

Coping with the threat of severe acute respiratory syndrome: Role of threat appraisals and coping responses in health behaviors

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The present study examines the psychological impact of severe acute respiratory syndrome (SARS) by exploring the coping strategies and health behaviors enacted in response to the SARS epidemic. Hierarchical linear regression indicated that the use of wishful thinking in response to the threat of SARS was related to both avoiding public places and avoiding people perceived to be possible carriers of the SARS virus, but was not associated with the use of more adaptive health behaviors, such as using disinfectants and hand washing. Conversely, those who reported engaging in empathic responding in response to the threat of SARS were both less likely to report avoiding people perceived as being at a high risk for SARS and more likely to report engaging in effective health behaviors. Support seeking was not a significant predictor of the health behaviors examined in the present study. Results are discussed in terms of coping with health threats and health promotion.

Key words: coping, empathy, health behaviors, health threat, severe acute respiratory syndrome (SARS).

Introduction

Increased understanding of severe acute respiratory syndrome (SARS) is necessary for researchers, health-care providers and the general public alike. If we are to prevent the spread of disease and reduce its far-reaching effects, there must be knowledge of not only the virus itself, but also of the social and psychological sequelae of the disease. Furthermore, if we are to prevent the spread of disease, study of the impact of SARS cannot be limited to those relatively few who have actually contracted SARS; it must also include the general public's reactions to the disease. That is, how has the general public reacted psychologically, socially

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and behaviorally to news of the disease? To what extent does the general public feel threatened by the possibility of the disease spreading, and how do they cope with these fears? Do their ways of managing their fear of SARS affect their ability to engage in adaptive health behaviors? Understanding ways in which the general public's coping with their SARS-related fears affects their ability to engage in preventative health behaviors is critical. Such knowledge would potentially be applicable, not only in the face of the SARS outbreak, but also in general health promotion.

Health behaviors

One of the most significant effects that SARS has had on the general public has been a change in health-related behaviors (Bray, 2003). These changes were multi-faceted and encompassed everything from frequent hand washing and the use of face masks to complete isolation from the outside world. As evidenced, in part, by the economic fallout of the disease, a common behavior change, particularly in affected areas, was to avoid public venues such as restaurants, marketplaces and airports. Although this sort of behavior is undoubtedly associated with decreasing one's risk of exposure to the virus, it was associated with significant economic costs without a correspondingly large reduction in risk (CDC, 2003a; WHO, 2003a).

Another behavioral response to reports of the outbreak was to limit contact with people perceived to be at risk for the virus. This included people who displayed symptoms of the common cold (e.g. coughing or sneezing), workers in the health-care profession, and individuals assumed to have a high likelihood of having SARS by virtue of their ethnicity, nationality, or recent travel history. Given that the largest outbreak of SARS occurred in Asian countries, North Americans may have grouped those of Asian ancestry within this last category. Similarly, being Canadian (or Torontonians in particular) was viewed by some as evidence of being high risk by those outside of Canada or North America. Avoiding people perceived to be at risk for SARS was unlikely to be effective from a health-care perspective, and certainly can be viewed as detrimental from a psychological and social perspective. Such behaviors no doubt lead to ostracism of those believed to be at risk. When associated with certain ethnic or racial groups, the obvious result is racism.

A third possible behavioral response to the outbreak was to engage in preventative health behaviors as prescribed by the World Health Organization (WHO), the Center for Disease Control (CDC) and a variety of other health-care units, hospitals and individual health-care providers (e.g. CDC, 2003a, 2003b, 2003c; NBC4.com, 2003; WHO 2003a). Suggestions were widely publicized via television, websites, and lay-oriented news reports indicating that behaviors such as taking more care with cleanliness, using disinfectants, washing hands more regularly, eating well and getting enough sleep were reasonable and useful preventative measures in which to engage. Not only were such strategies likely to be helpful in limiting the spread of SARS, they also have few negative side effects at both an individual and societal level.

Coping responses

Although numerous models for the prediction of health behaviors have been put forth (Fishbein *et al.*, 2001), few of them consider threats to health as a potentially stressful experience, as is likely to be the case with the SARS epidemic. When individuals are exposed to media reports of SARS, they may experience an increase in anxiety and threat associated with those reports. How these individuals cope with that threat may either facilitate or inhibit

their engagement in the aforementioned health behaviors, which, in turn, may directly alter the risk of disease. Examining the role of coping in health behaviors may inform public health efforts to encourage protective health behaviors. Models of stress and coping with disease (Lazarus & DeLongis, 1983; DeLongis & O'Brien, 1990) provide a useful framework through which to understand the ways in which threats to health, coping and health behaviors are related. These models emphasize the transactional or interactional nature of the stress and coping process and suggest that when people are exposed to stressors, such as news of the SARS epidemic, an evaluative thought process is triggered in which they consider whether or not the stressor is a threat to their own well-being. This process in turn prompts an evaluation of options for coping with the perceived stressor. This, then elicits an array of coping behaviors in an attempt to manage various aspects of the stressor.

The literature on coping with illness suggests a number of strategies for dealing with illness-related stressors that might meaningfully be applied to the current SARS crisis (O'Brien & DeLongis, 1997). These include wishful thinking, support seeking and empathic responding. Wishful thinking refers to the individual's efforts to cognitively escape from or avoid the situation by wishing, fantasizing or hoping it goes away or is somehow over. Wishful thinking has been found to be associated with negative outcomes, such as depression, anxiety, increased stress-related physical symptoms, and poor adjustment to illness (Penley *et al.*, 2002). However, we know of no study examining the role of wishful thinking in the implementation of health-related behaviors.

Support seeking involves efforts to gain emotional, informational or tangible support from others. Although there is a strong and consistent association between social relationships and positive health outcomes (Coyne & DeLongis, 1986; House *et al.*, 1988), there has been little research examining the association of support seeking with engaging in protective health behaviors.

Finally, empathic responding is a mode of coping that has recently begun to receive attention in the stress literature. Individuals engaging in empathic responding try to understand what others are experiencing and offer support and assistance. Empathic responding may provide benefit to the recipient of these efforts (O'Brien & DeLongis, 1997), but, perhaps even more critical, evidence suggests that engaging in empathy and support can provide benefits for the provider as well (Brown *et al.*, 2003; Kramer, 1993; Visitini *et al.*, 1996) in terms of improved psychological well-being, physical health, and relationship satisfaction. However, we are aware of no research examining the relationship of empathic responding to health behaviors.

The present study

We sought to examine ways in which the perception of the threat of SARS was related to coping and, in turn, how coping was related to health behaviors. Understanding the ways in which coping is related to engaging in health behaviors may be critical to encouraging effective health behaviors in the face of health crises such as SARS. It was expected that perceived threat of SARS would be associated with higher reported frequency of engaging in a variety of coping strategies in an attempt to deal with feelings of threat and fear. Specifically, these were expected to include wishful thinking, support seeking and empathic responding. Finally, we expected specific coping strategies to be instrumental in facilitating specific health behaviors. That is, given the avoidant nature of wishful thinking as a coping strategy, it seemed reasonable to assume that the use of such a strategy for managing the threat of SARS might be associated with avoidance-type health behaviors. Here, we expected

higher levels of wishful thinking to be associated with higher reports of avoiding both public places and individuals perceived to be at risk for SARS. Finally, empathic responding involves considering the stressful experience not only in terms of one's own feelings and well-being, but also in terms of other's well-being. Given the use of empathy, one might be less likely to consider other people as objects to be avoided but rather as people needing and requiring care. Without the impulse or need to engage in avoidant behaviors, efforts for engaging in health behaviors may be turned towards more preventative and effective health behaviors such as hand washing. No specific hypotheses were made regarding the relation of social support seeking to health behaviors. Although we expected those reporting higher perceived threat of SARS to engage in higher levels of support seeking, we had no clear expectations regarding which health behaviors might be facilitated by such a coping strategy given the paucity of previous research.

Methods

Data collection

Data were collected through an online questionnaire linked to a number of websites, including psychology websites, the laboratory websites of the second and fourth authors and their colleagues, and advertisements on Google, a search engine. The Google advertisement popped up when individuals searched for information on 'SARS'. It asked viewers to complete an online questionnaire about how they were coping with the SARS threat. All of the links first took potential participants to an informed consent page. Once they indicated they had read the consent form and consented to participate, they were taken to the questionnaire. The questionnaire was written in English. Data included here are from questionnaires completed between 8 June and 8 September 2003.

Participants

Sample. Seventy-one percent of the sample resided in Canada, 14% of these in Toronto. Other countries of residence included China, Costa Rica, Germany, Hong Kong, Singapore and the USA. Approximately 19% of the respondents were living in a SARS-affected area. Forty-three percent reported Canada as their country of birth. The majority of the respondents (Rs) were under 30 years of age (62%), female (74%) and had over 12 years of education (86%). Approximately half the sample was composed of students. Other occupations included health-care workers, engineers, psychologists and office workers. Ethnicity was not included due to the difficulties in coming up with a suitable classification system that could be used in a worldwide survey.

Materials and procedures

The SARS Collaborative Research Group¹ (including the second and fourth authors) jointly developed the main questionnaire. Only those variables related to the current study will be discussed. Some of the measures used in the present study were from this original questionnaire (the health behaviors component, demographic information and the support seeking and wishful thinking coping items). Other measures (perception of SARS threat,

empathic coping items, and state anxiety) were added to the questionnaire specifically for use in the study described here.

State anxiety. Feelings of current anxiety were assessed through an updated version of Spielberg *et al.*'s (1970) measure of state anxiety. Respondents were asked to rate their current feelings related to SARS on a 4-point scale ranging from 'not at all' to 'very much so'. The scale consisted of 17 items including such items as 'I feel tense', 'I feel upset', 'I feel nervous'. Consistent with previous reports (Gaudry *et al.*, 1975) internal reliability of the scale in the present study was high (Cronbach's $\alpha = 0.94$).

Perception of SARS threat. Participants were asked to rate the extent to which the following statements were true for them at the current moment on a 4-point scale ranging from 'not at all' to 'a great deal'. The five items were; 'I don't think I could get SARS', 'I feel nervous about getting SARS', 'SARS is threatening my health', 'I don't feel worried about getting SARS', 'My daily routine has been disrupted due to thoughts about SARS'. Internal reliability of the scale was moderate ($\alpha = 0.65$).

Ways of coping. Items were chosen from the Ways of Coping Questionnaire (Folkman *et al.*, 1986) that tapped strategies for coping that were applicable to coping with the threat of SARS. Items from two subscales were included in the present study (wishful thinking and support seeking). In addition, items from the Relationship-Focused Coping Scale (empathic responding; O'Brien & DeLongis, 1996), which were applicable to the current study, were also included. Instructions to respondents for the coping items were 'To what extent have you managed whatever concerns or fears you might have about SARS in each of the ways listed below?'

Wishful thinking. Rs were asked the extent to which they had managed their concerns or fears about SARS through 'wishing SARS would go away or somehow be over with' on a 4-point scale ranging from 'not at all' to 'a great deal'.²

Support seeking. Support seeking was assessed by asking Rs to rate the extent to which they had managed whatever concerns or fears they had about SARS by 'talking to someone to find out more about SARS' and 'talking to someone about how I was feeling about SARS' on a 4-point scale from 'not at all' to 'a great deal'. The reliability of the scale was high ($\alpha = 0.87$).

Empathic responding. Respondents were asked to report the extent to which they had helped others who might be concerned about getting SARS on a 4-point scale ranging from 'not at all' to 'a great deal'. The four items included: 'Tried to understand the other person's concerns about SARS', 'Tried to understand how the other person felt about SARS', 'Tried to help the other person(s) by listening to their concerns about SARS', and 'Tried to help the other person(s) by doing something for them'. Consistent with past research (O'Brien & DeLongis, 1996), reliability of the scale in the present study was high ($\alpha = 0.91$).

Health behaviors. As noted above, items were taken from the Web questionnaire on SARS developed by members of the SARS Collaborative Research Group¹. Instructions to respondents for the health behavior items were 'To avoid getting SARS, I have personally...' and specifically for the Avoiding people subscale, 'How likely are you to avoid the following people?'

Avoiding public places. Respondents were asked to identify behaviors in which they had engaged to avoid getting SARS. The 10 possible behaviors were: avoided travel to SARS-infected areas, avoided eating in restaurants, avoided shaking hands, avoided travel in taxis, avoided travel on subways or commuter trains, avoided eating in food courts/food centers, not gone to work/school, avoided large gatherings of people, avoided particular types of people, and avoided travel by airplane. The number of responses, based on the response alternatives checked, was summed for a final scale. Reliability of the scale was moderately high ($\alpha = 0.79$).

Avoiding people. Respondents were asked to indicate, using a 5-point scale ranging from 'very unlikely' to 'very likely', the degree to which they avoided people who might be perceived as having a higher risk of having been exposed to the SARS virus. The 10 items were: a person you know has just come from an area infected with SARS, a person who has a fever, a person who sneezes, a person who looks unwell, a health-care worker, a person who is coughing, a person who you think might possibly be from an area infected with SARS, a person who has a family member who has come down with SARS, a stranger wearing a surgical/hygiene mask, and a stranger not wearing a surgical/hygiene mask. The final scale consisted of the sum of the checked alternatives. Reliability of the scale was high ($\alpha = 0.91$).

Taking health precautions. Respondents were asked to identify behaviors in which they had engaged to avoid getting SARS. These eight health behaviors included: wearing a mask, washing hands more often, taking more care about cleanliness, using disinfectants, eating a balanced diet, exercising regularly, taking an herbal supplement, and making sure they got sufficient sleep. The number of items endorsed was summed into the 'Taking precautions' scale. Reliability of the scale was moderately high ($\alpha = 0.78$).

Results

Descriptive statistics and zero-order correlations

Table 1 presents descriptive statistics for the study variables. *t*-tests were conducted examining gender differences in the study variables; the only significant difference to emerge was that women in the study were significantly more likely to report seeking social support than were men ($t(54) = -1.71, p < 0.01$). *t*-tests were also conducted to examine differences between those participants living in SARS-affected ($n = 14$) versus SARS-unaffected ($n = 59$) areas. No significant differences emerged on any of the study variables. The most significant time for the SARS outbreak was before mid-July (WHO, 2003b). However, given that data collection continued until September, *t*-tests were conducted examining whether there were significant differences between responses reported before and after mid-July on the study variables. There were no significant differences due to time of data collection (adjusting for the number of tests conducted).

Table 1 also presents the bivariate correlations among study variables. Perception of SARS threat was significantly related to reports of both coping (wishful thinking and support seeking) and health behaviors (avoidant behavior, avoiding people perceived to be at risk for SARS and taking precautions). As shown in Table 1, Rs who reported feeling threatened by SARS were also more likely to report wishing SARS would go away and to seek support from others to deal with their perceptions of threat. Those higher on threat were also more likely to report engaging in avoidant behavior, such as avoiding public places and avoiding

Table 1 Bivariate correlations between state anxiety, perception of SARS threat, coping strategies and SARS-related health behaviors

	1.	2.	3.	4.	5.	6.	7.	8.
1. Avoiding public places	–							
2. Avoiding people	0.69***	–						
3. Taking precautions	0.57***	0.43***	–					
4. Wishful thinking [§]	0.42***	0.55***	0.43***	–				
5. Support seeking [§]	0.23	0.34**	0.41***	0.42***	–			
6. Empathic responding [‡]	0.35**	0.11	0.50***	0.35**	0.44***	–		
7. State anxiety [†]	0.39**	0.31**	0.36**	0.26*	0.50***	0.36**	–	
8. SARS threat [‡]	0.54***	0.52***	0.53***	0.33**	0.25*	0.19	0.45***	–
Mean	1.05	23.37	1.60	2.89	2.34	2.45	27.12	8.89
Standard deviation	1.61	8.64	1.86	1.52	1.31	0.95	9.49	2.93

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

[†] $N = 67$.

[‡] $N = 69$.

[§] $N = 72$.

people perceived to be at a higher risk of having been exposed to the virus, such as health-care professionals or people who looked ill. Finally, they were more likely to report engaging in such preventative health behaviors as washing their hands and getting sufficient rest.

The correlations between coping and health behaviors are presented in Table 1. Wishful thinking, support seeking and empathic coping were significantly and moderately intercorrelated (r 's from 0.35 to 0.44). The intercorrelations among the abbreviated forms of the coping subscales used here are similar in size to those reported in previous studies using the full scales (Folkman *et al.*, 1986).

As shown in Table 1, Rs who tended to wish that SARS would go away as a way of dealing with the threat of SARS, also tended to report avoiding both public places, such as markets or restaurants and individuals perceived to have a higher likelihood of being exposed to the SARS virus. These Rs also tended to report engaging in health precautions, such as using disinfectants and taking more care with cleanliness. Rs who reported seeking social support in response to the threat of SARS were also likely to report avoiding people perceived to be at high risk of SARS, such as health-care workers, and engaging in health behaviors, such as eating a balanced diet and exercising regularly. However, these Rs were only slightly more likely to report avoiding public places as a response to the SARS threat ($r = .23$, $p < 0.10$). Rs high on empathic responding tended to report avoiding a variety of public places in an effort to avoid exposure to SARS. Furthermore, those high on empathic responding tended to report engaging in more protective health behaviors, such as hand washing, in their efforts to prevent spread of the disease.

However, these bivariate relations are difficult to interpret given the potential confounding of coping and health behaviors with perceptions of the threat of SARS and with state anxiety. Multivariate analyses were conducted controlling for perception of threat and levels of anxiety, as well as scores on all coping scales, in order to allow a more meaningful picture

of the independent associations of each form of coping to each of the three health behaviors examined here.

Multivariate analyses

Table 2 presents the results of three hierarchical linear regression analyses. These were used to examine the relationship between coping and perceived threat of SARS to each of the three types of health behaviors examined in the study, Avoiding public places, Avoiding people and Taking precautions. State anxiety was entered in step 1 of the equation, perception of SARS threat in step 2 and the three coping strategies (wishful thinking, support seeking and empathic responding) as a set in step 3.³ Both wishful thinking ($\beta = 0.27$), $t(61) = 2.38$, $p < 0.05$ and perception of SARS threat ($\beta = 0.31$), $t(61) = 2.67$, $p < 0.05$ were significantly positively associated with avoidance of public places even after controlling for state anxiety, support seeking and empathic responding. That is, Rs who reported engaging in more wishful thinking to cope with the threat of SARS were more likely to report avoiding public places as a way to reduce exposure to the SARS virus. SARS threat ($\beta = 0.27$), $t(61) = 2.45$, $p < 0.05$ and wishful thinking ($\beta = 0.46$), $t(61) = 4.20$, $p < 0.05$ were significantly associated with a greater likelihood of avoiding people. This held even after controlling for state anxiety, support seeking and empathic responding. Empathic responding was associated with significantly lower reports of trying to avoid other people ($\beta = -0.29$), $t(61) = -2.53$, $p < 0.05$, again controlling for state anxiety, perception of SARS threat and the other coping strategies. In other words, Rs who reported the use of wishful thinking as a way of coping with the threat of SARS were more likely to report avoiding people perceived to be at risk for having SARS. However, Rs who reported the use of empathic responding were less likely to report engaging in such behavior, once threat of SARS and anxiety were controlled. Finally, SARS threat ($\beta = 0.38$), $t(61) = 3.45$, $p < 0.01$ and empathic responding ($\beta = 0.30$), $t(61) = 2.71$, $p < 0.01$ were significantly associated with taking precautions, even after controlling for state anxiety and ways of coping with SARS. That is, Rs who reported responding to the threat of SARS through empathic responding were more likely to report taking health precautions to decrease the risk of getting SARS.

In sum, multivariate analyses controlling for differences in perceived threat of SARS, state anxiety and other ways of coping indicated that both wishful thinking and empathic responding were significantly associated with specific SARS-related health behaviors.⁴ Controlling for differences in perceived threat of SARS, state anxiety and other ways of coping, support seeking was not significantly related to the SARS-related health behaviors examined in the present study.⁵

Discussion

The current study examined the psychological impact of SARS by examining the coping strategies and health behaviors reported in response to the SARS outbreak. Consistent with the study by Tam *et al.* (this issue) and that by Chang and Sivam (this issue), the present findings revealed a link between cognitions and coping responses. Our findings suggest that feeling threatened by SARS is associated with the use of such coping strategies as wishful thinking and support seeking. It further suggests that patterns of coping with the threat of SARS are associated with engaging in specific health-related behaviors intended to reduce the risk of infection. Interestingly, this pattern of findings appeared to remain the

Table 2 Hierarchical linear regression of SARS-related health behaviors ($N = 67$)

	Avoiding public places			Avoiding people			Taking precautions		
	B	SE B	Beta	B	SE B	Beta	B	SE B	Beta
Step 1									
State anxiety	0.08	0.02	0.48***	0.34	0.10	0.39**	0.08	0.02	0.43***
R ² Δ	0.23***		0.15**				0.18***		
Step 2									
State anxiety	0.05	0.02	0.30*	0.18	0.11	0.20	0.04	0.02	0.23t
SARS threat	0.20	0.06	0.37**	1.11	0.36	0.38**	0.26	0.08	0.41**
R ² Δ	0.10**		0.11***				0.13**		
Step 3									
State anxiety	0.04	0.02	0.27*	0.18	0.11	0.20	0.00	0.02	0.02
SARS threat	0.17	0.06	0.31*	0.80	0.33	0.27*	0.24	0.07	0.38**
Wishful thinking	0.27	0.12	0.27*	2.52	0.60	0.46**	0.19	0.13	0.16
Support seeking	-0.14	0.15	-0.12	0.58	0.76	0.09	0.17	0.16	0.12
Empathic responding	0.17	0.19	0.10	-2.53	1.0	-0.29*	0.58	0.21	0.30**
R ² Δ	0.08t		0.19***				0.16**		

t $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

B, unstandardized regression coefficient; Beta, standardized regression coefficient; SE B, standard error of the unstandardized regression coefficient.

same regardless of gender, education, and whether the individual was from a SARS-affected area.

Specifically, those participants who reported engaging in wishful thinking in response to the threat of SARS appear more likely to engage in two forms of avoidant health behavior: avoiding public places and avoiding people perceived to be possible carriers of the SARS virus. However, those engaging in wishful thinking regarding the virus did not describe themselves as engaging in more of the sort of health behaviors most likely to be viewed as effective by health-care professionals. That is, wishful thinking does not appear to facilitate engaging in critically important health behaviors, such as hand washing and using disinfectants to clean potentially contaminated surfaces.

Conversely, those who reported the use of empathic responding were not only less likely to report avoiding people who may be perceived as potentially having SARS but also more likely to report engaging in precautionary measures and health behaviors likely to be viewed as effective (CDC, 2003a, 2003b, 2003c; WHO, 2003a). Hence, those who report using empathic responding in response to SARS appear to use effective precautionary health behaviors without engaging in avoidant health behaviors that were associated with significant economic and societal costs. Consistent with our expectations, it may be that using empathy and perspective-taking to cope with threatening events inhibits a knee jerk reaction to simply avoid anyone who is perceived as being a possible threat. Empathic responding may inhibit individuals from viewing the public at large and the places in which they can be found as a primary threat and therefore something to be avoided. As such, health behavior efforts may be geared more toward prevention than avoidance. The present study suggests that those who can respond empathically to others even in the presence of health threats may be better at engaging in productive health behaviors that may contribute to their own and to others' health and well-being.

Although perception of SARS threat was associated with the use of support seeking, this coping strategy was not significantly associated with engaging in the SARS-related health behaviors examined in this study, controlling for the other variables examined. There are several possible reasons for this. It may be that we did not have sufficient power to detect an effect given the relatively small sample size. Support seeking may also be related to other outcomes not examined in the present study such as mood or feeling comforted, and it may be that any relation between support seeking and health behaviors is indirect via these more direct effects of social support. Finally, as is observed in the general literature on social support, the effect of support seeking on outcomes may depend upon the response of others (Lehman *et al.*, 1993). That is, others may not always respond favorably to requests for support. Previous research has indicated that even when support is offered to another, it is not always perceived as helpful. For example, cancer patients report that a sizable proportion of the support that is offered to them fails to provide the comfort or aid that was presumably intended (Dakof & Taylor, 1990). In the context of health behaviors, support may not always be sufficient to promote effective health behaviors. Consequently, it may be that we need to examine the interactional patterns between the person eliciting support and the recipient of the support requests if we are to understand the ultimate effects of support seeking.

An obvious limitation of the present study is the cross-sectional nature of the data that does not allow the examination of changes over time or processes. The understanding of how individuals cope with SARS would be aided by longitudinal data permitting, for example, examination of the endurance of health behavior changes or how fluctuations in perceptions of threat, perhaps related to media reports, are related to changes in health behaviors. Furthermore, the sample was collected through the Internet using self-report data and thus is

subject to the biases and limitations of self-report data and selective sampling due to the use of the Internet. Benefits of the Internet as a collection tool include cost-effectiveness and the enhanced reach of sampling demographics. Additionally, there are recommended strategies to avoid such problems as data falsification and data security issues (Smith & Leigh, 1997). However, care must be taken to be aware of the medium's limitations as well. The question of validity is an important one. Studies comparing data collected in traditional formats, such as pencil-and-paper (Schwarzer *et al.*, 1999) and telephone survey (Chang, 2002) have found that Internet studies have high validity and yield similar results to data collected in more traditional mediums. In fact in some cases (Chang, 2002; Murray & Fisher, 2002), Internet surveys have shown higher predictive validity and better psychometric properties than more traditional mediums. However, it is important to note that, as with many mediums, data collected from the Internet cannot be assumed to be representative of the general population. According to the American Internet User Survey, differences include Internet users generally being younger, wealthier and more educated than average survey participants (National Science Foundation, 2001).

Another notable limitation of the present study is that it examined only a few possible coping strategies using brief measures. There may be other coping strategies important to understanding the psychological and behavioral responses to the threat of SARS, such as problem-focused coping. Additionally, despite examining the role of education, gender and geographic region and failing to find significant differences, our sample is reflective of a well-educated, young, female population mostly residing in Canada, which is unlikely to be representative of populations in other countries. Given the international nature of SARS and its impact, future research should examine a broader sample to see the extent to which the results identified in the present study generalize to other populations. Understanding cultural and geographic differences in coping strategies and health behaviors may facilitate designing more effective health promotion campaigns and media messages focusing on those messages with wider applicability across divergent groups.

Finally, the present study did not examine the impact of coping on close others. For example, network members may both facilitate and hinder health behaviors as well as impact and be impacted by the coping of another. The current study examined the individual in isolation, which does not capture the interpersonal nature of coping in general or of the SARS threat in particular. While SARS may be transmitted via body fluids person to person, the threat and fear associated with the disease surrounding it travel even faster from person to person. This threat may ultimately be just as damaging to society and individual well-being as the disease itself is to the health of those infected.

Conclusion

Given the significant relationships that emerged between coping and health behaviors, the present study highlights the importance of considering coping in managing health threats and in encouraging and discouraging various health behaviors (see also Chang & Sivam, this issue; Gan *et al.*, this issue). The avoidant behaviors reported in the present study (avoiding public places and people perceived to be at a higher risk for having SARS) and the study by Gan *et al.* (this issue) may be associated with significant economic and societal costs to areas affected by SARS. For example, the Ontario Government reported that SARS-related costs, including lost revenue related to decreased tourism and commerce, and assistance for individuals, the health-care system and economic recovery totalled \$1.13 billion CAN

(Ontario Government, 2003b). In communities across Canada, community leaders called for awareness programs to address what they saw as a growing aversion towards the Asian community (e.g. Ontario Government, 2003a; Rider, 2003). Understanding that wishful thinking in response to the threat of SARS is related to such avoidant behaviors offers the possibility of minimizing the use of this coping strategy and the resultant economic and societal impact this form of coping has had on SARS-affected cities around the globe. Similarly, the results reported here in relation to avoiding people have significant implications for managing public perceptions of disease threats, particularly when individuals being avoided may belong to a particular ethnic group or groups of health-care professionals. The latter may inadvertently serve to reduce the probability of preventative treatment. Having this knowledge can assist public health officials in promoting positive health behaviors while at the same time assisting them in promoting accurate knowledge that will not result in the targeting of particular individuals.

Notably, our findings suggest methods of coping, such as empathic responding, which might usefully be encouraged via mass media campaigns to both increase effective preventative health behaviors and decrease behaviors that are likely ineffective at best, and potentially damaging to society at worst. It may be important to encourage the use of empathy in coping with health-threatening diseases such as SARS in our public health messages given that such coping strategies are not associated with higher feelings of threat and are associated with better health behaviors. Given the global impact of SARS on health, perceptions of threat, economic functioning, and societal stability, understanding the psychological impact of SARS is critical in our attempts to manage the disease and the public reaction to it. Knowledge of the psychological reaction to SARS may help us create more effective and productive health messages aimed at limiting the detrimental effects such diseases can have on the well-being of society, even among those many who never contract the disease.

Acknowledgments

This research was supported by a SSHRCC grant to the second author and a SSHRCC and Michael Smith doctoral fellowship to the first author. We would like to thank our colleagues in the SARS Collaborative Research Group, particularly George Bishop, for input regarding the design of this study.

End notes

1. SARS Collaborative Research Group was assembled by George Bishop with assistance from the American Psychological Society, Division 38 of the American Psychological Association and the Society of Behavioral Medicine. The SARS Collaborative Research Group includes: Allan Best (University of British Columbia), George D. Bishop (National University of Singapore), Anita DeLongis (University of British Columbia), Anne Marie Vartti (Finnish National Public Health Institute), Arja R Aro (Erasmus Medical Center, The Netherlands), Ayse Uskul (York University), Boon Ooi Lee (Nanyang Technological University, Catherine So-kum Tang (Chinese University of Hong Kong), Jyu-Lin Chen (University of California, San Francisco), Daniela E. Schreier (Argosy University), Esther R. Greenglass (York University), Francis Ngau (National University of Singapore), Frank J. Penedo (University of Miami), Jeff Kibler (Jackson State University), Johannes Brug (Erasmus Medical Center, The Netherlands), Kerstin Schroder (Addiction Research Institute, Vermont), Kevin McCaul (North Dakota State University), Leslie Martin (La Sierra University),

- Linda D. Cameron (University of Auckland), Lois C. Friedman, Mary Poon (San Francisco General Hospital), Nicholas DiFonzo (Rochester Institute of Technology), Noelle Leonard, Prashant Bordia (University of Queensland), Rima Styra (University Health Network), Stefano Occhipinti (Griffith University) and Winnie W.S. Mak (Chinese University of Hong Kong).
2. Due to the collaborative nature of the questionnaire, there were limitations on the number of items that could be included. Given the space restrictions, only one wishful thinking item was included.
 3. While state anxiety may also be viewed as a dependent variable, the current study sought to examine health behaviors as the outcome variable. Given this goal, state anxiety was controlled for in the analyses to ensure that the relationships observed between coping and health behaviors were not simply due to their shared variance with general state anxiety. Further, in examining the relationship of threat of SARS to health behaviors, we wanted to control for the respondent's general level of anxiety, so that we could examine the specific effects of SARS-related fears on health behaviors.
 4. We also ran a series of hierarchical linear regression analyses controlling for the effects of education, gender, affected versus non-affected SARS region, and the interactions between coping and gender, coping and affected/non-affected areas, and coping and time of responding (e.g. before or after mid-July). The pattern of findings regarding the relationship of coping to health behaviors in these analyses was identical to those reported here.
 5. A regression model was also run with the two items tapping social support (instrumental and emotional) entered separately. The effects of social support on health behaviors remained non-significant in these models, regardless of whether the two items were entered together in the same equation or in separate equations.

References

- Bray, M. (2003). Living in the midst of a killer virus. CNN Online. Retrieved 1 September 2003 from <http://edition.cnn.com/2003/HEALTH/03/28/hk.virus/index.html> (29 March).
- Brown, S. L., Nesse, R. M., Vinokur, A. D. & Smith, D. M. (2003). Providing social support may be more beneficial than receiving it: Results from a prospective study of morality. *Psychological Science*, *14*, 320–327.
- Center for Disease Control. (2003a). Hand hygiene in healthcare settings. Retrieved 1 September 2003 from <http://www.cdc.gov/handhygiene/>
- Center for Disease Control. (2003b). Basic information on SARS. Retrieved 1 September 2003 from <http://www.cdc.gov/ncidod/sars/factsheet.htm>
- Center for Disease Control. (2003c). Interim guidance on infection control precautions for patients with suspected severe acute respiratory syndrome (SARS) and close contacts in households. Retrieved 1 September 2003 from <http://www.cdc.gov/ncidod/sars/ic-closecontacts.htm>
- Chang, L. (2002). A comparison of samples and response quality obtained from rdd telephone survey methodology and internet survey methodology. *Dissertation Abstracts International*, *62* (8-B), 3845.
- Chang, W. & Sivam, R. (2004). Constant vigilance: Heritage values and defensive pessimism in coping with severe acute respiratory syndrome in Singapore. *Asian Journal of Social Psychology*, *7*, 35–53.
- Coyne, J. C. & DeLongis, A. (1986). Going beyond social support: The role of social relationships in adaptation. *Journal of Consulting and Clinical Psychology*, *54*, 454–460.
- Dakof, G. A. & Taylor, S. E. (1990). Victims' perceptions of social support: What is helpful from whom? *Journal of Personality Social Psychology*, *58*, 80–89.
- DeLongis, A. & O'Brien, T. (1990). An interpersonal framework for stress and coping: An application to the families of Alzheimer's patients. In: M. P. Stephens & J. H. Crowther, eds. *Stress and Coping in Later-Life Families*, pp. 221–239. Washington, DC: Hemisphere Publishing Corp.
- Fishbein, M., Triandis, H. C., Kanfer, F. H., Becker, M., Middlestadt, S. E. & Eichler, A. (2001). Factors influencing behavior and behavior change. In: A. Baum, T. A. Revenson & J. E. Singer, eds. *Handbook of Health Psychology*, pp. 3–18. London: Lawrence Erlbaum Associates.

- Folkman, S., Lazarus, R. S., Dunkel-Schetter, C., DeLongis, A. & Gruen, R. J. (1986). Dynamics of a stressful encounter: Cognitive appraisal, coping and encounter outcomes. *Journal of Personality Social Psychology*, *50*, 992–1003.
- Gan, Y., Liu, Y. & Zhang, Y. (2004). Flexible coping responses to severe acute respiratory syndrome-related and daily life stressful events. *Asian Journal of Social Psychology*, *7*, 55–66.
- Gaudry, E., Vagg, P. & Spielberger, C. D. (1975). Validation of the state-trait distinction in anxiety research. *Multivariate Behavioral Research*, *10*, 331–342.
- House, J. S., Landis, K. R. & Umberson, D. (1988). Social relationships and health. *Science*, *241*, 540–545.
- Kramer, B. J. (1993). Expanding the conceptualization of caregiver coping: The importance of relationship-focused coping strategies. *Family Relations*, *42*, 383–391.
- Lazarus, R. S. & DeLongis, A. (1983). Psychological stress and coping in aging. *American Psychologist*, *38*, 245–254.
- Lehman, D. R., Davis, C. G., DeLongis, A., et al. (1993). Negative and positive life changes following bereavement and their relations to adjustment. *Journal of Social and Clinical Psychology*, *12*, 90–112.
- Murray, D. & Fisher, D. (2002). The Internet: A virtually untapped tool for research. *Journal of Technology in Human Services*, *19*, 5–18.
- National Science Foundation, Division of Science Resources Studies. (2001). The application and implications of information technologies in the home: Where are the data and what do they say? Available at <http://www.nsf.gov/sbe/srs/nsf01313/socio.htm>
- NBC4.com (2003). SARS prevention information from the Centers for Disease Control and Prevention. Retrieved 10 September 2003 from <http://www.nbc4.com/health/2085930/detail.html>
- O'Brien, T. B. & DeLongis, A. (1996). The interactional context of problem-, emotion-, and relationship-focused coping: The role of the big five personality factors. *Journal of Personality*, *64*, 775–813.
- O'Brien, T. & DeLongis, A. (1997). Coping with chronic stress: An interpersonal perspective. In: B. H. Gottlieb, ed. *Coping with Chronic Stress*, pp. 161–190. New York: Plenum Publishing Corporation.
- Ontario Government (2003a) Commission urges tolerance and respect during the SARS health emergency. News release. Retrieved September 1 2003 from http://www.ohrc.on.ca/english/news/e_pr_SARS.shtml (4 April).
- Ontario Government (2003b). Fact Sheet: SARS. Retrieved 10 September 2003 from http://www.mah.gov.on.ca/userfiles/HTML/nts_1-12557-1.html (27 June).
- Penley, J. A., Tomaka, J. & Wiebe, J. S. (2002). The association of coping to physical and psychological health outcomes: A meta-analytic review. *Journal of Behavioral Medicine*, *25*, 551–603.
- Rider, D. (2003). Fear of virus fuels racism: Ontario must do more to stop return to days of 'Yellow Peril', Asian leaders say. *Ottawa Citizen*, 4 April 2003.
- Schwarzer, R., Mueller, J. & Greenglass, E. (1999). Assessment of perceived general self-efficacy on the Internet: Data collection in cyberspace. *Anxiety, Stress and Coping*, *12*, 145–161.
- Smith, M. A. & Leigh, B. (1997). Virtual subjects: Using the Internet as an alternative source of subjects and research environment. *Behavior Research Methods, Instruments and Computers*, *29*, 496–505.
- Spielberger, C. D., Gorsuch, R. L., & Lushere, R. E. (1970). *Manual for the State-Trait Anxiety Inventory – Form X*. Palo Alto, CA: Consulting Psychologists Press.
- Tam, K. P., Lau, I. & Chiu, C. (2004). Biases in the perceived prevalence and motives of severe acute respiratory syndrome prevention behaviors among Chinese high school students in Hong Kong. *Asian Journal of Social Psychology*, *7*, 67–81.
- Visintini, R., Campanini, E., Fossati, A., Bagnato, M., Novelli, L. & Maffei, C. (1996). Psychological stress in nurses' relationships with HIV infected patients: The risk of burnout syndrome. *AIDS Care*, *8*, 183–194.

World Health Organization (2003a). Frequently Asked Questions on Severe Acute Respiratory Syndrome (SARS). Retrieved 10 September 2003 from <http://www.who.int/csr/sars/sarsfaq/en/>
World Health Organization (2003b). Severe Acute Respiratory Syndrome (SARS). Retrieved 4 October 2003 from <http://www.who.int/csr/sars/en/index.html>