while contrasting beliefs demotivated testing. Most participants held the former view, and if they felt their symptoms were consistent with COVID-19 and there was a chance they could have contracted COVID-19, they intended to test. A minority, however, did not believe COVID-19 warranted the level of concern it is receiving. For example one male (43–50 yrs) said, 'I think the whole COVID thing is actually quite a bit of, um, bluff from a lot of people, I don't think it's anywhere near as serious as its been made out to be', and this from another male (51–60 yrs) 'I see COVID as just like another strain of the flu so, um, you know, uh … if people want to go get tested, good on them.' The participants stating this view were middle to older aged, but there were also younger participants who, although they did believe COVID-19 could result in severe illness, did not see themselves as vulnerable due to their young age. Therefore, while many participants were, these younger participants were not, motivated to seek testing out of concern for their own wellbeing.

3.3.4. 'If I am not concerned for me – am I concerned for others?'- community risk assessment

The minority of participants who did not perceive COVID-19 as a 'real' threat to themselves also did not see it as a real threat to others, or

at least no different to other seasonal viruses that authorities manage very differently. Therefore, these participants had no intention to test. While some of these participants suggested they would socially isolate if unwell, others reported feeling no obligation to test or isolate, 'I've never been tested and I won't get the jab for it, either' – M, 51–60 yrs.

Participants who were not concerned for themselves often did articulate concerns about spreading COVID-19 to others, including friends, family, colleagues, and the general community. One such participant said,

> … it is also my obligation to the South Australian government, to the Australian Community, that I get tested and that I'm not a risk to not only the people around me but the people that I come into contact with … So, it's also a moral obligation to the place I live to … to make sure that I follow the guidelines, um … not only the guidelines, but also their requests. Because they're not pushing us to get tested, they're asking us to get tested, so, um, it's my moral obligation, um, for the community, the wider community, that I make sure I'm not a risk to them, too – M, 43–50 yrs.

This was especially the case when participants could identify particularly vulnerable members of their own social networks. One participant, who had not been tested, mentioned she did not know anyone particularly vulnerable to severe COVID-19, but she had previously,

> … but had we still had those people in our life, then I think I would've been much more likely to go and have a test whenever I felt a little bit sick because I would think "Oh my god, I'm going to kill off my mum!", you know, um, if I don't. So, I think that was a major factor. Had I had some vulnerable people around me, that would've certainly influenced my decision to take testing more seriously – F, >60 yrs.

In this way, even if participants were not concerned for themselves, some still perceived the potential severity of the risk for vulnerable people they know or even the broader community in general strongly enough to result in an intention to test. For others this concern played out not as an intention to test, but rather an intention to isolate themselves while ill, or at the very least stay away from their identified vulnerable contacts (Fig. 1).

3.3.5. 'What will it cost me?' – barriers to testing

For those who reached the point of intending to test (Fig. 1) the ultimate testing outcome was determined by more practical barriers to testing. These are well articulated in extant literature (Bonner et al., 2020; Shahrour et al., 2021; Sim & Embrett, 2021); therefore we have briefly listed those identified by these participants in Table 2. For these participants, the most important and less documented barriers were related to the chance of contracting illness (including COVID-19) at a testing centre, and disruption associated with having to isolate following testing (it is a mandatory requirement to isolate until receiving a negative test in South Australia). Testing is free in Australia and all participants reported they could access testing; the vast majority reported they could easily get tested if they wanted to. Delays to testing were reported where participants were attempting to mitigate the negative impacts of testing on their lives, primarily disruption, like one male participant (35–42 yrs) who said 'So, with my job I'm quite busy anyway, so, like, so it doesn't fit in the schedule … so I said "Okay, another time. Just get on with the job".'

4. Discussion

This research found that delays to seeking testing for individuals in a low COVID-19 prevalence environment were primarily due to three reasons: 1) the enactment of 'watch and wait' strategies in symptom assessment, 2) beliefs that COVID-19 always presents as severe illness or with specific symptoms, and 3) where individuals who intend to test attempt to reduce the impact of testing on their lives. Most individuals

Table 2
'Costs' of testing as identified by participants.

Work/study barriers	Example quotes
- Disruption to planned work schedules due to testing or isolating while awaiting results	- 'I thought "Well, if I get in there now and they go 'Oh, you've got to quarantine for two days', well I can't do now, I've got to push all the jobs back and it's going to throw everything back".' - M
- Being unable to attend education and examinations due to testing or isolating while awaiting results	- 'I had an exam in between and I couldn't attend it because I had to be home up until my results were out.' - M
Physical barriers	
- Discomfort from the test itself	- ' … I don't just want to go and get her tested … because you hear about that thing getting stuck and how painful it is.' - F
- Discomfort due to waiting in long testing lines for long periods of time	- ' … that is the only thing I know of, is that you have to get up really early, wait for hours and hours … ' - F
Perceived risk	
- Risk of contracting illness/COVID-19 at the testing centre	- 'Because I said, "If I'm not sick, I'm going to get sick if I go in there", so that would be a deterrent for me.' - M
- Trauma to children from testing procedure	- ' … it felt concerning to me to put a toddler through that, especially when, at the time, everybody was getting tested and those lines were just horrific.' - F
- Potential for inaccurate results leading to further disruption and distress	- 'I have no … I have no confidence in the tests' - F
Monetary barriers	
- Loss of income due to being unable to work due to testing or isolating while awaiting results	- ' … not having, um, access to paid sick leave, and that influenced the decisions of a lot of, um, my colleagues at work.' - F
- Difficulty affording take-away food due to living alone and isolating while awaiting results	- 'I live in a shared house, I can't go out and make meals, I have to order it.' - M

perceived the low prevalence environment as a low threat/risk environment, and therefore an important justification made by participants for their choice not to test was that social isolation is a legitimate alternative to testing and would mitigate any risk to others.

The primary reason for a delay to testing found here was the 'watch and wait' strategy employed during symptoms assessment; an appraisal or planning delay (Sim & Embrett, 2021). Delays were also seen where participants (and alarmingly, as reported by participants, a number of general practitioners) did not believe symptoms listed on the SA Health COVID-19 information sheet warranted COVID-19 testing. These findings are consistent with Australian cross-sectional research exploring reasons for (not) testing (Bonner et al., 2020; Grundy et al., 2020). Sim and Embrett (2021) and others (McCaffery et al., 2020) report these delays to be caused by low health literacy. We believe our more detailed findings however show this to possibly be less an issue of health literacy, and more to do with relying on known and trusted methods for the management of personal illness, in the context of a perceived low threat environment. To this day (Better Health Channel, 2021; HealthDirect, 2021) key messaging from Australian health authorities with regard to cold symptoms is to reduce social activity, rest, and only seek medical help if symptoms persist or become unusually severe. Further, advertising for cold and flu medications have constructed 'soldiering on' (continuing daily activities despite illness) as a modern and responsible approach for time-poor, busy parents and others as recently as 2020 (Johnson & Johnson Pacific Pty Limited, 2020). Essentially, this is exactly what our participants described doing. However, with the COVID-19 pandemic came a sudden shift in message from authorities to stress the importance of seeking COVID-19 testing at the first sign of illness; a message that, while entirely appropriate for pandemic management, sits in stark contrast to previous messaging around personal illness management. Repeatedly, participants in this study described this messaging as 'lacking common sense'. In support of others (Tsirtsakis,

2020) we suggest this reflects authorities' lack of communication to the public about the logic of, and need for, ongoing surveillance through testing, even during times of low COVID-19 prevalence, that is, the *public* health goals of testing. In addition to the lack of information, it may also be the case that certain information and/or information sources are distrusted, at least by particular population groups (Ward, 2020). A qualitative study around (dis)trust in COVID-19 information/sources in Australia found that whilst government sources and Chief Public Health Officers were generally trusted and their advice followed, the swathe of misinformation on social media led to some broader questioning of who or what to trust (Ward et al., In Press). The so-called 'infodemic' of COVID-19 (Gallotti et al., 2020; Tangcharoensathien et al., 2020) obviously needs to be taken into account when trying to work with population groups to undertake testing or comply with COVID-19 regulations, since information provided may well differ from the complex and confusing tidal wave of mis/dis/information that we are all confronted with on a daily basis. This suggests that further information could be communicated to the public, not just about *what* they should do (i.e. get tested) but also about *why* they should do it (i.e. the logic behind the decision). This could apply to management of other pandemics, as well as communication of other messages relevant to COVID-19, for example vaccination.

The subtle difference in *personal* health management and *public* health management is brought to the fore by the request for individuals to test despite their low risk of COVID-19. Participants were not concerned that they may have COVID-19, therefore testing was wholly unnecessary from their *personal* health management perspective. Very few were aware of any reason beyond this to consider testing. Acknowledgement of this slight shift in focus, along with clear communication of how pandemic management differs from personal illness management, and therefore *why* they should test *despite* the low likelihood of their illness being COVID-19, may assist individuals to see the purpose of testing beyond simply managing their own uncertainty about their illness. And this is needed more than ever in the context of increasing rates of vaccination, where vaccinated individuals are more likely to experience lower symptom severity. Likewise, broader communication and explanation of the logic in the public health management of the pandemic may assist the public in correcting the mistaken belief that social isolation is a legitimate alternative to testing.

One way of understanding the underlying rationale for (not) getting tested for COVID-19 is the concept of 'candidacy', or the extent to which people see themselves as 'candidates' for getting COVID-19. Candidacy was originally posited as a way of understanding why working-class men were less likely to undertake health promoting activities to prevent coronary heart disease (Davison et al., 1991, 1992; Frankel et al., 1991) and has recently been applied to understanding if and how women in Australia undertake health protection behaviours to reduce their risk of getting COVID-19, what the authors call 'COVID-19 candidacy' (Ward et al., 2021). In that study, women who perceived themselves potential 'candidates' for COVID-19 were more likely to engage in behaviours to protect themselves and their families. In order to improve testing rates for COVID-19 (and compliance with other public health strategies aimed at reducing transmission), public health practitioners should attempt to understand the extent to which different population groups see themselves as candidates for COVID-19 – groups that do not view themselves as 'COVID-19 candidates' may need additional forms of information and engagement in order to improve testing and compliance rates.

Similarly, most participants believed COVID-19 to be something 'more' than the common cold. Again, this has been attributed to low health literacy (Sim & Embrett, 2021), however again we can see conflicting communication from authorities. All press conferences include the now trite instruction to 'get tested at the first sign of any symptoms, no matter how mild'. In apparent conflict, many also include descriptions of severe COVID-19 illness filling Australia's hospitals and intensive care units to justify imposing severe restrictions to freedom of movement during local or interstate outbreaks. The news media too is awash with stories of severe COVID-19 and pleas from hospital beds for public

compliance to health orders in an attempt to increase perceptions of threat severity and therefore motivate public compliance (Collins, 2021; Lyons, 2021; Truu, 2021). Yet in the context of a population with little exposure to COVID-19 this may be unintentionally fostering beliefs about COVID-19 presentation that prevent or delay individuals from seeking testing when only mildly symptomatic, as most cases will be, particularly with high rates of vaccination. What may help therefore is greater balance in reporting on COVID-19 illness, and more nuanced explanation provided and reported with authorities' requests for testing. Directly addressing the issue of the perceived low threat environment and therefore helping the public to reconcile the request to test when it seems to 'lack common sense' is needed.

Our sample was limited to primarily metropolitan participants and did not include a special focus on cultural and linguistic diversity for time and resource reasons. This may be reflected in the high access to testing reported by our participants relative to other studies which find access is more limited in regional and remote locations, and in culturally and linguistically diverse populations (Hengel et al., 2021; Sim & Embrett, 2021).

In this study, the COM-B model was useful in developing the data collection tools and therefore eliciting rich, comprehensive data. In terms of data analysis, we developed our own conceptual groupings (Fig. 1) to more clearly report the decision making of participants during the analysis. These conceptual groupings may be useful to other studies exploring similar themes around public health testing behaviours.

5. Conclusion

This research demonstrates that Australian adults *do* follow health advice in the management of personal illness, however, in a low COVID-19 threat environment they rely on known and trusted directions that typically conflict with relatively new pandemic management directives that do not make logical sense to them. In this sense, South Australian authorities are somewhat victims of their own success in largely eliminating COVID-19 and successfully communicating appropriate personal illness management strategies prior to the pandemic. The challenge for public health intervention therefore appears to be to motivate individuals largely untouched by the effects of COVID-19 to comply with at times severe health orders while also communicating a balanced picture of COVID-19 presentation, and assisting the public to adapt the resources they already possess in responding to infectious illness to the pandemic context. Further strategies could be developed in order to address this, both in response to COVID-19, and in future pandemics.

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Declaration of competing interest

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Appendix A. Supplementary data

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