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SOCIAL COGNITIVE DETERMINANTS OF HAND WASHING:
THE RELATIONSHIP BETWEEN TRUST IN HEALTH INFORMATION
AND HAND WASHING BEHAVIOR AMONG YOUNG FINNISH MEN.

MASTER'S THESIS

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ABSTRACT

Background:

Many people fall sick because of infectious diseases transmitted through hands. Many of those diseases could be avoided through frequent hand washing. Trust in information from health authorities is important for compliance with recommended hand washing behavior in times of a current public health threat. However, it remains uncertain if this is also the case in times of no current health threat.

Aim:

This thesis applies a social-cognitive model and examines social cognitive factors predicting hand washing and their relations to trust in authority-provided health information.

Methods:

Cross-sectional data from N=140 young Finnish men aged 18-22 was collected in the Finnish army in 2011 to test the assumptions that, (1) trust in authority-provided health information is associated with higher knowledge, higher self-efficacy, higher perceived effectiveness of hand washing, lower perceived risk, and less disease worry; (2) Higher self-efficacy, higher knowledge, higher perceived effectiveness of hand washing, higher perceived risk, and higher disease worry is associated with more hand washing and to explore (3) whether there is a direct effect of trust in authority-provided information on hand washing and whether it is mediated by self-efficacy, knowledge, perceived effectiveness of hand washing, perceived risk and disease worry.

Results:

The results show that trust in authority-provided health information is associated with higher self-efficacy, higher knowledge, higher perceived effectiveness and lower perceived risk; that higher self-efficacy and higher disease worry are associated with hand washing; and that there is a direct independent effect of trust in authority-provided health information on hand washing. Furthermore, it was found that trust in authority-provided health information differs according to the educational level.

Conclusion:

The results are important to understand how certain social cognitive predictors of behavior are related to both, hand washing and trust in authority-provided health information, in times of no current health threat. The results give information for designing health intervention campaigns, which should address self-efficacy, disease worry and trust in authority-provided information. Moreover, it is suggested to modify the social-cognitive model in so far as to include more social influences.

Keywords: Hand washing, trust, health information, health authorities, health-protective behavior, infectious respiratory diseases, social cognitive model

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1 INTRODUCTION

Since we were children, we learned to wash our hands after coming inside, after going to the bathroom or before eating. Probably everyone in Western societies knows about this seemingly ordinary behavior. At the same time, hand washing is an effective way to prevent the transmission of infectious diseases. It is also common knowledge that seasonal influenza spreads easily and affects peoples of all ages. Due to globalization, worldwide mobility has vastly increased and with it the danger of infectious diseases spread (World Health Organization, 2009). Until today, infectious respiratory diseases present a major public health threat for people all over the world.

However, little is known yet about how people behave to the health threat of a seasonal influenza. An understanding of the factors that influence health-related behavior, such as hand washing, is important to decrease the likelihood of infection and transmission (Bish & Michie, 2010). Therefore, the purpose of this thesis is to find out which factors determine hand washing, to help authorities promote hand washing; and to understand which factors influence people's trust in information from authorities in order to carry out the recommended behavior. In detail, this thesis is an analysis of social cognitive determinants of hand washing and its relation to trust in authority-provided health information based on data from young Finnish men. As young, less educated men have the lowest compliance with health-protective behavior (Bish & Michie, 2010), this analysis sheds light on their behavior facing a seasonal influenza health threat, in order to be able to predict their behavior and give suggestions on how it can be modified in health behavior interventions.

Health is a complex, multi-dimensional construct involving a combination of biological, behavioral, psychological and social systems. A social psychological perspective which analyzes multiple determinants and takes the individual and social environment into account is helpful in understanding health behavior. It is especially beneficial, because behavior is a function of people's perception of reality rather than objective characterizations of the environment (Conner, 2010).

To place the necessity of this kind of research in a broader context, a short overview over the past and present imminence of infectious respiratory diseases and the thereof resulting public health threat will be given first (Chapter 1.1). Then, hand washing as

one health-protective behavior will be thoroughly described and its social psychological determinants presented (Chapter 1.2). As trust in health information from authorities is generally crucial in health contexts, and particularly during an infectious diseases threat, it will be discussed and its relation to health-protective behavior presented (Chapter 1.3). To provide a solid theoretical background for the present study, three social cognition models of health behavior will be briefly described and their shortcomings discussed (Chapter 1.4), followed by the introduction of a social-cognitive model by Liao, Cowling, Wing, Man, and Fielding (2010) and Liao, Cowling, Wing, and Fielding (2011) (Chapter 1.5). In the ensuing empirical part (Chapter 2 and 3) hypotheses about the relation between trust in authority-provided health information, certain social cognitive predictors of behavior and hand washing will be tested. The hypotheses are partly a replication of the aforementioned model and partly of exploratory nature. In the final discussion (Chapter 4) the results of the analysis will be discussed and compared to other studies. Furthermore, limitations will be mentioned and implications for research and practice suggested, especially in regard of how the level of hand washing can be increased.

1.1 The health problem

Emerging and re-emerging infectious diseases are of high public health concern due to the limited human immunity against new strains of infectious diseases and its excess morbidity and mortality. People also perceive infectious diseases as less controllable than chronic life-style related diseases (Vartti, Oenema, Schreck, Uutela, de Zwart, Brug & Aro, 2009). Therefore, understanding the epidemiology of seasonal influenza is helpful to comprehend how an unknown infectious virus would behave in the general population.

The frequent seasonal influenza and the rare influenza pandemics represent a continuum of a disease, as the latter is an emergence of a new subtype of virus in humans to related viruses which circulated in subsequent years or decades. Usually, the repetitive annual seasonal influenza exceeds the morbidity and mortality of pandemic influenza. Although the population immunity increases as the virus evolves over time, it is reasonable to assume that a novel virus against which no or low

immunity exists is expected to produce a disease of longer duration than a seasonal influenza. (Van-Tam, 2009.) At the present time, the avian influenza virus (A/H5N1) has the greatest pandemic threat as it is highly pathogenic and entails a high fatality rate (Sellwood, 2009).

According to the World Health Organization (WHO), three criteria have to be met in order to declare a pandemic: firstly, a new influenza virus type A unrelated to pre-pandemic viruses must emerge in populations with no or little immunity; secondly, it must cause significant illnesses; and thirdly, it must spread from person to person (WHO, 2009; see *ibid.* the WHO definition of six pandemic phases).

Within the last century, four pandemics occurred which all originated in Asia (China) or Russia, as the opportunity for genetic reassortment and mutation of viruses between people, birds and possible pigs is highest in these areas (Sellwood, 2009). The “Spanish Flu” in 1918 was the worst pandemic in the last century, as it killed 30-50 million people worldwide. The “Asian Flu” in 1957-1958 and the “Hong Kong Flu” in 1968-1969 killed both an estimated 1-4 million people. Most recently, the “Swine Flu” pandemic resulted in the death of more than 18,000 people globally in 2009-2010. (WHO, 2009.) Apart from pandemics, the virus of the “bird flu” killed 332 people in Asia and Africa since 2003, the Severe Acute Respiratory Syndrome (SARS) led to the death of 916 people in 2003 and other acute infectious respiratory cause more than two million deaths per year globally (WHO, 2009; WHO, 2010).

Despite the advances in medicine, pharmacy and disaster management nowadays, the impact of a pandemic outbreak would have severe global consequences. Increased air travel fastens the pace of transmission and leaves less time to prepare. Dark predictions foresee health care systems overburden, economies suffer and the social orders disrupt. (WHO, 2009.) As all influenza-related viruses constantly change, re-emerge and recycle their antigens, no vaccination can be produced before the outbreak of the virus, which leads to the choice of other health-protective measures than vaccination. (WHO, 2009.)

There are several non-pharmaceutical ways of protection against infectious respiratory diseases. Bish and Michie (2010) categorized them into three groups: *preventive behavior*, which includes hygiene behaviors such as hand washing, cleaning surfaces,

coughing or sneezing in a tissue – also called “respiratory etiquette”, wearing face masks, taking vaccination; *avoidant behavior*, which includes avoiding crowds, public transport and follow quarantine recommendations; and *management of disease behavior*, which includes taking antiviral medication and consulting a health professional. Within the scope of this thesis, I will only focus on one preventive behavior, hand washing, as it is simple, inexpensive, widely accessible, and usually without conflicting interests. In contrast, vaccinations are seldom available, facemasks constrain people’s lifestyle and avoidant behavior limits people’s mobility and is not always feasible.

1.2 Hand washing and its social psychological determinants

Hand washing is regarded as a potentially important behavior for preventing the transmission of infectious respiratory diseases. Experts of a broad range of public health related disciplines recommend rigorous and routine hand washing as an important protective strategy for the general population before, during and after influenza pandemics (Aledort, Lurie, Wasserman, & Bozzette, 2007).

A clear and significant impact of hand washing on the risk of respiratory infections was discovered in a systematic review, along with the fact that hand washing can decrease the overall risk of contracting a respiratory infection by 16 % (Rabie & Curtis, 2006). In addition, frequent hand washing has shown to decrease respiratory infections in healthcare settings (De Wandel, Maes, Labeau, Vereecken, & Blot, 2010; Dyson, Lawton, Jackson, & Cheater, 2011), community settings (Aiello, Coulborn, Perez, & Larson, 2008), within an office environment (Savolainen-Kopra, Haapakoski, Peltola, Ziegler, Korpela, Anttila, Amiryousefi, Huovinen, Huvinen, Noronen, Riikkala, Roivainen, Ruutu, Teirilä, Vartiainen, & Hovi, 2012) and in military settings (Ryan, Christian, & Wohlrabe, 2001; Mott, Sisk, Arbogast, Ferrazzano-Yaussy, Bondi, & Sheehan, 2007).

Within Europe, Finland has the highest percentage of people (78%; European average 54%) who mention regularly hand washing as a measure to protect against the “swine flu”. Furthermore, 87% of the Finnish population reported that they already wash their

hands regularly, which is 22 percentage points above the European average. (European Commission, 2010.)

Hand hygiene plays an essential role in the spread of a virus, as hands transport bacterial and viral respiratory pathogens and serve as a disease vector on the hand-to-face route of transmission (Rabie & Curtis, 2006). The transmission of influenza pathogens in humans occurs through various routes, but mainly through direct physical contact with an infected individual, indirect contact through contaminated hands, objects or instruments, and droplets from the respiratory tract of an infected individual which can travel up to one meter through the air (Brankston, Gitterman, Hirji, Lemieux, & Gardam, 2007).

Latest hand hygiene recommendations suggest to wash hands with soap and water when visibly dirty, after using the toilet, before preparing food, after blowing nose, sneezing, coughing, touching mouth or nose, after touching surfaces or objects a person has touched with an infectious disease and when coming inside from the open air. Hands should be washed at least ten times per day. To clean the hands with alcohol-based disinfectant, the surface of the hands should be entirely covered with it and rubbed for up to 30 seconds until they are dry. When washing hands with water and (liquid, bar, leaf or powdered) soap, the soap should be applied to the surface of both hands and after careful rubbing for at least ten seconds rinsed with water and dried thoroughly with a single-use towel or paper (WHO, 2009a).

Similar to other health-protective behavior, hand washing behavior is developed and established through socialization in early life and a result of various influences from biology, education, environment and culture. The analysis of individual factors, such as social cognitive determinants, can provide additional insight into hand hygiene behavior (Conner & Norman, 2005). In a systematic review about demographic and attitudinal determinants of health-protective behavior during a pandemic, Bish and Michie (2010) discovered that hand washing and other health-protective behavior is influenced by intrapersonal factors such as knowledge, attitudes, beliefs; interpersonal factors including social norms, social support, and social pressure; and other factors such as state anxiety, cues to action, and trust in authorities. Beside these attitudinal determinants, Bish and Michie (2010) found that the associations between demographic factors and health-protective behavior are largely ambivalent. No

straightforward pattern for age, ethnicity or marital status was found. The association between health-protective behavior and education is also inconclusive. However, the results adumbrate that educated people are more likely to carry out protective behavior and that women are generally more likely to carry out health-protective behavior than men. (Bish & Michie, 2010.)

In addition, the following social cognitive determinants have been found to have a relation with health-protective behavior: perceived severity of the disease, perceived costs of the health behavior, perceived efficacy of the health behavior, perceived susceptibility or risk to the disease, knowledge about the disease or behavior, self-efficacy and perceived vulnerability (Bish & Michie, 2010; Leppin & Aro, 2009; Voeten, de Zwart, Veldhuijzen, Yuen, Jiang, Elam, Abraham, & Brug, 2009; Tang & Wong, 2005). Most of these determinants are central concepts in health behavior models (see Chapter 1.4) and they differentiate between individuals from the same background in terms of their likelihood to perform a certain health behavior (Conner & Norman, 2005). This study will focus on a limited number of social cognitive determinants, which will be further described in Chapter 1.5.

1.3 Trust in authority-provided health information

The role of risk communication from authorities is important when the public is at risk for a real or potential health threat and when treatment options are limited. The level of trust in and the satisfaction with risk communication is crucial, as it indicates how likely the risk assessment from the authorities is considered to be credible, which then has an influence on health-protective behavior (Bish & Michie, 2010). The success of public health authorities' persuasive communication is determined by several factors.

According to the Yale Attitude Change Approach from Hovland, Janis, and Kelley (1953), an important factor in persuasive communication is the communicator's credibility, which is composed of the communicator's expertise and trustworthiness. People's response to persuasive messages and the way information is received and processed depends on the route of persuasion. Petty and Cacioppo (1986) suggest in their Elaboration-Likelihood-Model of information processing (which is similar to the Heuristic-Systematic-Model from Chaiken, Liberman, & Eagly, 1989) that two routes

of decision making and attitude change are activated after persuasive communication: the central route and the peripheral route. The central route is taken when people are highly motivated and able to elaborate, analyze and process the information. The peripheral route of persuasion occurs when people are unwilling and unable to process the information, thus rely on their affects, expertise cues or mental shortcuts. The route of information processing is essential for persuasive communication as it predicts behavior and determines the duration of attitude change. (Petty & Cacioppo, 1986.)

Besides Hovland et al. (1953) also Brug, Aro and Richardus (2009) and Slovic (1999) emphasize the importance of trust in the source of information, which then assigns the effectiveness of risk communication. On that account, it is the health authorities' responsibility to carry out transparent, proactive, and open communication, as it builds, preserves, and promotes trust (O'Malley, Rainford, & Thompson, 2009). Trust is a core element in persuasive risk communication (Abraham, 2009) and a key emotion (Slovic, 1999). It determines the truthfulness of information from different sources (Liao et al., 2011) and is hence a core element in risk perception (Slovic, 1999). Trust is a relational concept, as it evolves between people, people and organizations or institutions or people and events (Gilson, 2003; Calman 2002). Rotter (1971) defines interpersonal trust as being "an expectancy held by an individual or a group that the word, promise, verbal or written statement of another individual or group can be relied on" (p. 444).

During an urgent, unknown or uncertain health threat, trust in information becomes important when people consider making decision to change their behavior (Calman, 2002). The awareness of a threat situation arises from information coming from several sources about the prediction, perception and comprehension of the risk (Liao et al., 2011). Government health messages are a major source of information (Liao et al., 2010). Several studies show that people with higher trust in government and public health authorities were more likely to follow their recommendations during the SARS outbreak (Rubin, Amlôt, Page, & Wessely, 2009) and that trust in information is related to health-protective behavior in general (Bish & Michie, 2010; Tang & Wong, 2005). The compliance with recommended hand washing behavior during a current health threat, for example, relies also on the public's trust in the information about its

effectiveness and trust in the authorities who are the source of the information (O'Malley et al., 2009). However, convincing people that a certain health threat is real is often the more urgent task for public health authorities, rather than calming down arising panic (Rubin et al., 2009).

1.4 Social cognition models of health behavior

Social cognition models offer a way to understand and predict individual health behavior. These models focus on different health-related cognitions, attitudes, beliefs and feelings in order to determine the performance or absence of a certain health-related behavior. The expectancy-value judgments, assuming that decisions are made on probabilities that certain actions have certain outcomes and that the individual evaluates the outcome, is shared by many social cognition models.

Although there is no evidence-based model of health-protective behavior against infectious respiratory diseases yet (Leppin & Aro, 2009), some of these models have been applied in this research field (Bish & Michie, 2010; Leppin & Aro, 2009; Tang & Wong, 2005). In the following, I will briefly describe the assumptions behind three major social cognition models and discuss their shortcomings, before I will suggest the use of a social-cognitive model from Liao et al. (2010) and Liao et al. (2011).

The assumptions behind the Health Belief Model (HBM; Becker, 1974) are that health behavior is determined by two factors: firstly, perceptions or beliefs about a personal health threat, which includes perceived susceptibility and perceived severity; and, secondly, evaluations about the effectiveness of the behavior to counteract it, which includes considerations about the perceived benefits which should be higher than the perceived costs of the behavior. These factors combined with the individual health motivation (the value that the individual attaches to his/her health) and internal or external cues to action (triggers to the individual taking action) result in health behavior. (Becker, 1974; Sutton, 2001; Conner, 2010.)

As the name implies, the Protection Motivation Theory (PMT; Rogers, 1975) refers to the individual protection motivation (or intention) to perform health behavior. The behavior intention is determined by a combination of threat and coping appraisal. The

threat appraisal consists of perceived susceptibility and severity (like in HBM) and intrinsic and extrinsic rewards of the behavior. The coping appraisal consists of perceptions about response costs, outcome efficacy and self-efficacy. Both, threat and coping considerations, determine the protection motivation, which leads to adaptive or maladaptive response to a health threat. (Rogers, 1975; Sutton, 2001; Conner, 2010.)

The three key factors in the Theory of Planned Behavior (TPB; Ajzen, 1991) which determine behavioral intentions and thus health behavior, are: attitudes (a function of the likelihood that the outcome occurs after performing behavior and an outcome evaluation); subjective norms (a function of normative beliefs about significant others approval to perform the behavior and the internal motivation to comply); and, perceived behavioral control (a function of the control beliefs about the access to resources and opportunities to perform the behavior and the importance of internal and external control factors which facilitate or inhibit the behavior). (Ajzen, 1991; Sutton, 2001; Conner, 2010.) The concept of perceived behavioral control is fairly similar to Bandura's concept of self-efficacy, which is one of the key determinants of behavior in the self-efficacy theory, which is a component of his social cognitive theory (Sutton, 2001). Perceived self-efficacy is the generative capability of numerous skills and what the individual believes he/she can do with them for various purposes in different situations (Bandura, 1997).

These social cognition models of health behavior are at times criticized, mainly for their strong conscious-rationalist situational appraisal and the presumption that behavior is guided by conscious intentions. The too narrow emphasis on cognitive dimensions of risk perception in explaining health-protective behavior (which is the main shortcoming of the HBM and PMT and also partly of TPB) is especially problematic during an infectious respiratory disease health threat (Leppin & Aro, 2009; Vaughan, 2011).

The reason for that lies in the controllability of infectious respiratory diseases, which is considerable different from other infectious diseases, natural or technological hazards. The outside threat of an infectious respiratory virus is difficult to control as it spreads with every-day human behavior. For example, when people try to protect themselves from sexually transmitted diseases they generally have control over the situation and know their sexual encounters. However, this is not the case in times of

an infectious respiratory disease (i.e. it is oftentimes impossible to know who transmits a virus by droplets). Health threats, other than infectious respiratory disease threats, are to a certain extent observable, voluntary, modifiable or controllable (Leppin & Aro, 2009) and therefore not entirely comparable to the threat of an infectious respiratory virus. As the transmission of an infectious respiratory disease is uncertain and invisible, it makes other humans an ambiguous source of threat. Other people's behavior is often seen as the source of threat rather than the own behavior (Liao et al., 2010.)

These specific situational constraints during an outbreak of an (unknown) infectious respiratory disease illustrate the necessity to include emotional components into the models to determine health-related behavior. TPB and PMT include fear as an emotional component, but in a way which indicates that cognitive risk assessment determines the perception of fear. This might be applicable when predicting behavior for some health threats, but it is questionable in an acute threat situation where the cognitive risk perception is strongly influenced by the absence of evidence-based information (Leppin & Aro, 2009). Therefore, emotional components of decision making, such as fear or disease worry, should be taken into theoretical consideration when addressing behavior related to infectious respiratory diseases.

The invisibility and uncertainty of an infectious respiratory disease outbreak also makes social factors more important to consider. TPB includes the influence of a "subjective norm", but it does not fully cover broader social influences. The observation of behavior from others makes individuals susceptible to the influence of social conformity to adopt behavior (Bandura, 1997; Liao et al., 2011). If health information from an official source is lacking, the observed behavior from others, lay knowledge and cautionary tales might determine behavior. Therefore, these two broader social determinants of behavior should also be incorporated into a health model about infectious respiratory diseases protection.

Recently, some researchers suggested accounting more thoroughly for the joint impact of social and affective influences when determining health-related behavior in response to an infectious respiratory disease threat (Liao et al., 2010; Liao, et al., 2011). In the following, their suggested social-cognitive model will be introduced and in the further scope of this thesis tested.

1.5 The social-cognitive model used in this study

So far, it was outlined that hand washing is determined by a variety of different social cognitive factors; that uncertainty during disease outbreaks increases the impact of information trustworthiness (on carrying out recommended behavior and to inform about the awareness of the situation) (Calman, 2002); and, that the difficult controllability of the virus transmission makes social and emotional factors important determinants of behavior.

As neither TPB, PMT, or HBM account precisely for the combined impact of social and affective influences, Liao et al. (2010) and Liao et al. (2011; based on Voeten et al., 2009) suggested a social-cognitive model which jointly accounts for both concepts. The model is based on the assumption that risk communication from formal sources (government, authorities, media) and informal sources (peers, affiliates, cautionary tales) influences different cognitive processes which create a certain “situational awareness” which then again produces personal hygiene practices (respiratory etiquette, hand washing with soap/disinfectant, using serving utensils) and social distancing (social avoidance). It is proposed in the model that the “situational awareness” variables (self-efficacy, knowledge about the disease, perceived effectiveness of hand washing, perceived risk and disease worry) are intervening variables between trust in information and health-protective behavior. The relation between trust in different sources of information and different “situational awareness” variables is a novel assumption from Liao et al. (2010) and Liao et al. (2009) based on theoretical reasoning as aforementioned. Furthermore, it is proposed that trust in informal information and perceived susceptibility capture social factors and disease worry emotional factors of health-protective behavior.

Most of the “situational awareness” variables in Liao et al. (2010) and Liao et al.’s (2011) model are incorporated elements from the above mentioned social cognition models. Setting their strict traditional definitions in context of the present study, the applied definitions could be as following: *Perceived effectiveness* (similar to “response efficacy”, “outcome expectancy” and “perceived benefits”) can be defined as the belief about the perceived positive and negative consequences of hand washing in response to the health threat of an infectious diseases and belief that hand washing

is effective in reducing the health threat (Becker, 1974). Perceived effectiveness is also similar to the broader “attitude towards behavior” construct from TPB, which is defined as the subjective probability that the behavior (hand washing) will produce a certain outcome (no infection with diseases). The effectiveness beliefs of hand washing are linked to personal outcome beliefs if one would wash their hands, which are assumed to enhance hand washing (Ajzen, 1991; Becker, 1974). *Perceived risk* (similar to “perceived susceptibility” and “perceived vulnerability”) can be defined as the individual’s perceived likelihood of contracting an infectious disease if he/she would continue carrying out the current hand washing behavior (Becker, 1974; Rogers, 1983). It is assumed that greater perceived risk leads to greater health threat which motivates people to decrease this dissonance through hand washing (Becker, 1974). *Disease worry* (similar to the concept of fear) can be defined as a chain of thoughts and images about an infectious disease, which are negatively-affect laden and not controllable (Borkovec, Robinson, Pruzinsky, & Dupree, 1983). Worry in an early phase of a disease outbreak can diminish concern at a later time, as different ways of coping with the worry reduces new upcoming worry (Goodwin, Gaines, Myers, & Neto, 2011). *Self-efficacy* can be defined as the individual’s optimistic belief in his/her ability to execute frequent hand washing to maintain good health and not infect with a disease in various situations (Bandura, 1997). Self-efficacy is an important and direct predictor of intention and behavior as the individual evaluates the control which he/she has over the behavior and environment (Bandura, 1997).

This social-cognitive model was tested twice. In the first study, Liao et al. (2010) included the following four concepts in the “situational awareness”: knowledge of the disease, self-efficacy, perceived susceptibility, and worry about contracting the disease. A test of the model with data from Hong Kong collected during the early phase of the A/H1N1 (“swine flu”) public health threat shows that trust in formal information was positively correlated with knowledge and self-efficacy, whereas trust in informal information was positively correlated with worry and negatively correlated with perceived susceptibility. Knowledge of the disease, self-efficacy, and worry were positively correlated to hand hygiene practices and self-efficacy and worry were positively correlated to social distancing. (Liao et al., 2010.)

In a second study, Liao et al. (2011) composed the “situational awareness” with the following concepts: knowledge of the disease, perceived effectiveness of the personal hygiene practices, perceived susceptibility, and worry about contracting the disease (Liao et al., 2011). It was assumed that greater trust in formal information was related to greater knowledge, greater perceived effectiveness, lower perceived susceptibility, and less worry. All “situational awareness” variables were assumed to have a positive association with personal hygiene practices. Furthermore, it was assumed that greater trust in informal information was related to less knowledge, lower perceived effectiveness, greater perceived susceptibility, and greater worry, which then was associated with uncertain personal hygiene practices. The model was tested by using two independent data sets from Hong Kong. One sample was collected during the peak of the A/H5N1 public health threat (“bird flu”) and another sample was collected three years later in the early phase of the A/H1N1 public health threat (“swine flu”). The results show that trust in formal information was positively associated with perceived effectiveness and worry in the A/H5N1 sample, and positively associated with knowledge and perceived effectiveness in the A/H1N1 sample. In the A/H5N1 sample, all “situational awareness” concepts, except perceived susceptibility, were positively associated with personal hygiene practices. In the A/H1N1 sample, knowledge and perceived effectiveness were positively associated with personal hygiene practices. The only positive association with trust in informal information in both datasets was to disease worry. (Liao et al. 2011.)

1.6 The present study

Liao et al.’s (2010) and Liao et al.’s (2011) social-cognitive model was designed to predict health behavior in an early stage of a disease outbreak. This thesis aims to find out whether the model predicts the influence of trust in information on health behavior in times of no current health threat in the same way as during a current health threat. Therefore, the associations between trust in authority-provided health information (meaning from formal, reliable sources such as public health authorities/ministries), social cognitive determinants of hand washing (self-efficacy, knowledge, perceived effectiveness, perceived risk, disease worry) and hand washing is analyzed in a

healthy Western study sample. To test these associations, the original social-cognitive model from Liao et al. (2011) and Liao et al. (2010) will be slightly modified in so far as it only includes trust in authority-provided health information and leaves out trust in informal information. Both, self-efficacy and perceived effectiveness will be included in the model, based on their significant results in Liao et al.'s (2010) and Liao et al.'s (2011) study. In addition, only hand washing will be analyzed as health-protective behavior, leaving out other personal hygiene practices and social distancing.

In the modified model it is hypothesized that (1) greater trust in authority-provided health information is associated with higher knowledge, higher self-efficacy, higher perceived effectiveness, lower perceived risk, and less disease worry; (2) Higher self-efficacy, higher knowledge, higher perceived effectiveness, higher perceived risk, and higher disease worry is associated with more hand washing. In addition, I want to explore (3) whether there is a direct effect of trust in authority-provided health information on hand washing, or if the relationship is mediated by the “situational awareness” variables self-efficacy, knowledge, perceived effectiveness, perceived risk and disease worry. See Figure 1 for a simplified graphical presentation of the hypothesized associations.

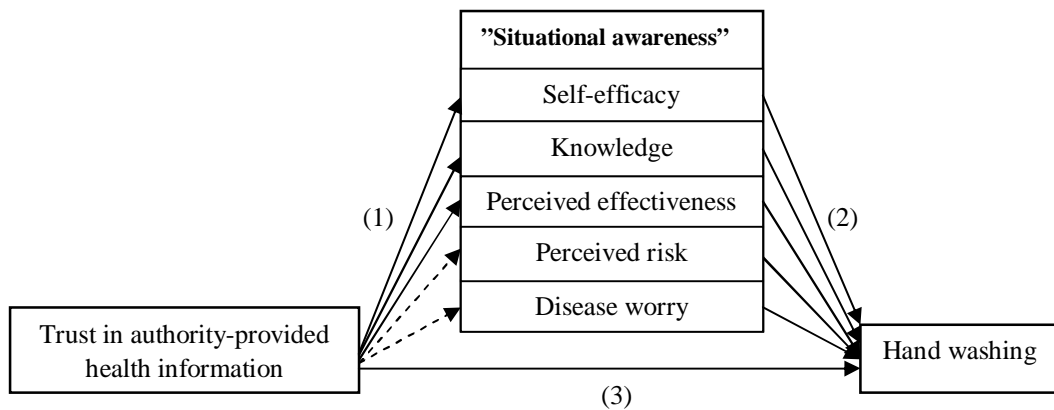


Figure 1. Hypothesized associations. Negative associations are noted in dashed lines.

2 METHOD

2.1 Source of data

The present study is based on data of a larger intervention trial conducted by the Finnish National Institute of Health and Welfare (THL) to promote hand washing in the Finnish army. Before the data collection, researcher from THL organized four focus groups with 29 conscripts and two group leaders in the Karjala brigade on August 2011 to support the development of a quantitative questionnaire. The thereupon developed questionnaire was mainly based on existing theories and scales, yet modified with specific military content using results from the focus groups. The research plan of the intervention trial was reviewed by the coordinating ethics committee of the Hospital District of Helsinki and Uusimaa. In September 2011, the data was collected in two battalion units in the Karjala brigade, using a paper-and-pencil questionnaire. In October 2011, a second version of the questionnaire with some minor modifications was distributed for another round of data collection. In November 2011, I got in contact with the THL researchers for the first time and permission was given to me to use the data for the purpose of this study. The focus groups and the questionnaires were fully anonymous and originally designed in Finnish.

In total, 141 male conscripts filled in the questionnaires, whereas I excluded one respondent from the analysis due to clearly incorrect responses, which decreased the total number of participants to $N = 140$. The average age of the respondents was 19.4 years ($SD = 0.80$), all respondents were male. 50.4% of the respondents reported having finished academic secondary school as their highest educational degree, 36.7% reported vocational school and 12.9% comprehensive school or as the highest educational degree. The majority of respondents were single (65.7%) and students (67.7%). Their self-reported health condition was good: 90% of the respondents answered being in excellent, very good or good health condition. 45.3% of the respondents never smoked cigarettes, 68.6% of the respondents did not use snuff and a large majority (94.3%) did not have asthma. The descriptive statistics of the main socio-demographic and health characteristics in the sample are given in a frequency table (see Table 1 in Appendix).

2.2 The variables

In the following, the process of developing the variables for this analysis and its descriptive statistics will be described. If applicable, exploratory principle component factor analysis was conducted to create multi-item variables. A full list of the main variables, the exact wording of the questions and the answer scales is available in Table 2 (see Appendix).

The variable assessing *trust in authority-provided health information* (short: trust in information) was measured directly. Respondents were asked to agree on a five-point ordinal scale ranging from “strongly disagree” to “strongly agree” to the statement “The health information given by the Finnish authorities is trustworthy”. Most of the respondents (44.6%) somewhat agreed with this statement, 19.4% strongly agreed with it. 28.1% of the respondents neither agreed nor disagreed with it. 3.6% (N = 5) somewhat disagreed with the statement and 4.3% (N = 6) strongly disagreed with it.

The respondent’s *self-efficacy* about their ability and certainty to follow the recommendations was measured by six items, addressing different situations in which the respondents were asked whether they are certain if they would wash their hands. On a four-point ordinal scale ranging from “certainly not” to “certainly yes”, the respondents were asked if they would be able to follow the recommendations for instance “even when I am in a hurry” or “when using part of my break for washing hands”. The reliability of the items was good ($\alpha = 0.78$) although one item (“when I am in the field practice or shooting gallery”) correlated weakly with the other five items. Furthermore, the same item had the lowest factor loading (0.44) on a single factor, which was extracted using factor analysis with varimax rotations. I decided to exclude this item (which incorporates military constrains, as the question was about specific behavior during field practice or shooting gallery) due to the low communalities. The exclusion of the item increased the overall reliability of the remaining items ($\alpha = 0.80$) and increased the lowest factor loadings on the single extracted factor to 0.66. The KMO decreased slightly (from 0.76 to 0.74) but the Bartlett’s test remained significant ($p < .001$). The mean perceived self-efficacy was 2.67 (SD 0.62) and the mode was 3 (“Probably yes”) with 17.9%.

The respondent's *knowledge* related to virus spreading was assessed by a single item. The respondents were asked to agree on a five-point ordinal scale ranging from “strongly disagree” to “strongly agree” to the statement “Flu or stomach diseases are rarely spread through hand contact”. Most of the respondents (41.4%) strongly agreed with this statement, 30.7% somewhat agreed, 20.7% neither agreed nor disagreed. 5.7% (N = 8) somewhat disagreed with this statement and 1.4% (N = 2) strongly disagreed. The item was reverse scored for the following analysis so that high scores reflect a correct answer (in this case high knowledge).

The respondent's *perceived effectiveness* about hand washing with regard to preventing an illness was measured after the respondents read through the WHO's recommendations about hand washing frequency. The respondents were asked then to rate three items on a seven-point scale ranging from “likely” to “unlikely” about their belief in consequences if they would follow the hand washing recommendations. In detail, it was asked “If I follow the hand washing recommendations, I believe that as a consequence... I reduce my risk of catching a flu or stomach disease”; “...I reduce the risk of my roommates catching a flu or stomach disease” and “... I remain in better health”. The reliability of the three perceived effectiveness items was high ($\alpha = 0.91$). As the items were suitable for factor analysis (KMO = .71 and according to Bartlett's Test $p < .0001$), factor analysis generated one perceived effectiveness factor on which all three items were loading with factor loading exceeding 0.87. The items were reverse scored for the analysis, so that high scores reflect high perceived effectiveness. The mean perceived effectiveness was 5.88 (SD 1.22) and the mode (18.6%) was 6.

The *perceived risk* of getting an infectious disease (flu or stomach disease) was assessed with a single relative question. On the statement “The likelihood I get ill is...” 16.5% of the respondents answered “much lower than average”, 23.7% “a bit lower than average”, 44.6% “average”, 12.2% “a bit higher than average” and 2.9% “much higher than average”, whereas the comparison group were the other peer conscripts.

Individual *disease worry* was measured with two direct items (“Right now, I am not afraid of getting a flu/stomach disease” and “The thought of getting a flu/stomach disease feels unpleasant”) whereas the first item was reverse scored for the proceeding analysis, so that high scores on both items reflect high worry. The respondents were

asked to evaluate both statements on a five-point ordinal scale ranging from “strongly disagree” to “strongly agree”. The reliability of the disease worry construct is rather small ($\alpha = 0.52$) and the correlation between both items is poor ($r = 0.35, p < .001$) but significant. However, as both items are marginally suitable for factor analysis (KMO = .50, Bartlett’s test $p < 0.001$) one factor with factor loading exceeding 0.82 was extracted when conducting factor analysis with both items. The mean disease worry was 3.29 (SD 1.03) and the mode 3 (“Neither disagree nor agree”) with 23.6%.

The respondent’s *hand washing* performance was assessed by 15 items which include general situations and those relevant in military settings in which one should wash one’s hands (according to the WHO recommendations). On a five-point ordinal frequency scale from “never”, “rarely”, “every second time”, and “almost every time” to “every time”, the respondents were asked to state when they wash their hands, for instance “before eating in the barracks” or “when my hands stink”. The overall reliability of the items was high ($\alpha = 0.84$). Although all items measure the same construct, some correlations between the items were negative and many were nonsignificant. However, factor analysis is suitable (KMO = .79, according to Bartlett’s test $p < .001$) and a factor analysis with varimax rotation extracted four factors with factor loadings above 0.48. A temporary exclusion of three low correlating items (“I wash my hands when I have been in the WC in the barracks”, “I wash my hands when I have relieved myself in field practice” and “I wash my hands when eating in field practice”) neither changed vastly the total reliability ($\alpha = 0.85$) nor the lowest factor loading (0.42), which is why the items were not excluded but kept in the analysis. As all items theoretically measure the same construct, a single factor was demanded from the factor analysis, which resulted in low factor loading (0.28).

Due to the fact that the above mentioned items measure mostly the situations in which the respondents wash their hands, but not the total hand washing frequency, I decided to add up the sum variable, measuring the situations of hand washing, with the hand washing frequency per day. For this latter item, respondents were asked how many times a day they typically wash their hands with either water and soap or hand disinfectant on a five-point frequency scale ranging from “0-2 times per day” to “10 times and more per day”. Taking into account that the respondents may not be able to

recall how many times per day they actually wash their hands, I added a self-evaluation about the current hand washing behavior and to which degree the WHO recommendations are followed. This self-evaluation of hand washing was measured with one item (“I follow the recommendations myself”) on a five-point agreement scale ranging from “strongly disagree” to “strongly agree”.

A factor analysis (KMO = .60, Bartlett’s test $p < .001$) with varimax rotation showed that all items used for the hand washing variable (situations, frequency, self-evaluation) are loading on one factor with the lowest factor loading 0.64. The variable was almost normally distributed ($M = 2.70$, $SD = 0.59$, skewness $-.09$, kurtosis $-.76$) and the hand washing mean was 2.70 (SD 0.59).

According to the test of normality concerning skewness and kurtosis, all developed variables are normally or close to normally distributed.

2.3 Statistical methods

At first, a one-way independent analysis of variance (ANOVA) was conducted to examine significant mean differences in trust in information and hand washing according to both, relevant socio-demographic and health characteristics.

For the test of the first and the second hypothesis, Pearson’s bivariate correlations coefficients were analyzed which were given for the intercorrelations between the variables. A respective correlation matrix includes all major variables with p -value, which indicate a positive or negative significant linear association. As this test only includes bivariate correlations, the simultaneous effect of other variables cannot be controlled for. When testing the first hypothesis, the correlation coefficients between trust in information and the “situational awareness” variables (self-efficacy, knowledge, perceived effectiveness, perceived risk and disease worry) were analyzed. For the test of the second hypothesis, the correlation coefficients between the “situational awareness” variables and hand washing variables were analyzed. Age and self-reported health were entered into the correlation matrix as well to explore potential associations.

To test the third hypothesis, a multiple hierarchical regression analysis was conducted to explore whether trust in information has a direct effect on hand washing or whether it is mediated by the “situational awareness” variables. The method of entering variables in a hierarchical order was chosen for theoretical considerations and based on previous findings. For this test, trust in information is the independent variable, hand washing the dependent variable and the “situational awareness” variables serve as mediating variables (although not strictly speaking, as no statistically required Sobel test was conducted). The standardized regression coefficients of trust in information in a first model, and of trust in information and the “situational awareness” variables in a second model, serve as predictors of how strongly each variable influences hand washing. An adjusted R squared, which takes the number of variables and number of observation into account, is used to indicate the proportion of variance in hand washing which is accounted for by each model.

All reported standardized parameters in the subsequent statistical analysis with p -values equal or less than .05 were considered to be statistically significant. The data was processed and analyzed with SPSS version 15.0 (SPSS Inc., Chicago IL).

3 RESULTS

The results of the ANOVA (Table 2) show that there is a significant effect of education on trust in information. The educational groups differ in terms of trust in information in a way that respondents with comprehensive school education have the lowest trust in information followed by respondents with vocational school education. Respondents with secondary school education have the highest trust. Results from post hoc tests show that the mean differences between comprehensive school and secondary school are significant ($p < .05$ according to the Hochberg test and Games-Howell test). The effect size of the difference in the mean is, however, low ($r = 0.22$). No other significant mean differences between the variables were found.

Table 2. Mean differences according to socio-demographic and health characteristic (ANOVA).

	Trust in information (N=139) Mean 3.71 SD 0.96			Hand washing (N=138) Mean 2.70 SD 0.59		
	N	Mean (SD)	p	N	Mean (SD)	p
<i>Highest educational degree</i>		3.7 (0.96)	.02		2.7 (0.59)	.96
Comprehensive School	18	3.2 (0.99)		17	2.7 (0.52)	
Vocational School	51	3.7 (1.03)		50	2.7 (0.62)	
Secondary School	69	3.9 (0.86)		70	2.7 (0.60)	
<i>Marital status</i>		3.7 (0.96)	.48		2.7 (0.59)	.17
Cohabiting or steady relationship	48	3.8 (1.01)		46	2.8 (0.66)	
Single	91	3.7 (0.94)		92	2.7 (0.56)	
<i>Working status before army</i>		3.7 (0.97)	.46^a		2.7 (0.60)	.21
Employed	30	3.5 (1.22)		30	2.8 (0.55)	
Unemployed or out of working life	14	3.6 (1.08)		13	2.4 (0.48)	
Student	92	3.8 (0.86)		91	2.7 (0.62)	
<i>Smoking</i>		3.7 (0.96)	.40		2.7 (0.59)	.62
Never or quit	64	3.8 (0.90)		63	2.7 (0.66)	
Occasionally	17	3.8 (0.88)		18	2.5 (0.62)	
1-10 cigarettes/day	24	3.8 (0.99)		23	2.8 (0.50)	
>10 cigarettes/day	33	3.5 (1.09)		33	2.7 (0.47)	

^a Levene’s test indicated unequal variances, that is why the significance of Welch’s *F*-ratio is reported here (degrees of freedom for the residuals of the model are adjusted from 133 to 28).

Table 3 shows the correlation coefficients, which are used for testing the first and second hypothesis. In regard of the first hypothesis, the results show that those who trust in information have higher self-efficacy, higher knowledge, higher perceived effectiveness and less perceived risk. In regard of the second hypothesis, the results indicate that those who have high self-efficacy and high disease worry carry out greater *total* hand washing. Furthermore, correlation coefficients indicate that those who trust in information have greater *total* hand washing. As these results are of bivariate nature, they do not control for the simultaneous effect of any other variables.

The correlation matrix also gives background information about how the “situational awareness” variables are correlated: those with disease related knowledge also have a higher perceived effectiveness of hand washing and higher disease worry. Those with disease worry have higher perceived effectiveness of hand washing and higher perceived risk. And those being self-efficacious have a higher perceived effectiveness of hand washing. Self-reported health was associated to higher perceived risk.

Besides the *total* hand washing variable, its three components (hand washing *frequency*, hand washing *situations*, and hand washing *behavior self-evaluation*) were also included into the correlation matrix, to examine potential associations.

All four hand washing variables are highly correlated ($p < .001$), except for the correlations between hand washing *frequency* and both hand washing *situations* and hand washing *self-evaluation* ($p < .01$).

The correlation coefficients show that there is no significant association between hand washing *frequency* and trust in information, whereas the other three hand washing variables are positively related to trust in information. There is a less significant association between hand washing *frequency* and self-efficacy ($p < .05$), compared to the significance level of the association between self-efficacy and the other three hand washing variables ($p < .001$). Out of all four hand washing variables, only hand washing *situations* is positively associated with perceived effectiveness and only the *total* hand washing variable is positively associated with disease worry. No significant associations were found between any of the four hand washing variables and knowledge or perceived risk.

Table 3. Correlation matrix of major variables.

Variable	1	2	3	4	5	6	7	7a	7b	7c	8	9	10
1 Trust in information	1												
2 Knowledge	.25**	1											
3 Perceived effectiveness	.19*	.27**	1										
4 Perceived risk	-.18*	.04	.07	1									
5 Disease worry	.02	.22**	.25**	.19*	1								
6 Self-efficacy	.32***	.09	.18*	-.12	-.04	1							
7 Hand washing <i>total</i>	.35***	.04	.16	.01	.19*	.46***	1						
7a Hand washing <i>frequency</i>	.05	.05	.10	-.02	.10	.21*	.61***	1					
7b Hand washing <i>situations</i>	.37***	.08	.17*	-.12	.17	.45***	.71***	.27**	1				
7c Hand washing <i>evaluation</i>	.33***	.00	.12	.10	.16	.35***	.85***	.23**	.40***	1			
8 Age	.03	.09	-.09	.09	-.07	.04	-.07	-.10	.07	-.09	1		
9 Education	.22*	.11	.02	-.04	.05	-.02	-.01	.08	-.07	-.01	-.19*	1	
10 Self-reported health	-.10	-.02	.09	.45***	.11	-.09	.06	-.01	.05	.06	.05	-.04	1
Min – Max	1 - 5	1 - 5	1 - 7	1 - 5	1 - 5	1 - 4	1.5 - 4.1	1 - 4.5	1.3 - 4.4	1 - 5	18 - 22	1 - 3	1 - 5
Mean	3.71	4.05	5.88	2.61	3.29	2.67	2.90	2.01	2.90	3.21	19.44	2.37	2.26
(SD)	(0.96)	(0.99)	(1.22)	(0.10)	(1.03)	(0.62)	(0.62)	(0.67)	(0.62)	(1.10)	(0.80)	(0.70)	(0.95)

*** $p < .001$; ** $p < .01$; * $p < .05$. Missing pairwise. Two-tailed test.

Table 4 shows the results of a multiple hierarchical regression analysis to see the independent effect of trust in information on hand washing and to explore a potential mediating effect of the “situational awareness” variables. As trust in information differs according to the educational level of the respondents, the regression analysis is conducted under the control of education.

Table 4. Regression analysis predicting hand washing, controlling for education.

Variables	<u>Model 1^a</u>				<u>Model 2^a</u>		
	<i>r</i>	β	B (SE)	<i>p</i>	β	B (SE)	<i>p</i>
Trust in information	.35***	.37	0.23 (0.05)	.00	.27	0.17 (0.05)	.00
Self-efficacy	.46***				.39	0.37 (0.08)	.00
Disease worry	.19*				.19	0.11 (0.05)	.02
Knowledge	.04				-.10	-0.06 (0.05)	.21
Perceived effectiveness	.16				.02	0.01 (0.04)	.84
Perceived risk	.01				.06	0.04 (0.05)	.42
<i>R</i> ²			.13***			.31***	
<i>R</i> ² <i>adj.</i>			.12***			.27***	

****p*<.001; ***p*<.01; **p*<.05. Missing listwise.

^a Education is included in the model.

The results show that the higher trust in information, the more hand washing regardless of the respondents’ educational background. This regression model (Model 1), which predicts hand washing through trust in information, accounts for 12% of variance in hand washing.

In Model 2, the influence of the “situation awareness” variables on hand washing is displayed, under control of education and trust in information. The results suggest that the more self-efficacious the respondents are about hand washing, the better their hand washing. And the more disease worry they have, the better their hand washing.

No mediation effect of the “situational awareness” variables on the association between trust in information and hand washing was found. The association between trust in information and hand washing remains significant when self-efficacy, disease worry, knowledge, perceived effectiveness and perceived risk were added into the

model. The relative impact of trust in information decreases a little in Model 2, compared to Model 1, but the high significance level stays the same. The final model (Model 2) accounts for 27% of variance in hand washing. The adjusted R squared increases from 12% in Model 1 to 27% in Model 2, indicating that the increase in the explanatory power of the model does not merely originate from the greater number of variables, but from their explanatory power.

4 DISCUSSION

4.1 Summary of the results

This study investigated the associations between trust in authority-provided health information, self-efficacy, disease worry, knowledge, perceived effectiveness, perceived risk and hand washing using cross-sectional data from young Finnish men.

The first hypothesis received partial support: Trust in authority-provided health information is significantly associated with higher self-efficacy, higher knowledge, higher perceived effectiveness and less perceived risk. The lack of a significant association between trust in information and disease worry is unsurprising. In the initial studies, trust in formal information was only once (in the A/H5N1 data) related to disease worry, but unrelated to it in the other tests with A/H1N1 data. The reason for the inconsistent results is most likely the different public perception of both influenzas, as A/H1N1 was perceived as a rather non-threatening event in Hong Kong. Thus, the formal risk communication about the health threat did not trigger much disease worry. Respectively, the risk communication in Finland about the flu or stomach disease is probably not emphasizing it as a threatening event, although the disease worry is rather high ($M = 3.29$). Trust in informal information, however, was related to disease worry in both data sets, which confirms the assumption that during a stage of high uncertainty, people also consult informal sources of information which usually increase disease worry. (Liao et al., 2010; Liao et al., 2011.) As trust in informal information was not included in the scope of this study, disease worry remained unrelated to trust in information.

The second hypothesis received partial support: higher self-efficacy and higher disease worry are significantly associated with more hand washing. No significant associations were found between knowledge, perceived effectiveness, perceived risk and hand washing, which is surprising. The mean knowledge about hand washing is high ($M = 4.05$), but it might not have a high validity as it is measured by a single item. Nevertheless, merely knowledge about the importance to carry out a certain health-protective behavior is seldom a significant predictor of health behavior (Kiviniemi & Rothman, 2010). The fact that perceived effectiveness has no significant effect on hand washing is interesting as perceived effectiveness is highly correlated with self-efficacy and disease worry, which both have a significant effect on hand washing. The nonsignificance of perceived effectiveness, knowledge and perceived risk on hand washing indicate that behavioral decisions are not always made based on rational reasoning. It would be reasonable to assume that people wash their hands more often if they believe in the effectiveness of it to protect from infectious diseases; or if they believe that they are at risk of getting sick and they know about the health threat that evolves from not washing hands frequently. However, as already outlined in Chapter 1.4, behavior is not entirely cognitively motivated. The nonsignificant association between perceived risk and hand washing could also be attributed to the illusion of unique invulnerability (Perloff, 1987). This phenomenon describes the false belief that negative events (in this example, catching a flu or stomach disease) only happen to other people.

The results of a hierarchical regression analysis respond to the third exploratory hypothesis: trust in authority-provided health information does have a direct, independent effect on hand washing. No mediation effect was found from the “situational awareness” variables on the association between trust in information and hand washing. That means, the five “situational awareness” variables do not play a significant role in explaining the relationship between trust in information and hand washing. Hence, there is no evidence for the assumption that trust in information is mediated by the “situational awareness” variables to explain the variance of hand washing. One possible way to explain this principal finding is to take a cognitive response approach (Greenwald, 1986), according to which persuasive communication activates topic-related experiences, memories, feelings and thoughts also beyond the

communication itself. In this case it would be former experiences of authorities communicating a health risk or memories on authority-provided health information. Chaiken et al. (1989) propose that reliance on heuristics to process information are far more common than we think. In the context of this study, it would mean that in Finland a heuristic, such as “authority-provided information can be trusted” would exist and that health information from authorities are mainly processed by the peripheral route. This means, a heuristic, based on previous positive experiences, feelings or thoughts with authority-provided risk communication would be activated. This approach would explain the fact that 84% of the Finns completely or mostly trusted health authorities about information on “swine flu”. A higher level of trust existed only in three other Nordic welfare states, namely Iceland (91%), Denmark (87%) and Norway (85%), whereas the European average was at 62% (European Commission, 2010). According to these results, the heuristics “information from health authorities are trustworthy” seem to apply to most Nordic welfare states and can probably be attributed to their health care systems. Furthermore, the results suggest that the cultural background is an important indicator for trust in health authorities and that Finland is a country with an overall high level of trust ($M = 3.71$).

4.2 Comparison to other studies

Not many studies have yet investigated the associations between trust in authority-provided health information and social cognitive determinants of health-protective behavior. However, Rubin, Potts, and Michie (2010) conducted a study in the UK with similar results to the one in the present study. They found that trust in risk communication during the “swine flu” was associated with increased knowledge, increased perceived effectiveness of health-protective measures and decreased disease worry (Rubin et al., 2010).

As for the second hypothesis, plenty of studies investigated social cognitive determinants of health-protective behavior in general or hand washing in particular. The effect of *self-efficacy* on various health-protective behaviors during the SARS threat was also found by a study from Tang and Wong (2005) among older people in Hong Kong. Similar to the results of the present study, Brug, Aro, Oenema, de Zwart,

Richardus, and Bishop (2004) found no association between *knowledge* of SARS and health protective behavior. Tang and Wong (2005) found that neither *knowledge* nor beliefs about the *effectiveness* of protective behavior were a significant predictor of health-protective behavior. The reason for this result might be the lack of public knowledge about SARS at that time and the uncertainty whether protective behavior was effective in protection against it (Tang & Wong, 2005). However, a variety of studies have found significant associations between *perceived effectiveness* of health-protective behavior and the actual health behavior (see for example Leppin & Aro, 2009; Vaughan, 2011). Rubin et al. (2009) found that people in Hong Kong were more likely to comply with health related recommendations during SARS if they believed that the recommended behavior was effective. Similar to the results of this study, *perceived risk* was also unrelated to hand washing in the studies from Liao et al. (2010) and Liao et al. (2011) with a potential explanation for that finding missing. In contrast, Rubin et al. (2009) and Tang and Wong (2005) found an association between perceived risk and health-related behavior. *Worry* about becoming a victim of the “swine flu” (as a combination of personal worry and worry about family members) was correlated with preparatory behavior (buying protection items, less frequent use of public transportation and cancelling or delaying travel plans) in a online study with mostly European participants (Goodwin et al., 2011).

As for the third hypothesis: the result that trust in information has a direct effect on hand washing is similar to findings in Tang and Wong’s (2005) study. Although they did not test for a mediating effect, they found a positive association between perceived efficacy of health authorities to manage the disease and preventive behavior. Respondents with higher trust in local health authorities’ ability to control the spread of the virus were also more likely to practice preventive behavior (Tang & Wong, 2005). On the other hand, only public opinion about the authorities’ openness to communicate was associated with health protective measures in a similar study (Quah & Hin-Peng, 2004). Rubin et al. (2009) found that during the “swine flu” in the UK, recommended change in health-protective behavior was associated with the perception that the authorities can be trusted.

A study from Finland by Vartti, Aro, Jormanainen, Henriksson, and Nikkari (2010) found that Finnish conscripts have a lower level of trust in authorities compared to

the level of trust in general Finnish population-based studies. The less favorable opinion about authorities in young age is a possible explanation for this finding. Whether a similar kind of cohort effect also underlies the results in the present study remains unknown, however, the mean trust is rather high ($M = 3.71$). Similar to the findings in this study, Vartti et al. (2010.) also found that Finns with higher education, regardless of their age, have greater trust in authorities.

Two important remarks should be considered, when comparing the results to other empirical studies. First of all, behavior of people is generally limited to contextual and situational circumstances. This is why the situational constraints in a military setting might be uncontrolled influential factors to hand washing in this study. In an environment of constant demanded order and obedience, the conscripts might not be (or might not think they are) equally free to determine their behavior, even if it is as ordinary and habitual as hand washing. In addition, the onset of a potential “health authorities’ information can be trusted” heuristic can also be influenced by the military setting, as in this environment generally demands a certain level of trust in authorities. When carefully interpreting the results of the present study from a social psychological perspective, one should be aware of the cognitive bias and the underestimation of external situational factors as determinants of behavior.

The second remark is about the cultural setting in which the data is collected. There are certainly differences between Asian and Western (European and North-American) countries. So far, the major health threat from infectious respiratory diseases was located in Asian countries, which is why a large part of studies was conducted there. The evolving research interest in western countries is mostly based on theoretical potential health threats and the future possibility of a severe virus outbreak. As this is hypothetically true, it is yet unlikely to assume people’s reactions to it are universally comparable. Leppin and Aro (2009), for example, notice that the social context of risk perception is different throughout countries and that the “social risk perception” is probably stronger in collectivist societies in Asia, than in more individualistic Western countries. It is also probable that people in countries with stricter social order or a lower democracy level behave a priori more compliant on what is said by authorities. This is why theories and models which describe the behavior of people in

one part of the world are not necessarily comparable and applicable to the behavior of people in other cultures.

A study from de Zwart, Veldhuijzen, Elam, Aro, Abraham, Bishop, Richardus, and Brug (2007), for example, shows that response efficacy and self-efficacy were higher in Asian populations than in European during the “bird flu”, whereas perceived seriousness, perceived vulnerability and risk perception was higher in European countries. People from Denmark, the only Nordic welfare state participating in this study, reported the lowest perceived vulnerability and lowest risk perception of all European countries participating (Poland, UK, The Netherlands, Spain) and even lower than the means of the Asian countries (de Zwart et al., 2007). This result might be another confirmation of a health-beneficial positive heuristic about risk perception in reaction to diseases in Nordic Welfare states.

Furthermore, a study comparing Finnish people to Dutch people found that (although both countries were not affected by SARS) people in Finland had higher level of trust in health officials, more knowledge and more worry compared to people in the Netherlands. The results are attributed to the centralized public communication about the outbreak. In Finland, one designated spokesman handled the communication, whereas in the Netherlands several people did (for a further explanation of the Scandinavian way of risk perception see for instance Mullet, Lazreg, Candela, & Neto, 2005). (Vartti et al., 2009.) These results are important to keep in mind as the understanding of cultural differences in practices and beliefs are especially important when designing a successful risk and communication strategy (Abraham, 2009).

4.3 Limitations, Reliability, Validity

The study has some limitations, which might restrict its generalizability. First of all, it is based on cross-sectional data which is why the causal direction of the significant associations remains unknown. However, according to Bandura (1986), human behavior is a triadic reciprocity with mutual influence of personal factors (cognitive, affective and biological nature), environmental factors and behavior which are inseparable entwined. Thus, the results from the first hypothesis could be bi-

directional interpreted, as trust in information influences the “situational awareness” variables but the values of the “situational awareness” variables also have an impact on the level of trust in information. For example, higher knowledge could lead to higher trust in information as one can confirm the rightness of the information and thus trust them more. The same applies for the results of the second hypothesis: it is demonstrated that some “situational awareness” variables influence hand washing, but it is also likely to assume that frequent hand washing has an effect on certain “situational awareness” variables. For instance, increased hand washing could enhance the effectiveness beliefs in regard of cleaning hands from pathogens and therefore more hand washing is practiced.

Secondly, the study is a secondary analysis, as the data was originally designed and collected for other purposes. The measurement and operationalization of certain variables, especially those measures with a single item, is therefore suboptimal. Trust in information might be a multi-item construct (or at least a multi-item construct could capture more thoroughly the implicit and explicit characteristics of trust), but in the present questionnaire it is measured directly with one item only. Knowledge is also measured by one item, although the entire spectrum of disease and virus spread related knowledge is much broader than can be assessed by a single question. Additional knowledge questions could address, for example, different ways of virus transmission and protection against it (respiratory etiquette), facts about vaccination and hand washing, and facts about the severity of respiratory infectious diseases or stomach flu.

Ideally, all concepts measured by a single item should be addressed by multi-item measures to better grasp the entire scope of the concept and receive higher reliability and validity. However, due to space constraints, many questionnaire-based studies have to use shorter, thus less optimal, measures of potential multi-item constructs (see for example Liao et al., 2010; Liao et al., 2011; Tang & Wong, 2005). Comparisons of single-item and multiple-item measures show that no method is empirically better in general and that no difference of both scales in terms of common method variance was found (Gardner, Cummings, Dunham, & Pierce, 1998).

Perceived risk was measured only by a relative item (risk in comparison to the peer conscripts). No item assessed perceived absolute risk or the value component of risk. Leppin and Aro (2009) notify that in current empirical influenza research the operationalization of risk perception is oftentimes improvable, as it seldom covers three dimension of risk (cognitive, emotional and value component) or it measures risk with a single item (see for example Kristiansen, Halvorsen, & Gyrð-Hansen, 2007; Quah & Hin-Peng, 2004). Nevertheless, the use of a relative risk item in this study entails at least a social component of risk, at it implies social comparison in terms of perceived risk in comparison to the peer conscripts.

The measurement of the affective component of disease worry is also suboptimal. In this study, disease worry was simply cognitively measured by asking whether thoughts about the flu feel unpleasant, which is not sufficient for an affective predictor of behavior. Also, using a single item variable is not ideal to fully cover the emotional response to the disease (Goodwin et al. 2011), but it is done sometimes due to space constraints (Leppin & Aro, 2009).

The fact that hand washing was only accessed through self-reported data can also bias the results. Problems like socially desirable answers and trouble of correctly estimating current behavior can occur, which makes the data less accurate. Direct observation of the actual behavior would be a good additional method of data collection, although it is practically almost impossible to get observational behavior data and self-reported data on social cognitive factors from the same participants. Studies under experimental conditions would be another, complementary method of data collection, although it does not reflect natural hand washing behavior and it would answer different research questions. Nevertheless, also Liao et al. (2010), Liao et al. (2011), Tang and Wong (2005), De Wandel et al. (2010) used self-reported hand washing data and that is sometimes all that is possible. The fact that in this study the self-reported hand washing variable was quite comprehensively operationalized should invalidate most concerns about the variable's reliability and validity.

And finally, the present study uses a different statistical method to test the hypothesis than Liao et al. (2010) and Liao et al. (2011), who use Structural Equation Modeling (SEM) to test the hypothesis. The statistical methods in this study used for testing the

first two hypotheses are correlations, which only indicate bivariate associations without simultaneously controlling for other variables. Regression analysis, which was used for the third hypothesis, does that partially and similar to SEM. The regression analysis conducted in this study is based on the assumption that the ordinal measurement scale of the variables can be interpreted as coded on a metric scale. Strictly speaking, this is a violation of the measurement scale and the regression assumption. The results can be biased as the distances between the different answer categories are not metric, thus easily comparable. However, this procedure is oftentimes done in applied social psychological studies.

Besides the limitations, the study also has its strengths. The response rate was 100% which is obviously a merit. However, the environment of filling in the questionnaire could have given the impression that the participation in the study was mandatory (because the unit leaders were present) which could have lead to social desirable answers and biased results. But in fact the survey was fully anonymous, participation voluntary and the respondents were secured their privacy, as no one could see or glance over their answers at the point of filling in the questionnaire.

The operationalization and use of multi-item variables (whenever possible) with high reliability of scales, and especially the elaboration of a multi-item, comprehensive hand washing construct is another strength of this study. Contrary to other studies, hand washing was not measured by a single item, but it was constructed out of three different components: hand washing situations, hand washing frequency and the evaluation of the current hand washing behavior. This is a more reliable measure of behavior, as it accounts for various determinants of hand washing simultaneously. Moreover, the comprehensive hand washing variable was the most significant of all.

The addition of the components is an unusual procedure, as one would rather expect a multiplication of the components. However, a variable which multiplied the three hand washing components was found to be highly correlated ($r = .95, p < .001$) with the “added hand washing” variable. It showed only very slight differences in the correlation coefficients, yet no differences in any significance level. In the regression analysis, the non-normally distributed “multiplied hand washing” variable showed higher unstandardized coefficients and standard errors, a slightly changed beta and a

decreased adjusted R squared, but no changes in the significance level. Finally, after extensive testing of both, the “multiplied hand washing” and the “added hand washing”, I decided conducting the analysis in this study with the “added hand washing” variable because it is normally distributed, in addition to being highly correlated with the “multiplied hand washing” variable.

The explained variance of health-protective behavior in the present model is different, yet higher, from that in the original model. Liao et al.’s (2010) first model explains 11.3% of variance in hand washing. The later model explains 17.1% of variance in hand washing in the A/H1N1 dataset and 21.8% in the A/H5N1 dataset (Liao et al. 2011). The social-cognitive model used in the present study explains 27% of the variance in hand washing. The reasons for the differences in the explanatory power of the models are probably either sample differences or the different choice of methods.

Although the present study has limitations which are important to consider, the modification of the model (including self-efficacy and perceived effectiveness) and its high explanatory power, the construct validity of the social cognitive variables and the elaborated, comprehensive hand washing variable make this research significant and allow meaningful conclusions about the results in regard of planning programs of health behavior change (see Chapter 4.5).

4.4 Implications for theory and research

The results of the present study question the social-cognitive model from Liao et al. (2010) and Liao et al. (2011). Their model provides a strong foundation to test the associations between trust in information, variables forming the “situational awareness” and hand washing. However, empirically tested in healthy western population it does not bring the same results, as within the initial Hong Kong study sample. The main reason for this difference might be the absence of a current health threat at the time of data collection or prior to it in the Finnish army. The influence of the geographic proximity or emergence of a health threat should be considered when studying the association between trust in information and hand washing, as there are differences in the “situational awareness” variables (especially in disease worry) depending on whether the perceived health threat is real or not (Liao et al., 2011).

Another explanation is that the situational constraints caused by the current health threat during times of the data collection in Hong Kong did play a bigger role than it is accounted for. Health-related behavior is probably influenced by different factors, depending on whether a current public health threat exists or not. This could also be a possible explanation for the differences in the explanatory power of the models.

The shortcomings of the model itself should also be considered in future research. Firstly, although it claims to be a social-cognitive model, perceived (absolute and relative) risk is not a concept addressing social aspects of decision making or social influence on behavior as claimed by Liao et al. (2010). Certainly, perceived risk, in terms of spreading an infectious respiratory disease virus, is essentially different from the perceived risk of other diseases, as it includes a “social aspect” as potentially everyone can “anonymously” transmit a virus by air droplets. However, it does not fully cover social psychological aspects of implied or imagined social influence, which reflects the way people affect behavior and thoughts of others. As various cognitive and emotional processes are involved in risk perception, they should be all accounted for when measuring risk perception (Leppin & Aro, 2009).

Kiviniemi and Rothman (2010) emphasize three different ways of how other people influence health behavior: (1) through social norms, which are the individual’s belief about how other people evaluate a behavior; (2) through social comparison, which has major implications for understanding how individuals think about their *absolute* health risk and *comparative* health risk; (3) and through the experience of prejudice and discrimination, which leads to negative health effects. In the initial model, Liao et al. (2010) and Liao et al. (2011) proposed to address social influence through the concept of trust in informal information. This might be insufficient, because even in the hypothetical case of the absence of informal information, the individual’s behavior would still be influenced by social comparison or social pressure. Moreover, the behavior of those people who do not trust informal information in general (for example people with high need for cognition) would still be influenced by social norms. One way to account for social influence is to include a concept such as “perceived social pressure”, as it is done in the Integrated Social Cognition Model (Fishbein, Triandis, Kanfer, Becker, Middlestadt, & Eichler, 2001). In this “major theorist” model, it is assumed that the social (normative) pressure to carry out a

behavior is greater than that not to perform the behavior. A modification of the present social-cognitive model in terms of including such a social determinant into the “situational awareness” variables would benefit the model and add to its validity and the overall reliability.

Secondly, the results of this study show that both self-efficacy and perceived effectiveness should be included in the “situational awareness” variables. Both variables are correlated to trust in information and self-efficacy is additionally correlated to hand washing. Self-efficacy serves as a potential (in this case the only) mediating variable in the association between trust in information and hand washing. Based on these results, I suggest to include both, self-efficacy and perceived effectiveness, into the “situational awareness” variables in Liao et al.’s (2010) and Liao et al.’s (2011) model.

And finally, the results of the present study strongly suggest to carefully operationalize the construct measuring hand washing behavior. Obviously, there are significant differences in whether hand washing is measured through frequency questions, through behavioral self-evaluation, with regard to the situations in which the hands should be washed or if it is a combined variable containing hand washing frequency, situations and behavioral self-evaluation. The simple use of a hand washing frequency variable, for example, had peculiar correlations compared to the other variables: It was unrelated to trust in information and had a considerable lower significance level on the correlation with self-efficacy. Thus, mere frequency of carrying out a behavior does not say much about the control people think they have about it. This outcome was surprising and should be kept in mind when interpreting results from studies which used a single self-reported hand washing frequency variable. More research should be done to explain how different hand washing behavior inter-correlate and how it is associated with other variables.

Hand washing is a frequent behavior in a stable context of everyday life. Therefore, Norman and Conner (2005) suggest that the impact of past behavior reflects the operation of habitual response, which does not need mediation through behavioral intention. This means, the past hand washing behavior has a direct effect on future behavior, as it is a habitual response to the same context. The behavior is performed

automatically with little conscious awareness to the stimuli. (Norman & Conner, 2005.) In further research, these considerations about the habitual nature of hand washing should be addressed. See also Verplanken and Aarts (1999) on the importance of habit and automaticity behavior in the attitude-behavior relation.

Inspired from the Integrated Social Cognition Model, the perceived advantages of hand washing (in comparison to the perceived disadvantages) could also be included into the “situational awareness” variables. Additionally, more research needs to be done on hand washing in times of no current health threat in general Western populations. It is important to investigate more possible determinants of hand washing, to explain thoroughly how trust in information influences hand washing and to explore if it is mediated by other social cognitive factors than the ones included in this study. A replication of this study in other countries and even among various population groups could help to further test the model and add to its validity and reliability.

4.5 Implications for practice

Intervention studies and behavior change strategies can be conducted to increase hand washing. Several such studies show great success in increasing the level of hand washing. For example, one study on hand hygiene in an office environment in Finland found that through a controlled intervention trial infectious diseases were reduced by 6.7% when personal guidance on enhanced hand washing with water and soap and instructions on how to reduce the transmission of an infection otherwise (through respiratory etiquette, avoiding shaking hands) were given (Savolainen-Kopra et al., 2012). Similar results of hand hygiene programs were also found in military settings: A two-year hand washing program in the US army (which included among others hand washing at least five times a day, installation of soap dispensers, education about and reinforcement of hand washing) decreased the rate of respiratory illness by 45% in comparison to the average rate in preceding years. (Ryan et al., 2001.) Another study in the US army found that after an intervention in two groups (one group which received unlimited access to hand sanitizer bottles, instructions and posters on hand washing, reminder and reinforcement by their drill sergeant to use the

hand sanitizer; and one group which only received bottles of hand sanitizer) the respiratory illness rate dropped by 40% and the gastrointestinal illness by 48%, compared to a control group (Mott et al., 2007).

However, all studies with research interventions, especially with randomized controlled trials, need approval from an ethic committee. This is required as manipulations can have unexpected, undesired or even harmful outcomes, study variables are invading the privacy, participation is involuntary, requires deception or is lacking informed consent. The *Declaration of Helsinki* requires ethical review of all medical research, as the involved human subjects are put at risk (For more information see World Medical Association, 2008). The American Psychological Association (APA) commits its members and students to comply with the *Ethical Principles of Psychologists and Code of Conduct*. It contains five general principles to guide researcher towards ethical ideals (Beneficence and Nonmaleficence, Fidelity and Responsibility, Integrity, Justice, Respect for People's Right and Dignity) and ten ethical standards, which are enforceable rules for psychologists. (For more information see the Ethics Code, American Psychological Association, 2002). In the context of an intervention study about hand washing, it would be important to ensure an institutional approval of the intervention, informed consent to research, an offer of inducement to the participants and their debriefing.

If one plans to design a behavior change campaign to increase the level of hand washing among young Finnish men in the army, the interventions need to fit to the structure of the hand washing related attitudes. That means one needs to consider whether it is a cognitive or affective attitude and adjust the intervention action accordingly. The present study shows three constructs to modify in order to increase hand washing: self-efficacy, disease worry and trust in authority-provided health information.

One way to increase hand washing is by increasing trust in authority-provided health information. The level of trust in authority-provided health information can be achieved through open, transparent communication. The health authorities should avoid negative, trust-destroying events, miscommunication or mistakes such as too late information of the public, because trust is fragile and difficult to maintain (Slovic,

1999). Ideally, the risk communication should be comprehensible, entail cues about risk perception, health-protective strategies, related knowledge and skills. Ongoing transparency within risk communication and a limited number of sources involved, is the most effective way to seize control of sensational media coverage and public discourse. (Cava, Fay, Beanlands, McCay & Wignall, 2005; O'Malley et al., 2009.) Inconsistent information from various sources on the other hand result in questions regarding the credibility of available information and leads to public confusion and incredulity (Cava et al., 2005).

Risk communication encourages people to adapt healthy behavior, helps to understand consequences of the disease, helps minimize the risk, and increases trust about the efficacy of carrying out protective behavior (Rothman & Kiviniemi, 1999). In order for the message itself to be most persuasive, it should only discuss arguments supporting hand washing and entail behavioral advice and effective ways on how to deal with the threat. Less educated and uninformed people respond most successfully to one-sided messages (in contrast to a two-sided message which also include arguments opposing hand washing). This is important to consider, as the present study suggests that less educated people have lower trust in information. Furthermore, the message should have personal relevance for the young men (thus, it should speak directly to the needs and interests of young men). If the message entails personal relevant arguments, the likelihood increases that the men are able and motivated to process the information on the central route. This would lead to enduring, resistant attitude change which will be predictive of behavior. In order to increase trust in information also through the peripheral route of persuasion, the expertise heuristic "health authorities' information can be trusted" should be confirmed. (Petty & Cacioppo, 1986; Chaiken et al., 1989.)

Hand washing can also be increased through disease worry. For this purpose, risk communication and persuasive messages should entail fearful elements, as fear is a behavioral determinant. According to Rogers (1983), fear, which is essentially similar to worry, influences behavior through protection motivation. Health-related intimidations make people think about ways to protect. Thus, if the persuasive message would be gain-framed (Kiviniemi & Rothman, 2010) and entail affective, fearful components which address disease worry, it would lead to more hand washing.

The inter-correlations between disease worry and the other social-cognitive determinants are also insightful, especially in terms of increasing disease worry. As knowledge and disease worry are correlated, one could also increase knowledge in order to increase disease worry (which then would lead to increased hand washing). Increased knowledge on the other hand would also lead to higher trust in information.

A third way to increase hand washing is through self-efficacy. Self-efficacy plays an important role in behavioral motivation as it gives information on the amount of control people think they have about their behavior and environment. A persuasive message addressing self-efficacy would entail cognitive components and be personally relevant. According to Bandura (1977), self-efficacy is affected by four sources: performance accomplishment (experience that one already has mastered hand washing and thus not contracted an infectious disease), vicarious experiences (noticing that other people succeed in hand washing in order to protect from diseases), verbal persuasion (encouragement and discouragement from other people about hand washing) and physiological states (interpretation of physiological reactions, like disgust or feeling of cleanness when washing hands). If one would emphasize more thoroughly the importance of these sources of self-efficacy, the level of self-efficacy would raise. This could be done for instance through an intervention which focuses on the recall of performance accomplishment and vicarious experiences as well as positive verbal persuasion or through a campaign addressing the positive physiological states after hand washing. If young men would be made more self efficacious about being able to follow hand washing recommendations in different situations, it would lead to more hand washing and to higher trust in authority-provided health information.

The Health Action Process Approach (HAPA model) is one theory of health behavior change in which self-efficacy plays an important role. According to this model, a health-related action is successfully carried out after people have developed an behavioral intention based on the motivation to act (which is based on self-efficacy, outcome and risk perceptions). This leads then to a volitional phase in which the action will be planned and accomplished. (Schwarzer, 2008.)

Another way of behavior change intervention is the RANAS model from Mosler (2012). In order to achieve a behavior change, five behavioral factors need to be favorable: risk factors, normative factors, ability factors and self-regulation factors. The mutual outcome of these behavioral determinants is behavior, intention and habit; whereas long-term habitual behavior is the goal of the intervention. Specific interventions can target the behavior underlying each factor correspondingly. The RANAS model proved to be successful in promoting hygiene behavior in several countries. (For an overview see Mosler, 2012.)

It is important to keep in mind that interventions with implementation intentions can increase the likelihood of successful behavior outcome. An implementation intention is an if-then plan which specifies the behavior that one will perform to achieve a goal given the situational context in which one will perform it. Because the situational context serves as a cue to remember the behavior, implementation intentions should make it more likely that behavioral decisions become reality. (Kiviniemi & Rothman, 2010; Sheeran, Milne, Webb, & Gollwitzer, 2005.) In the context of this present study, an implementation intention could be: *if I come inside the barrack from outside, then I will always wash my hands first.* (For an extensive overview of implementation intentions of health behavior see for example Sheeran et al., 2005).

Finally, it must be stated that the core element of pandemic influenza communication is to maintain and build public trust in health authorities before, during, and after an influenza pandemic (WHO, 2009). The results of the present study show, however, that trust in authority-provided health information in times of no current health threat is differing according to the educational level of young men in Finland. Open and transparent risk communication is a determine factor to promote trust and compliance with health-protective behavior and should be carried out by health authorities. Based on results of this study, health behavior interventions should address, among trust in information, disease worry and self-efficacy in order to achieve more hand washing. With regard to future research, the results suggest to operationalize the hand washing variable comprehensively, include sufficient social determinants of health-protective behavior and to not forget to include self-efficacy. In the end, hand washing is a too important health-protective behavior, as to be just perceived as an “ordinary behavior”.

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APPENDIX

Table 1. Descriptive statistics.

	N	Proportion %
<i>Age</i>		
18	10	7.3
19	70	51.1
20	48	35.0
21	5	3.6
22	4	2.9
<i>Highest educational degree</i>		
Comprehensive School ^a	18	12.9
Vocational School ^b	51	36.7
Secondary School ^c	70	50.4
<i>Marital status</i>		
Cohabiting	7	5.0
Steady relationship	41	29.3
Single	92	65.7
<i>Occupation before army</i>		
Employed	30	22.1
Unemployed	6	4.4
Student	92	67.7
Out of working life	8	5.9
<i>Self-reported health condition</i>		
Excellent	33	23.6
Very good	53	37.9
Good	40	28.6
Satisfactory	13	9.3
Poor	1	0.7
<i>Do you smoke?</i>		
Never	63	45.3
I quit	1	0.7
Occasionally	18	12.9
1-10 cigarettes/day	24	17.3
>10 cigarettes/day	33	23.7
<i>Do you use snuff?^d</i>		
No	96	68.6
Occasionally	39	27.9
Regularly	5	3.6
<i>Do you have asthma?</i>		
No	132	94.3
Yes	8	5.7

^a Compulsory education (9 years).

^b Post-compulsory secondary education in a vocational track (3 years)

^c Post-compulsory secondary education in an academic track (3 years)

^d Smokeless pulverized tobacco, also known as “snus”.

Table 2. Full list of main variables.

Construct	Questions	Response scale
<i>Trust in information</i>	The health information given by Finnish authorities is trustworthy.	agreement 1-5
<i>Knowledge</i>	Flu or stomach diseases are rarely spread through hand contact.	agreement 1-5
<i>Perceived effectiveness</i>	If I follow hand washing recommendations, I believe that as a consequence... ...I reduce my risk of catching a flu or stomach disease. ...I reduce the risk of my roommates catching a flu or stomach disease. ...I remain in better health.	likelihood 1-7
<i>Self-efficacy</i>	How certain you are that you would be able to follow recommendations in the following situations? I would be able to follow the recommendations... ...even in a hurry. ...even when neglecting other things to wash hands. ...when others neglect washing hands. ...when using part of my break for washing hands. ...when I am sick.	certainly 1-4
<i>Perceived risk</i>	The likelihood I get ill is...	likelihood 1-5
<i>Disease worry</i>	Right now, I'm not afraid of getting flu/stomach disease. The thought of getting flu/stomach disease feels unpleasant.	agreement 1-5
<i>Hand washing -situations</i>	I wash my hands when... ...I have been in the WC in the barracks. ...I have relieved myself in field practice. ...in the morning. ...before eating in the barracks. ...before snacks. ...before eating in field practice. ...I have touched things or surfaces touched by a sick person. ...after eating. ...I have sneezed/coughed in my hand. ...my hands are dirty. ...my hands stink. ...my hands feel sticky. ...I have picked my nose. ...coming back from barracks after leave.	frequency 1-5
<i>-frequency</i>	Last week, how many times a day have you typically... ...washed your hands with water and soap? ...with disinfectant?	frequency 1-5
<i>-evaluation</i>	Evaluate the degree to which the recommendations for hand washing are followed RIGHT NOW in your garrison (unit). I follow the recommendations myself.	agreement 1-5