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Original article

# Practice of habitual and volitional health behaviors to prevent severe acute respiratory syndrome among Chinese adolescents in Hong Kong

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## Abstract

**Purpose:** To explore factors relating to the practice of habitual and volitional health behaviors against the severe acute respiratory syndrome (SARS) among Chinese adolescents in Hong Kong.

**Methods:** A community telephone survey was conducted with 230 Chinese adolescents. Random-digit dialing of the local residential telephone directory was used to select respondents, who were asked to provide information on their practice of SARS preventive health behaviors and associated factors as specified by the Health Belief Model. These factors included perceived threat of SARS, perceived benefits and barriers in practicing SARS preventive health behaviors, cues to action, knowledge of SARS, and self-efficacy. Hierarchical regression analyses were conducted to determine salient correlates of habitual and volitional health behaviors against SARS.

**Results:** About 54.8% of respondents reported practicing all three recommended habitual health behaviors. Another 47.8% indicated consistent practice of volitional health behavior of facemask-wearing to prevent SARS. Results of hierarchical regression analyses showed that habitual health behaviors against SARS were related to perceived health threat and environmental cues. For facemask-wearing, salient correlates were environmental cues, rates of SARS habitual health behaviors, younger age, and perceived health threat.

**Conclusions:** The Health Belief Model is useful in understanding Chinese adolescents' practice of health behaviors, especially volitional health behaviors. © 2005 Society for Adolescent Medicine. All rights reserved.

**Keywords:** Adolescents; SARS; Volitional health behavior; Prevention; China

Current global outbreak of severe acute respiratory syndrome (SARS) poses a great threat to international public health. With the gradual containment of the disease in various countries, there is an increasing concern to prevent it from becoming another endemic infectious disease in human populations [1,2]. Among reported cases of SARS infection, about 5% to 10% were aged 11 to 18 years [3,4], with clinical presentations and courses of the disease being as severe as those of adult infected patients [5]. This study aimed to examine factors relating to the practice of SARS

preventive health behaviors among Chinese adolescents in Hong Kong.

## *Understanding adolescent SARS preventive health behaviors*

Adolescence is often viewed as a time of optimum health, relative immortality and invincibility to illnesses. However, research has indicated that adolescents tend to have low adherence to health advice and often engage in risky behaviors that may put them at risk for life-endangering conditions or make them vulnerable to illnesses later in life [6–8]. There is an increasing belief that adolescents should be targeted for health promotion activities [9,10].

Various psychosocial models have been used to understand factors relating to adolescents' practice of health behaviors to facilitate the design and planning of health pro-

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motion strategies. Models that include perceived threat as a core component are most useful in understanding the practice of a variety of adolescent preventive health behaviors [11]. Among these models, the present study focuses on the Health Belief Model (HBM). According to the HBM [12], perceived threat refers to beliefs about the seriousness of a particular disease and one's susceptibility to this disease. The basic HBM also has three other core components, namely perceived benefits, perceived barriers, and cues to action. Perceived benefits refer to the degree to which an individual perceives particular health behaviors as beneficial or effective, whereas perceived barriers are perceived costs of undertaking specific health behaviors. Cues to action are prompts that remind or facilitate an individual to practice certain health behaviors. Two other components, knowledge and self-efficacy, have been added in the more recent modification of the HBM [13–15]. Self-efficacy refers to beliefs in an individual's own ability to perform the desired health behaviors.

The HBM has been used to study various health behaviors among Western adolescent samples, including condom use for acquired immunodeficiency syndrome (AIDS)/human immunodeficiency virus (HIV) prevention [16], HIV testing [17], prevention of teenage pregnancy [18], and diabetes self-management [15]. Similarly, the HBM is also useful in understanding Chinese adolescent health behaviors such as influenza vaccination [19] and HIV preventive behaviors [20]. Across these studies, perceived threat is consistently found to be the most powerful correlate of various health behaviors. The significance of other components varies with different target health behaviors and samples. Furthermore, the HBM is found to be more predictive of volitional health behaviors that are novel and new to the behavioral repertoire of an individual than habitual health behaviors that are usually well established and over-learned [21–23].

In Hong Kong, adolescents' practice of preventive health behaviors against SARS can also be understood in light of the HBM. Their perceived threat of SARS may have been increased by daily reports of SARS infection figures [4], different media programs on SARS, documentation about patients infected with or having died of SARS, and class suspension during the outbreak of SARS [24]. They may also perceive preventive health behaviors against SARS as having more benefits than costs, as local health authorities often emphasize their effectiveness and ease to perform [25]. There are abundant environmental cues to remind adolescents to adhere to health advice, and these include posters and notices about SARS preventive behaviors in noticeable areas in schools/public areas as well as disinfection stations with free alcohol towels and liquid soap in major shopping malls. Furthermore, updated information about SARS and effective ways to perform relevant preventive health behaviors are also disseminated through the media, seminars, and public education activities.

As guided by the HBM, it was hypothesized that per-

ceived threat, perceived benefits, cues to action, knowledge, and self-efficacy would have positive associations; whereas perceived barriers would have negative correlations with SARS preventive health behaviors. Furthermore, it was also hypothesized that components of the HBM would be more predictive of volitional than habitual health behaviors.

## Methods

### *Recruitment and characteristics of respondents*

This study was part of a larger study on SARS preventive behaviors of the general public in Hong Kong, which was conducted from March 29 to April 1, 2003. At the time of this study, SARS was spreading quickly in the local community with 20 to 30 new infections daily. Causative agents, transmission route, diagnostic tests, and specific treatments of the disease were still not yet fully known. Local health authorities had since implemented enhanced infection-control procedures in all hospitals, cohorting of SARS patients, suspension of classes for schools and universities, and ordering of infected individuals and their close contacts to quarantine themselves at home for at least 10 days. In the community, health advice was disseminated and vigorous community-wide public education and prevention programs in relationship to SARS were also launched.

The larger study was conducted using a telephone interview method. Telephone numbers were randomly selected from the local residential telephone directory for 2002, which covered all listed telephone numbers in all regions of Hong Kong. The last two digits of telephone numbers were deleted and replaced by two random numbers generated by the computer to capture unlisted telephone numbers. When telephones were busy or there was no answer, three follow-up calls on different dates and times were attempted before substituting a new telephone number. Individuals who first answered the phone, who were aged 11 years or above, and who were of Chinese ethnicity were invited to a 20-minute telephone interview on their demographic data, responses to local SARS outbreak, and practice of various SARS preventive health behaviors. The decision was made a priori to recruit until 1500 interviews were completed. Out of 2370 valid household contacts, 795 households refused to participate in the study, 38 were incomplete interviews with more than half of the required information missing, and successful telephone interviews were conducted with 1537 households. The success rate, calculated as percentages of completes to complete plus refusals/incompletes, was 64.4%. The sampling error was 3.1 percentage points. Among 1537 successful telephone interviews in the larger study, 15% ( $n = 230$ ) of the respondents were aged 11 to 18 years. The proportion of adolescents to adults in the larger study was comparable to 13.2% in the general population as reported in the 2001 Hong Kong population census. For the purpose of the present study, the adolescent subsample of

the larger study was used for subsequent data analyses. Among these adolescents ( $n = 230$ ), 43.5% were male and 56.5% were female. Their mean age was 15.35 years ( $SD = 2.15$ ), with the age distribution being 10% for 11–13 years, 52.2% for 14–16 years, and 37.8% for 17–18 years. Almost all respondents (92.7%) were in school, with only 3.2% working and 4.1% awaiting employment.

### Measures

**SARS preventive health behaviors.** Local health authorities had recommended various SARS preventive health behaviors, which were grouped into habitual or volitional health behaviors. For habitual health behaviors, respondents were asked whether or not they had engaged in each of the three recommended SARS preventive health behaviors in the past week: building up good body immunity (taking a proper diet, having regular exercise), maintaining good personal hygiene (washing hands properly, covering nose and mouth when sneezing and coughing), and ensuring home environment clean and with good ventilation (“yes” or “no” answers). A habitual health behavior index was computed for each respondent by summing up affirmative responses of these three items. For volitional health behavior, respondents were asked to indicate with a 4-point scale how often they wore facemasks to prevent contracting and spreading of SARS in the past week. The scale was scored from 0 as “never,” 1 as “occasionally,” and 2 as “almost all the time,” with high scores representing more frequent or consistent wearing of facemasks.

**Perceived threat of SARS.** Six items were used to measure the degree to which respondents perceived SARS as a health threat: whether or not respondents felt vulnerable to contracting SARS, were fearful of SARS, worried about its spread to the community, concerned Hong Kong was becoming a quarantine city, knew or had previous contact with individuals infected with SARS, and had respiratory infection symptoms such as sore throat, dry cough, fever, muscle ache, and shortness of breath. Respondents answered “yes” or “no” to each item. The perceived threat score was then computed by summing affirmative responses to these six items. A high score indicates the perception of SARS as being a great health threat. The internal consistency alpha of the perceived threat scale was .62.

**Perceived benefits of SARS preventive health behaviors.** Respondents were asked to indicate on a 4-point scale the degree to which they believed health behaviors as suggested by local health authorities could prevent the contracting and spreading of SARS. The item was scored from 1 as “very ineffective” to 4 as “very effective,” with high scores indicating the perception of having great benefits in practicing SARS preventive health behaviors.

**Perceived barriers.** Respondents were asked to respond “yes” or “no” regarding whether they had difficulty and felt

inconvenienced in practicing recommended SARS preventive health behaviors. The perceived barriers score was formed by summing affirmative responses to these two items. A high score indicates the perception of great barriers in practicing these behaviors.

**Cues to action.** Respondents were asked to indicate whether or not they perceived their family members and local government had prompted them to practice the suggested SARS preventive health behaviors (“yes” or “no” answers). A summary score was computed by summing affirmative responses. High scores indicate the perception of environmental cues to practice these behaviors.

**Knowledge about SARS.** Respondents were asked to indicate whether or not they perceived they had adequate knowledge about SARS and whether local health authorities had provided adequate information on SARS. These two items were scored on 4-point Likert scales ranging from 1 as “very inadequate” to 4 as “very adequate.” High scores indicate respondents perceiving themselves as being knowledgeable about the disease and its prevention.

**Self-efficacy.** Respondents were asked to indicate the degree to which they believed they were able to practice the suggested SARS preventive health behaviors. Responses were coded on a 4-point scale ranging from 1 as “totally incapable” to 4 as “totally capable.” High scores indicate high levels of self-efficacy in practicing these behaviors.

**Demographic information.** Respondents were asked about their age, gender, educational attainment, working status, and personal monthly income.

### Data analytic techniques

Statistical analyses in this study were conducted using SPSS 10.0 software (SPSS Inc., Chicago, Illinois). Descriptive statistics on the practice of SARS habitual and volitional health behaviors were examined. Pearson correlation analyses were conducted to examine associations among SARS preventive health behaviors, demographic characteristics, and six components of the HBM (i.e., perceived threat, perceived benefits, perceived barriers, environmental cues, knowledge, and self-efficacy). Hierarchical regression analyses were then performed to test the HBM and to identify salient predictors of the habitual and volitional health behaviors, respectively.

## Results

### Practice of SARS preventive health behaviors

For habitual health behaviors, slightly more than half of respondents (54.8%) reported practicing all three health behaviors as suggested by local health authorities (i.e., building up good body immunity, maintaining good personal hygiene, and keeping home environment clean with

Table 1  
Descriptive statistics and results of correlation analyses of major variables

	1	2	3	4	5	6	7	8	9
Demographics									
Age	1.00								
Components of Health Belief Model									
Knowledge	-.11	1.00							
Perceived threat index	.01	-.11	1.00						
Perceived benefits	-.09	.25**	-.16*	1.00					
Perceived barriers	.01	-.05	.09	.06	1.00				
Environmental cues	-.00	.04	.16*	.13	-.04	1.00			
Self-efficacy	-.06	-.04	-.04	.16*	.09	.06	1.00		
SARS preventive health behaviors									
Habitual health behaviors	-.13	.10	.23**	.17*	.01	.23**	.02	1.00	
Volitional health behavior of facemask-wearing	-.19**	-.09	.27**	.05	-.00	.40**	.14*	.38**	1.00
Mean	15.35	2.69	1.86	2.90	.39	1.35	3.17	2.31	1.20
SD	2.15	.44	1.48	.46	.58	.71	.54	.87	.85
Range	11–18	1–4	0–6	1–4	0–2	0–2	1–4	0–3	0–2

\*  $p < .05$ ; \*\* $p < .01$ .

good indoor ventilation). Another 25% of respondents practiced two of the three suggested habitual health behaviors, another 17% practiced only one, and the remaining 3.2% practiced none of these behaviors. For volitional health behavior of facemask-wearing, about 47.8% of respondents indicated consistent practice, 24.4% reported occasional practice, and 27.8% did not wear facemasks at all. Results of Chi-square tests found no significant gender difference on both habitual and volitional health behaviors against SARS ( $p > .05$ ).

Respondents were then divided into two groups according to their volitional health behaviors to determine the presence of any group differences in their demographics, psychological variables, and habitual health behaviors. Respondents who reported consistent and occasional use of facemasks were grouped as “users” ( $n = 166$ ), whereas those who never wore facemasks for SARS prevention were classified as “nonusers” ( $n = 64$ ). Results of Student’s  $t$ -tests showed that compared with users, nonusers of facemasks were older (Mean = 15.14 vs. 15.84,  $t = -2.14$ ,  $p < .05$ ), perceived less personal threat of SARS infection (Mean = 2.05 vs 1.34,  $t = 3.69$ ,  $p < .01$ ), detected fewer environmental cues to practice SARS preventive behaviors (Mean = 1.50, .95,  $t = 5.55$ ,  $p < .01$ ), and practiced fewer SARS habitual health behaviors (Mean = 2.43, 1.98,  $t = 3.58$ ,  $p < .01$ ).

#### Correlates of SARS preventive health behaviors

Pearson correlation analyses were conducted to examine associations among SARS preventive health behaviors, demographic characteristics, and six components of the HBM (i.e., perceived threat, perceived benefits, perceived barriers, environmental cues, knowledge, and self-efficacy) (Table 1). For habitual health behaviors against SARS, significant correlates were perceived threat, environmental cues, and

perceived benefits ( $r = .23$ ,  $.23$ , and  $.17$ , respectively;  $p < .05$ ). For volitional health behaviors of facemask-wearing to prevent SARS, environmental cues, practice of habitual health behaviors, and perceived threat were positive correlates ( $r = .40$ ,  $.38$ , and  $.27$ , respectively;  $p < .05$ ). Age was negatively related to facemask-wearing ( $r = -.19$ ,  $p < .01$ ).

As a number of variables were related to SARS preventive health behaviors, hierarchical regression analyses were conducted to determine the respective contribution of these variables when their common variances were also considered. Separate hierarchical regression analysis was conducted for habitual and volitional health behaviors. For both types of health behaviors, demographic variables of age and gender were entered as Block 1. Four core components of the HBM, including perceived threat, perceived benefits and barriers, and cues to action, were entered as Block 2. More recent HBM components of knowledge and self-efficacy were entered as Block 3. For volitional health behavior of facemask-wearing, rates of the practice of habitual health behaviors against SARS was added as Block 4. Final models of these two regression analyses were presented in Table 2.

For habitual health behaviors against SARS, results of the regression analysis showed that three blocks of variables together accounted for 11.2% of the variance. Demographic variables in Block 1 were insignificant, whereas core HBM components in Block 2 contributed an additional 9.2% of the variance ( $\Delta R^2 = .092$ ,  $F$  change = 5.209,  $p < .001$ ). More recent components of the HBM in Block 3 were not related to habitual health behaviors ( $p > .05$ ). Beta values of the final model of this regression analysis indicated that habitual health behaviors against SARS were related to perceived threat and environmental cues ( $\beta = .201$  and  $.131$ , respectively,  $p < .05$ ).

Table 2  
Results of final model of hierarchical regression analyses

	Standardized Coefficient Beta Value	Multiple R	R <sup>2</sup> Change	F Change
Habitual health behaviors				
Block 1: Demographics		.129	.017	1.757
Age	-.111			
Gender	-.007			
Block 2: Core HBM components		.329	.092	5.209**
Perceived threat	.201**			
Perceived benefits	.131			
Perceived barriers	.007			
Environmental cues	.144*			
Block 3: More recent HBM components		.335	.004	.444
Knowledge	.065			
Self-efficacy	.014			
Volitional health behavior of facemask-wearing				
Block 1: Demographics		.201	.040	4.366*
Age	-.157**			
Gender	-.057			
Block 2: Core HBM components		.493	.203	13.588**
Perceived threat	.131*			
Perceived benefits	.006			
Perceived barriers	-.026			
Environmental cues	.327**			
Block 3: More recent HBM components		.521	.028	3.928
Knowledge	-.124			
Self-efficacy	.109			
Block 4: Habitual health behaviors		.581	.066	19.961**
Habitual health behaviors	.273**			

\*  $p < .05$ ; \*\*  $p < .01$ .

Note: HBM denotes Health Belief Model.

For volitional health behavior of facemask-wearing, results showed that four blocks of variables together accounted for 33.8% of the variance. Demographic variables in Block 1 accounted for 4% of the variance ( $\Delta R^2 = .040$ ,  $F$  change = 4.366,  $p < .05$ ), whereas core components of the HBM contributed an additional 20.3% of the variance ( $\Delta R^2 = .203$ ,  $F$  change = 13.558,  $p < .000$ ). More recent components of the HBM in Block 3 were not significant ( $p > .05$ ). The practice of habitual health behaviors in Block 4 was significant and contributed another 7% of the variance ( $\Delta R^2 = .066$ ,  $F$  change = 19.961,  $p < .001$ ), even after effects of demographics and HBM components were considered. Beta values of the final model of this regression analysis indicated that facemask-wearing was related to environmental cues, practice of habitual health behaviors against SARS, younger age, and perceived threat ( $\beta = .327$ ,  $.273$ ,  $-.157$ , and  $.131$ , respectively,  $p < .05$ ).

## Discussion

This study showed that Chinese adolescents' rates of SARS preventive health behaviors were relatively high when compared with other health behaviors practiced by Western [26–29] and Chinese youths [8]. Results showed that slightly more than half of the present adolescent sample

practiced all three suggested habitual health behaviors. Among all adolescent respondents, 47.8% also reported consistent practice of volitional health behavior of facemask-wearing to prevent the contracting and spreading of SARS. In comparison, only one-third of surveyed youths reported sun protection measures in Australia [29], regular fruit or vegetable consumption in the United States [27], and consistent condom use for HIV/AIDS prevention in Hong Kong [8]. High rates of SARS preventive health behaviors as reported by the present adolescent sample might have been related to the perceived threat of the disease and vigorous public education efforts of the local government [30]. This study suggested that contrary to the common conception that adolescents are generally irresponsible and noncompliant [31], some adolescents would practice recommended health behaviors given adequate public education and mobilization.

It should also be noted that in the larger study in which the present adolescent sample was selected, about 61.2% of adult respondents reported the wearing of facemasks to prevent SARS [30]. In other words, adolescents' rates of SARS preventive behaviors were substantially lower than rates of adult respondents. Thus, adolescents should remain one of the target groups for SARS prevention activities. An

understanding of underlying motivational factors specific to adolescents would greatly facilitate the design and implementation of related prevention programs for adolescents.

#### *Health belief model and SARS preventive health behaviors*

This study showed that among six components of the HBM, perceived threat and cues to action were more salient correlates of SARS preventive health behaviors among Chinese adolescents. These findings were consistent with existing literature on the HBM. Perceived threat has been consistently found to be the most important correlate of a variety of health behaviors among Western [15–18] and Chinese youths [19,20]. Cues to action are not always included in studies on the HBM. When included, this component is also related to health behaviors in both general [13] and adolescent samples [32]. For adolescents, cues to action are the most effective when they are also built into their social networks such as peers, family, and school systems [33]. Indeed, at the time of this study, there were environmental cues not only to adolescents, but also cues to remind parents and school personnel to ensure that their children or students adhere to health advice on SARS prevention [25].

This study also found that more recent components of the HBM, knowledge and self-efficacy, were insignificant correlates of SARS preventive health behaviors. In fact, past studies on both Western [34] and Chinese samples [8,19] have also found that knowledge of the disease alone is inadequate to motivate adolescents to practice the desired health behaviors. Instead, knowledge is found to play a significant role in increasing perceived threat and vulnerability about the disease [8,18]. It should also be noted that at the time of this study, very little was known about SARS regarding its causative agents, transmission route, and specific treatments. Thus, it is understandable that the meager knowledge about this disease did not emerge as a salient correlate. It is plausible that as more information about the disease is available, such knowledge may become a salient factor in influencing adolescents' health behaviors.

Previous studies have documented that self-efficacy is a salient correlate of adolescent health behaviors [8,33,35]. However, present results showed that self-efficacy did not have significant contribution to the understanding of SARS preventive health behaviors when other components of the HBM were also considered. It may be that SARS preventive health behaviors are relatively easy to perform. Most adolescents can easily manage habitual behaviors of washing hands, covering nose and mouth with tissue when coughing and sneezing, and maintaining good indoor ventilation. Even for the novel behavior of facemask-wearing, it is easily learned and requires little skill.

#### *Habitual versus volitional health behaviors against SARS*

Results of the present study support the hypothesis that psychosocial models such as the HBM were more predictive of volitional than habitual health behaviors [21–23]. Specifically, core HBM components of perceived threat, perceived benefits and barriers, and environmental cues contributed an additional 20.3% of the variance in volitional health behavior of facemask-wearing; whereas these components accounted for only 9.2% of the variance in habitual health behaviors. These findings may be explained by individuals' deliberate evaluation process. Most psychosocial models, including the HBM, suggest that deliberate evaluation of the threat related to the disease as well as benefits, barriers, and cues surrounding specific health behaviors are crucial in predicting whether or not an individual practices a certain health behavior [12,36,37]. In this study, consistent facemask-wearing was novel to most Chinese adolescents in Hong Kong and required active evaluation of these psychosocial factors before they decided to practice such behavior. As mentioned, cues to wear facemasks were not only targeted at individual adolescents but were also available in adolescents' social network through their parents and teachers [33]. Thus, core components of the HBM emerged as more salient correlates of facemask-wearing than of habitual health behaviors.

Present findings also revealed that habitual and volitional health behaviors were moderately related to each other. In other words, Chinese adolescents who practiced habitual health behaviors such as washing hands, taking proper diet with regular exercise, and keeping good indoor ventilation were also more likely to practice the specific volitional health behavior of facemask-wearing. As pointed out by some researchers [38], different health behaviors may be interrelated to influence health. For example, smoking may reduce the desire to exercise, and intense exercise may affect food intake; whereas eating nutritious food does not necessarily preclude an individual from eating "junk" food. Similarly, increases in the practice of one type of health behavior may facilitate adherence to other health behaviors. Further research on the clustering of different health behaviors may facilitate clearer understanding of adolescent health behaviors.

#### *Limitations*

This study had several limitations. First, it was part of a larger study in which data were collected through residential telephone interviews. Consent had to first be obtained from persons who answered the telephone before the conduct of the interview. There was no information about demographic characteristics or reasons for refusal for those who declined the interview. Thus, it remained uncertain whether adolescents' response rate was at the same level as adults. Second, retrospective self-reports of adolescents were collected without external verification, and results might be subject to

recall and social desirability bias. There might also be doubts about the validity of responses by telephone interviews. However, previous studies have documented the similarity of responses between telephone and face-to-face interviews [39], and telephone interviews have become an increasingly acceptable methodology in collecting estimates of health behaviors [40]. Third, the measurement of the target SARS preventive behaviors was crude and without any contextual information. It was possible that adolescents' practice of SARS preventive behaviors might differ at home, in school, or in public places. Lastly, this study focused on core components of the HBM in understanding the practice of SARS preventive health behaviors. Components of other psychosocial models that are of particular relevance to adolescent samples, such as subjective normative beliefs of the Theory of Planned Behavior [36], were not examined.

Despite these limitations, results of this study have significant implications not only for the prevention of SARS, but also for general health promotion activities for Chinese adolescents. It should be noted that these health education programs are the most effective if they are also made available to adolescents' parents, family members, and school personnel [33]. In this study, perceived threat and cues to action were found to be powerful motivating factors in adolescents' practice of preventive health behaviors. Thus, health education and prevention programs for Chinese adolescents need to attend to these two core components.

## Conclusion

This study demonstrated that Chinese adolescents' practice of health behaviors could be fostered when given adequate public education and mobilization. In particular, the Health Belief Model was useful in understanding both habitual and volitional health behaviors among Chinese adolescents. Perceived health threat and cues to action were salient correlates of the practice of SARS preventive health behaviors.

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