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REVIEW

Psychological Impacts of Coronavirus Outbreaks on Adults: A Rapid Evidence Review

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ABSTRACT

A recent rapid review highlighted the negative psychological impacts of quarantining during coronavirus outbreaks on the public. However, to date, there has been no review of the psychological impacts of coronavirus on adults using research from community samples and not restricted to people quarantined during coronavirus. A rapid review was conducted to provide timely evidence about the mental health implications of coronavirus outbreaks on adults and to inform psychological research concerning the current COVID-19 outbreak. Three databases and Google Scholar were searched and a total of 27 studies were identified. Symptoms of anxiety and depression were identified during coronavirus outbreaks alongside concerns about becoming infected and family becoming infected. Those with pre-existing mental health conditions, young adults, women and those reporting physical symptoms appear to be vulnerable to negative psychological outcomes during coronavirus outbreaks. How people think about and understand coronavirus, and the coping strategies employed by people, may play a role in mitigating negative psychological outcomes. Results demonstrate the adverse psychological impacts of coronavirus outbreaks on adults and the need for continued investment in mental health services for the wider community during these times. Further longitudinal research is required to ascertain the long-term psychological consequences of coronavirus outbreaks. This review can be used to inform continued research on the psychological impacts of COVID-19 on adults.

KEYWORDS

Coronavirus; outbreak; adults; psychological impact; COVID-19

1 Introduction

In response to the 2019 outbreak of COVID-19, a rapid review on the psychological impacts of quarantine on children and adults found "wide-ranging, substantial, and … long-lasting" effects of being quarantined [1]. In this rapid review, Brooks et al. [1] specifically explored the psychological impacts of quarantining during outbreaks and found increased symptoms of posttraumatic stress, confusion and anger among adults. Another review highlighted the negative impact of an outbreak on SARS survivors [2], but did not consider the impact of SARS on the general public. Health care workers are also adversely impacted; Kang et al. [3] found practitioners in Wuhan, China, reported increased levels of

anxiety and distress as a result of dealing with COVID-19. Consequently, leading mental health organisations and media outlets worldwide have rushed to provide practical and psychological guidance as to how services, schools, and healthcare providers can respond to people during the COVID-19 crisis. An example of this innovation is the application of E-Rehabilitation and telehealth services for adults with mental or physical health concerns [4,5]. This rapid review was conducted to identify and synthesise the evidence regarding the psychological impacts of coronavirus on adults in the general community (including COVID-19, MERS [Middle East Respiratory Syndrome], and SARS [Severe Acute Respiratory Syndrome]). No known review to date has been conducted with this specific focus. These results can be used to guide the general public and inform the response of governments, mental health organisations, and the media regarding the mental health needs of the public during the current COVID-19 outbreak.

2 Method

2.1 Search Strategy and Selection Criteria

We combined the key words of psych*, COVID-19, SARS, MERS, outbreak, infection, and coronavirus to search PubMed, PsycINFO, and Embase electronic databases. We broadened the search to adults in general since earlier reviews have already reported on the psychological impacts among quarantined people [1] and SARS survivors [2]. The methodology for this paper followed that of the recent rapid review conducted by Brooks et al. [1] and the rapid review methodology was selected as the best approach for timely synthesis of the coronavirus evidence for ongoing research into COVID-19 [6].

The eligibility criteria for inclusion in this review were: (1) Population: General population of adults (excluding studies focusing exclusively on patient groups and healthcare workers); (2) Behaviour: Preventive, avoidant, or management of pandemic disease behaviours; (3) Psychological: Perceived risk of pandemic, general psychological distress, or psychiatric disorder; and (4) Date: Published after 2002 (when SARS emerged as a pandemic).

3 Results

A total of 1785 records were identified through database searching including Google Scholar searches. After deduplication, the remaining 1096 records were subject to title and abstract screening. A final 27 studies were deemed eligible according to the inclusion criteria for this review (see Fig. 1).

The characteristics of included studies are summarised in Table 1. There were two studies related to psychological outcomes associated with MERS, four with COVID-19, and 21 with the SARS outbreak. Ten studies were set in Hong Kong, nine in China, two in Singapore, one each in Saudi Arabia and Korea and another in New York exclusively. There were an additional three studies that compared population groups between countries, one between the USA and Canada, and another two between Hong Kong and Singapore. Most studies ($k = 21$) recruited participants from the general public, while three included university students, and one sampled older residents. One study compared SARS patients with a healthy control group from the public, and another compared the general public and university students. Two studies focused on particular subgroups including pregnant women and women attending antenatal clinics, and another which included participants involved in a cardiovascular risk study.

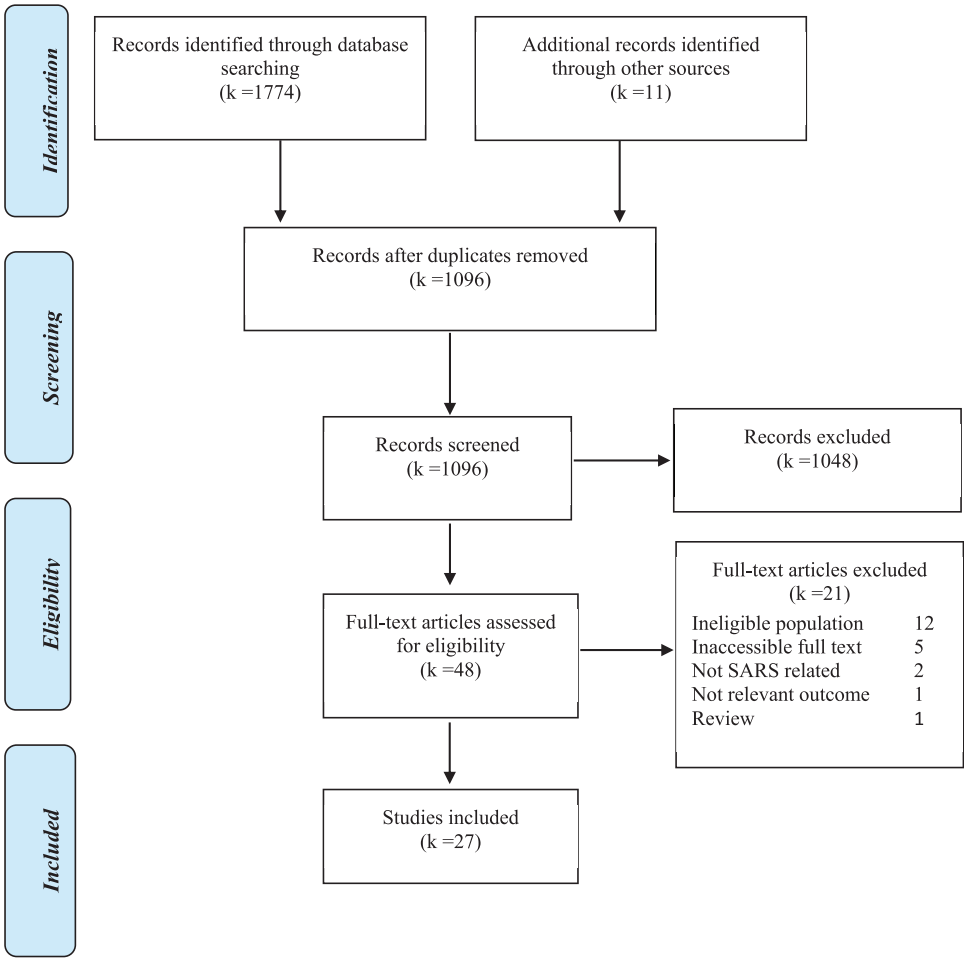

Figure 1: Study flow diagram

Table 1: Summary of eligible studies

Study (Year)	Country/ region outbreak [stage[a]]	Study design	Sample characteristics		Method of data collection & outcome measures	Key findings
			Sample size[b] age (%Female)	Study population & setting		
Alnajjar et al. [7]	Saudi Arabia (Jeddah) 2014 MERS-CoV (peak of outbreak)	Cross-sectional study	358 (59%) 18–72 years	General public Shopping center	Self-administered questionnaire Visual analogue scale (VAS): Anxiety	Moderate level of anxiety (58%) Anxiety was found to be highly associated with psycho-behavioural responses (avoidance behaviours) related to travel and public places

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Table 1 (continued)

Study (Year)	Country/ region outbreak [stage[a]]	Study design	Sample characteristics		Method of data collection & outcome measures	Key findings
			Sample size[b] age (%Female)	Study population & setting		
Blendon et al. [8]	Canada & USA 2003 SARS (Various stages: Early Apr to Early June)	Randomised cross-sectional study	251 666 500–1025	Toronto residents Early June 2003 Rest of Canada residents Early April 2003 Late May 2003 USA residents Early April Early June 2003	13 Surveys and phone interviews	42% concerned about SARS 9%–19% Avoidance behaviour 57% concerned about SARS 30% concerned about SARS 32% concerned about SARS 26% concerned about SARS 3%–11% Avoidance behaviour SARS outbreak had a significant psychological impact in Canada
Cheng et al. [9]	China 2003 SARS (during outbreak)	Longitudinal study (weekly questionnaires)	72 (56%) 19–24 years	Undergraduate students	Self-administered questionnaire 1. Chinese version of State Trait Anxiety Inventory (STAI) 2. Coping Flexibility Inventory 3. Coping and behaviour measure	Increase followed by decrease in state anxiety Higher trait anxiety related to higher state anxiety Lower personal hygiene and greater avoidance related to lower state anxiety
Chua et al. [10]	Hong Kong 2003 SARS (peak of outbreak)	Cross-sectional design	79 (66%) 18–60 years 145 (59%) 18–60 years	SARS patients (n = 30 female nurses) From 2 major hospitals isolation ward Healthy control from general community	Self-administered questionnaire with the Perceived Stress Scale (PSS)	SARS patients more stressed (PSS score = 20) than control group (PSS score = 18). In both groups, increased stress significantly associated with negative psychological effects such as boredom and depression. In healthy group only high stress associated with significantly increased age. 68% of controls experienced negative psychological effects compared to 91% of SARS patients.
Des Jarlais et al. [11]	USA New York 2003 SARS (during outbreak)	Cross-sectional study	928 (55%) 18 years and older	General public	Knowledge, attitudes and stigma about SARS; adapted version of non-patient version of structured clinical interview for DSM III-R	Women more worried about contraction; White Caucasian people less worried about contraction; higher education and more knowledge related to less stigma; increased worry related to greater depression in people with depression

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Table 1 (continued)

Study (Year)	Country/ region outbreak [stage[a]]	Study design	Sample characteristics		Method of data collection & outcome measures	Key findings
			Sample size[b] age (%Female)	Study population & setting		
Jin et al. [12]	China COVID-19 (initial and peak stage)	Cross-sectional design	788 (55%) Mean age: 35 years	General public in Wuhan City & outside of Hubei Province	Questionnaire online Emotional Contagion Scale for Public Emergency (ECS-PE)	Significantly higher anxiety level in high risk epidemic areas. Initial anxiety was not related to preventative measure or susceptibility to emotion contagion
Lai et al. [13]	Hong Kong 2003 SARS (before, mid and immediately after the outbreak)	Longitudinal random sampling survey design	296 (47%) Mean age: 68 years	General (older) public	Geriatric Depression Scale (GDS)	In men no change before or during SARS outbreak while scores significantly reduced after the outbreak (3.1). In women depressive symptoms increased from before (4.2) to during the SARS outbreak (5.2) but after the outbreak it returned to preoutbreak
Lau et al. [14]	Hong Kong 2003 SARS (Initial and mid stages)	Longitudinal random sampling survey design	1397 (49%) 18–160 years	General public Random telephone sampling	10 sequential Telephone survey	At initial stage 34% felt "worried/very worried" about their own or their family members' contracting virus at mid stage 18% were concerned. Initial stage 52% feared contracting virus in public places which significantly declined in mid stage to 36% No public panic was evident at either stages
Lau et al. [15]	Hong Kong 2003 SARS (end stage and 3 months after)	Longitudinal	1681 (50%) 18–60 years	General public Telephone sampling	2 random sampling cross-sectional telephone surveys	70% would avoid visiting Hospitals, 65% felt helpless, 55% horrified & 65% anxious because of SARS. 16% showed posttraumatic symptoms. 40% perceived increased stress in family or work settings, 48% perceived their mental health deteriorated.
Lau et al. [16]	Hong Kong 2003 SARS (one month after)	Cross-sectional design	302 (71%) > 65 years 158 (71%) 35–46 years	General public Elderly and community centres across Hongkong from l either the 'most' (>10 buildings with SARS cases) or 'least' Infection districts across Hong Kong	Individual face-to face interviews Measurement of Subjective Wellbeing (SWB) using the Personal Wellbeing Index (PWI)	Overall SWB level of all remained within normative range. Elderly living in highly infected districts showed significantly lower levels of SWB. Compared to younger, elderly group showed stronger community connectedness

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Table 1 (continued)

Study (Year)	Country/ region outbreak [stage[a]]	Study design	Sample characteristics		Method of data collection & outcome measures	Key findings
			Sample size[b] age (%Female)	Study population & setting		
Lee et al. [17]	Hong Kong 2003 SARS (Peak of outbreak)	Mixed qualitative and quantitative (Case-control) design	12 women (ethnographic interviews) 939 women as control (pre SARS cohort) 30 years 235 women during SARS peak 30 years	pregnant Chinese women from public hospitals: Antenatal clinics at Prince of Wales Hospital & Tai Po Nethersole Hospital.	Qualitative ethnographic interviews quantitative survey All were semi structured interviews and assessed for: Beck Depression Inventory (BDI), The State Trait Anxiety Inventory (STAI) & Medical Outcomes Study Social Support Survey (SSS).	Significantly better social support in the SARS cohort with 11% felt lonely & lack of support during SARS outbreak >50% worried about their Families or themselves contracting SARS No significant difference in depression between the SARS and pre-SARS cohorts
Lee et al. [18]	Korea 2015 MERS (Peak of outbreak)	Cross-sectional	6739 (50%) >19 years	General public	Self-administered questionnaire 4 groups of infection sensitivity: overall sensitive (39%) non-sensitive (15%) social concern (17%), Neutral (29%)	Overall sensitive group with high sensitivity had higher stress levels (18%), higher reliability on preventive behaviours (6%) & higher preventive behaviours (5%) compared to non-sensitive group
Leung et al. [19]	Hong Kong 2003 SARS (Peak of outbreak)	Cross-sectional survey	1115 (57%) ≥18 years	General public	Random telephone survey State Trait Anxiety Inventory (STAI) scale	Those with higher risk perceptions, moderate anxiety, females & history of positive SARS contact adopted precautionary measures more
Leung et al. [20]	Hong Kong and Singapore 2003 SARS (End stage)	Cross sectional survey	705 (57%) ≥18 years 1201 (50%) > 21 years	Hong Kong Singapore adults from general public	Random telephone survey	Hong Kong had significantly higher anxiety than Singapore sample >66% of Hongkong *vs.* 13% of the Singapore sample adopted practiced at least five of the seven preventive measures
Leung et al. [21]	Hong Kong 2003 SARs (peak and 3, 6 months post-outbreak)	Longitudinal design	4481 (Not reported) ≥18 years	Hong Kong general public	6 representative population-based surveys State Trait Anxiety Inventory (STAI) scale	Anxiety score (STAI) deceased from 25 at peak to 15 post-outbreak. Females, adults aged 30–49 years were predisposed to greater anxiety. Males & adults at the extremes of age were less likely to adopt self-protective behaviour.
Leung et al. [22]	Hong Kong and Singapore 2003 SARS (end of outbreak)	Cross-sectional study	705 Hong Kong residents 18 years and older 1201 Singaporeans 21 years and older	General public	Self-report measures of: 1) perceived health; 2) State Trait Anxiety Inventory (STAI); 3) use of health services; 4) contact with SARS patients; 5) perception of contraction risk; 6) beliefs about SARS; and 7) use of precautionary measures	Higher anxiety observed in Hong Kong Hong Kong people more knowledgeable about transmission. Knowledge increased use of precautionary measures Hong Kong used more precautionary measures and use of precautionary measures related to anxiety Younger, less-educated males less likely to adopt preventative behaviours

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Table 1 (continued)

Study (Year)	Country/ region outbreak [stage[a]]	Study design	Sample characteristics		Method of data collection & outcome measures	Key findings
			Sample size[b] age (%Female)	Study population & setting		
Li et al. [23]	China COVID-19 (peak stage of outbreak)	Cross-sectional design	4607 (73%) 17–90 years Mean age: 24 years	Adults from 13 provinces in China (general public)	Online survey	Slight change in public's emotional & behavioural reactions. Active engagement in precautionary behaviour
Main et al. [24]	China (Beijing) 2003 SARS (End stage of outbreak)	Cross-sectional study	381 (57%) 17–24 years	Undergraduate students University	Self-administered survey: 1. SARS-related stressors 2. Coping Inventory to measure coping strategy 3. 90-item Symptom Checklist Chinese version (SCL–90) to measure psychological symptoms 4. Perceived general health 5. Life satisfaction scale	Students experienced significant SARS-related stressors & psychological symptoms
Qian et al. [25]	China (Beijing and Suzhou) 2003 SARS (End stage of outbreak with data collected weekly)	Longitudinal	268 (47%) 18–42 years	Graduate and undergraduate students University	Self-administered questionnaire Psychological response questionnaire on SARS	Higher coping behaviours, more fearful cognitions and more negative emotions in Beijing. External stress related to cognitive differences, education related to emotional differences, education and external stress associated with behaviour differences Less external stress caused less perceived threat and less negative cognitions and behaviours in Beijing
Qian et al. [26]	China 2019 COVID-19 (beginning of outbreak)	Cross-sectional study	510 Wuhan residents (50%) 501 Shanghai residents (49%) Adults 18 years and older	General population	Self-report questionnaire 1.GAD-7 scale 2. Use of recommended and avoidance behaviours	33% experienced moderate to severe anxiety (Wuhan) 20% in Shanghai 79% of Wuhan and 64% in Shanghai used six precautionary measures Perceived susceptibility, severity of disease and confusion about information predicted anxiety Confidence to protect oneself lowered anxiety
Quah et al. [27]	Singapore 2003 SARS (End stage)	Cross-sectional design	1201 (50%) > 21 years	General public random telephone sampling	Structured questionnaire via telephone survey	45% had moderate-high anxiety which appeared to motivate preventive behavior (34% followed preventive measures *vs.* 28% with low anxiety). But only 14% considered SARS as a personal risk
Sim et al. [28]	Singapore 2003 SARS (End stage of outbreak)	Cross-sectional study	415 (40%) Mean age= 36 years	General population	Self-administered questionnaire 1. The general health questionnaire-28 (GHQ) 2. Impact of event scale-revised (IES-R) 3. Brief COPE	Higher SARS psychiatric and posttraumatic morbidities Psychiatric morbidity associated with higher posttraumatic stress, visiting fever station, younger age, greater self-blame, lower substance use Posttraumatic morbidity associated with higher denial and planning as coping approach

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Table 1 (continued)

Study (Year)	Country/ region outbreak [stage[a]]	Study design	Sample characteristics		Method of data collection & outcome measures	Key findings
			Sample size[b] age (%Female)	Study population & setting		
Wang et al. [29]	China 2020 COVID-19 (start to mid stage of outbreak)	Cross-sectional study	1210 (67%) 21–30 years	General public	Self-administered questionnaire 1. Impact of event scale-revised (IES-R) 2. Depression, anxiety and stress scale (DASS)	Rating of outbreak from moderate to severe (54%); moderate to severe depressive symptoms (16%); moderate to severe anxiety symptoms (29%); moderate to severe stress (8%) Female sex, student status, physical symptoms, poor rated health associated with greater psychological distress and higher anxiety, stress and depression Accurate information and precautionary measures lowered psychological distress, anxiety, stress and depression
Xie et al. [30]	China SARS (during the outbreak)	Cross-sectional study	647 (34%) Mage 23 years	General population and university sample	Self-administered questionnaire 1. Sensation inventory 2. Knowledge and perceptions of SARS 3. Reactions and behaviour to SARS Chinese version of State Trait Anxiety Inventory (STAI)	Exposure to SARS not related to anxiety Subjective interpretations of situation related to distress
Yeung et al. [31]	Hong Kong 2003 SARS (peak and end of outbreak)	Longitudinal study	385 (62%) 18–86 years	General public	Emotional response; Brief COPE	Decrease in problem-focused and increase in emotion focused coping Older people experienced less anger but more sadness; young adults used more emotion-focused coping at peak but less of this coping throughout outbreak. Older people used more emotion-focused coping at the end. More emotion-focused coping related to reduced anger and sadness for all ages; use of problem-focused coping reduced sadness in older adults

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Table 1 (continued)

Study (Year)	Country/ region outbreak [stage[a]]	Study design	Sample characteristics		Method of data collection & outcome measures	Key findings
			Sample size[b] age (%Female)	Study population & setting		
Yu et al. [32]	Hong Kong 2003 SARS (during the outbreak)	Cross-sectional	126 women 50–64 years	Population involved in cardiovascular risk study	Self-report questionnaire Centre of the epidemiological study of depression scale (CES-d) Perceived stress scale (PSS)	Higher depressive symptoms and emotional distress during outbreak Feeling scared (high perception of risk), restless sleep, financial losses associated with emotional distress
Zhu et al. [33]	China 2003 SARS (during the outbreak)	Cross-sectional study	8775 (41%) 17 to 76 years	Chinese public	Self-report questionnaire SARS mentality questionnaire	96% showed emotional changes of panic, nervousness and fear; changes in sleep patterns People used self-protective behaviour; worried about health of family 84% required information; 77% used information as prevention measure Social and economic impacts emphasised

Note:
[a] Time during outbreak study was conducted; 2003 SARS Outbreak period: Feb 2003 to July 2003; 2012 MERS Outbreak.
[b] Only individuals that completed the study were included.

3.1 Psychological Impacts

Symptoms of anxiety and depression were observed in the general community during the SARS and COVID-19 outbreaks [24,28,29,32]. Posttraumatic stress symptoms were reported in relation to SARS [15,28]. Public concern centred on contraction or family contraction of coronavirus [14,17,29]. Studies showed levels of anxiety fluctuated over the course of the SARS outbreak [9]. Lau et al. [14] found worry and fear about contraction decreased from the initial stages to the middle stages of the SARS outbreak. Blendon et al. [8] found the Canadian and USA public experienced anxiety due to SARS outbreak, but that anxiety declined during the course of the outbreak. In Lai's [13] study, depression in men and women returned to pre-pandemic levels after the SARS outbreak.

Emotional reactions of stress, anger and sadness were reported across several studies [10,29,31]. Lau et al. [15] found adults experienced feelings of helplessness and horror regarding the SARS outbreak. Feelings of loneliness and social isolation were found in the study by Lee et al. [17], as well as panic, nervousness and fear regarding the SARS outbreak reported in the study by Zhu and colleagues [33].

3.2 Age and Sex

Event-related distress differed between younger and older adults. Sim et al. [28] reported adults of a younger age (not specified) experienced heightened psychological distress as a result of SARS compared to older adults. Yeung et al. [31] found younger people were more likely than older people to express anger regarding the SARS outbreak, though older people expressed more sadness. Subjective wellbeing was lower but community connectedness found to be greater in older people during the SARS outbreak [16]. Females compared to males were at greater risk of psychological distress related to SARS and COVID-19 [11,13,20,29].

3.3 Mental or Physical Disease

People also at risk of poor psychological health during the SARS outbreak were found to be those who had experienced depression or a psychiatric condition prior to the SARS outbreak [11,28]. In addition, Wang et al. [29] found people experiencing physical symptoms and those with poor self-rated health reported increased levels of stress, anxiety and depression in the beginning to the middle stages of COVID-19.

3.4 Precautionary Measures

Several studies found increased use of precautionary measures among members of the public with greater anxiety about contracting SARS or MERS (e.g., wearing masks, staying away from public places [7,18,27,28]. Conversely, Wang et al. [29] found having access to information and engaging in health protective behaviours lowered stress, anxiety and depression among adults during COVID-19. Thus, from existing research it is unclear whether engaging in precautionary measures during outbreaks lowers anxiety or whether anxiety in and of itself leads to an increase in precautionary behaviour.

3.5 Proximity

Another potentially mitigating factor for psychological outcomes was proximity to coronavirus cases. One study found living in regions with less (not more) cases of coronavirus was associated with heightened anxiety [30]. In other studies, higher SARS exposure and living in high risk epidemic areas was associated with greater anxiety and lowered subjective wellbeing [10,12,16]. Again, results are inconclusive regarding the role of proximity in determining adults' mental health during coronavirus outbreaks.

3.6 Cognition

How one thinks about and perceives an outbreak appears to plays a role in psychological outcomes. Qian et al. [26] and Xie et al. [30] found perceived susceptibility of contracting COVID-19 and subjective interpretations about SARS increased anxiety of adults. Similarly, acceptance of the pandemic experience was associated with psychological health during the SARS outbreak; studies finding that over time people tended to feel less threatened and more accepting of their circumstances surrounding the outbreak [14,25]. Qian et al. [25] suggested that this might be because "the students [university students] could endure and/or accept living with SARS. When shocked by SARS, they might assess their circumstances and the disease to be more severe than it really was" (p. 95). Their negative cognitions about the outbreak went down every week, even though there were still high cases of SARS in the community.

The same study compared two college samples in Beijing (which was heavily impacted by SARS) and Suzhou (where only one case was found); while citizens in both areas faced strict restrictions, restraints were more severe in Beijing. Nonetheless, the Suzhou subsample had more negative emotions in the first and second week than in the fourth week. The authors suggest that initially the Suzhou public were concerned that the number of SARS cases would increase; when no cases were reported, students returned back to their pre-disaster level of psychological functioning quicker [25]. In sum, Qian et al. [25] reported that the "cognitions of SARS played a mediating role between the external stress and other psychological responses (p. 96)."

3.7 Knowledge

Qian et al. [26] found confusion about coronavirus predicted anxiety while confidence to protect oneself lowered anxiety. Likewise, Wang et al. [29] found accurate information about COVID-19 lowered psychological distress, anxiety, stress and depression. Zhu et al. [33] found 84% of their community sample wanted more information about SARS and it was concluded that "the uncertainty people have about the epidemic development was a key cause of panic during this time" (p. 447).

A major source of knowledge is the media, with some research finding that how information is portrayed in the media impacts psychological health. Blendon et al. [8] found the proportion of the USA population who described themselves as concerned about SARS increased when they were told that people in Asia and Canada had died from the virus [8]. Xie et al. [30] pointed out that there was "disproportionate attention placed on reporting cases of SARS (a person who contracts SARS is more newsworthy than is someone who does not contract SARS)" (p. 1104). They continued by arguing that "living in the center of the epidemic would have provided a method for obtaining more SARS-related knowledge than would obtaining information only from media reports" (p. 1104).

3.8 Coping

Another potentially mitigating factor for psychological outcomes is coping. Greater use of avoidant coping strategies (e.g., denial, disengagement) predicted negative psychological symptoms in Chinese university students during the SARS outbreak [24]. However, active forms of coping (e.g., planning, problem solving) did not relate to psychological outcomes of this sample. In comparison, denial and planning were coping strategies observed in adults experiencing posttraumatic stress [28]. Chinese university students living in more exposed regions of SARS outbreaks were observed in another study to engage in greater use of coping behaviours (type of coping not clearly defined), however these coping behaviours did not decrease participants' negative emotions [25]. After the SARS outbreak, poor psychological outcomes were associated with self-blame and interestingly, less use of substances [28].

Young adults were found by Yeung et al. [31] to employ more emotion-focused coping than middle-aged adults, but only at the peak of the outbreak, and this difference was not sustained throughout the outbreak period. Across all age groups, those who employed emotion-focused coping reported decreased anger and sadness, while use of problem-focused coping reduced sadness for older adults [31]. During the SARS outbreak, high community connectedness mitigated the risks of reduced wellbeing, depression and anxiety among adults [9,16].

4 Discussion

This review highlights the adverse psychological impacts of coronavirus outbreaks on adults in the general population and the various factors that potentially mitigate these negative psychological health effects for adults. Feelings of anxiety, depression and posttraumatic stress were commonly reported by adults during coronavirus outbreaks [7,28,29]. Seven studies were conducted over the course of the outbreak being researched and subsequently these studies were able to document changes in people's psychological reactions and cognitive appraisal of the unfolding circumstances. In these studies, researchers observed an increase in anxiety and distress followed by a decrease in anxiety and distress, from the earlier to the end stages of the outbreak, or after the outbreak had ceased [13–14,21]. Lai [13] found depression scores returned to pre-pandemic levels one month after the SARS outbreak. It is possible that people are able to return to their pre-pandemic functioning after the risk of contraction has passed, however most studies were cross sectional and few provided extensive longitudinal data; the maximum length of time after the outbreak that data were collected was six months.

Various demographic groups appear to be particularly vulnerable to adverse psychological outcomes, including those experiencing physical symptoms and those with poor self-rated physical health [29]. Those with pre-existing mental health issues, women and younger adults also appeared to be more vulnerable than other groups in the community to anxiety and other psychological concerns [11–13,21,26,16]. These groups might be particular targets for early psychological intervention and supports during outbreaks.

The results are inconclusive regarding the association between use of precautionary behaviours, such as wearing of masks and staying away from public places and anxiety. Some found a positive association

between the two [7,18,27,28], however, Wang et al. [29] found the reverse; engaging in precautionary behaviours was associated with lower stress, anxiety and depression. Likewise, the results regarding the association between proximity to the pandemic and mental illness is unclear. Other factors may well be influencing these results.

What people know and think about coronavirus appears to be an important factor when determining mental health outcomes. Xie et al. [30] found anxiety was greater for members of the public living in areas that were considered objectively better (less cases of SARS). According to the researchers, most people who lived closer to the SARS outbreak had, over time, considered the risk was reduced while those living away from immediate cases of SARS relied on the media to inform what they knew and thought about the outbreak and this increased distress levels [30]. Thus, higher exposure is not a sufficient explanation for the negative psychological impacts of virus outbreaks and research on the mental health effects of COVID-19 among high and low infected communities is required.

How people think about coronavirus and the information that is publicly available is potentially more important to social functioning, mental health and wellbeing than the frequency of contraction and severity of pandemics [25,30]. Awareness and understanding of COVID-19 can be due to direct exposure (i.e., being ill or having a family member who is ill) or indirect exposure as occurs through the media. To illustrate, Blendon et al. [8] referred to the "double-edged sword" of the media, in which the media helps people to prevent the spread of a pandemic, but also increases the anxiety of people who are not at high risk of contraction due to their geographical location. This research demonstrates that the spread of psychological distress due to coronavirus is not always proportional to the physical threat caused by the virus. Again, this points to the need for more research among less impacted communities as a result of COVID-19, as well as therapeutic and media reporting approaches that seek to minimise inaccurate interpretations of people about COVID-19 and the potential risks.

The results are unclear as to the types of coping strategies that best serve people during outbreaks. Coping is defined as efforts to deal with demands taxing or exceeding an individual's resources [3] and is typically considered as a cognitive or behavioral response to something appraised as stressful. Again, underscoring the role of cognition and subjective interpretations of coronavirus, coping occurs in response to the way an event is perceived (subjective apprasial) rather than objective characteristics of the situation response [3]. Perhaps not unexpectantly, avoidant coping, involving denial of the outbreak, appears to be related to poor psychological symptoms [24]. Drawing on the broader coping literature, there is an argument that both problem-focused and emotion-focused coping may be beneficial to one's mental health [34,35]. Problem-focused coping is aimed at resolving or altering the stressful event and typically involves efforts to remove the source of the stress or seeking information or assistance in handling the situation [3] (in the context of pandemics this could be related to engaging in precautionary behaviours). In comparison, emotion-focused coping aims to ameliorate "the negative emotions associated with the problem," [3] (p. 751), for example, seeking support from friends and family or expressing feelings of worry or distress. In a coronavirus outbreak, emotional focused coping may consist of connecting with others [9,36] and allowing people to express their anxiety about the event. Results of this review and earlier literature points towards the need to encourage people to engage in more problem- and emotion-focused coping (and cognitive reappraisal) around COVID-19. These findings have clear implications for both mental health practitioners, the government and the media regarding how people should be instructed to maintain good mental health during COVID-19 and future pandemics.

4.1 Implications

The results of this review prompt a number of implications and recommendations for practitioners, the government and media:

1. How the media (traditional and social) and the government portray and explain COVID-19 is critical, as this will shape the way the public understands the pandemic and reacts. Messages need to be clear and consistent to avoid confusion and reduce distress.
2. As well as providing accurate information, media and governments should describe the precautionary behaviours that the community need to engage in and at the same time report on recovery rates, rather than focusing solely on death rates. This may serve to promote more adaptive cognitions along with positive psychological health.
3. Government messages should include information about how people can live through the outbreak (and periodic increases in infection rates) and the possible mental health issues and distress people may experience (e.g., sadness, stress, loneliness). Hopeful messages can be given to the public regarding the likelihood of their distress passing after the pandemic.
4. Psychological services play a role in helping people adjust their negative cognitions and employ problem- and emotion-focused coping strategies. Coping strategies of connecting with others and cognitive reappraisal (to increase objective interpretations of the unfolding circumstances) are shown to be important. However, it is possible that social distancing measures and quarantining as a result of COVID-19 have reduced people's access to social and professional support. The coping strategies employed by people during COVID-19 and the potential impact of reduced access to formal and informal support is an area requiring more research.
5. Psychological and psychiatric personnel should be given an official platform through the media to communicate ways that people can adaptively cope and adjust to the changing circumstances around COVID-19. Psychological services appear to be more important during the outbreak and these services may subsequently be reduced as people adjust back to life after the pandemic.
6. Health practitioners require measures for assessing the psychological impact of the COVID-19 outbreak on adults, monitoring the potential for ongoing impacts and directing people to mental health services. This might involve an assessment or screening by mental health practitioners, including asking people about their knowledge about the outbreak and perceived susceptibility to contraction (and other subjective interpretations), in order to identify those at risk of experiencing heightened anxiety as a result of the outbreak.

4.2 Limitations

There are a few limitations to note in relation to this review. Firstly, while this rapid review employed a systematic review procedure, this review was not a systematic review and therefore some important studies may have been missed. Similar rapid and systematic reviews in this area will be important as the literature surrounding COVID-19 increases. Furthermore, this review identified several limitations of the coronavirus literature, including the lack of longitudinal follow up with participants to observe the long-term implications of coronavirus on mental health. Other factors which should be included in future COVID-19 research may include comparisons of people from areas with high infection rates and lower infection rates, comparisons of districts with different public health measures in response to COVID-19, and research comparing countries with different morbidity and mortality rates from infection.

4.3 Future Considerations

It is important to note that many of these mental health impacts were observed among those who were not directly impacted by the infectious diseases. As many measures attempt to control the spread of infectious diseases, the issue of mental and psychological health during and following such outbreaks requires greater attention. Given the lack of ongoing research in this area, longitudinal outcomes of coronavirus outbreaks is required in the months and years after an outbreak. Further research is also required comparing countries and regions with different contraction rates and government responses and how subjective interpretations relate

to psychological wellbeing and recovery in adults after coronavirus outbreaks. In addition, few studies used diagnostic measurements and future studies will need to do so in order to obtain accurate prevalence rates of psychiatric disorders, including disorder severity and chronicity.

5 Conclusion

Living through an epidemic or pandemic can have negative mental health consequences for adults. What the public knows and thinks about coronavirus and the coping strategies employed appear to play a key role in determining mental health outcomes. The findings in this review have implications for the media and research regarding the current COVID-19 outbreak, as well as for psychological and community services during pandemic outbreaks.

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