AN APPLICATION OF THE EXTENDED PARALLEL PROCESS MODEL TO OPTIMIZE HEALTH MESSAGES FOR AT-RISK POPULATIONS DURING COVID-19: INVESTIGATING THE RELATIONSHIP BETWEEN THREAT PERCEPTION AND PROTECTIVE BEHAVIOURS IN PEOPLE WITH OBESITY

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ABSTRACT

People with Obesity (PwO) are at an increased risk of more severe outcomes of COVID-19. Although protective behaviours can reduce the spread of COVID-19, strategies are required to motivate PwO to engage in these behaviours. Targeted messages can be used to encourage adherence to protective behaviours; however, careful consideration is needed to avoid worsen feelings of weight stigma. The Extended Parallel Process Model was applied to explore perceptions of COVID-19 and protective behaviours, and the effects of targeted messages on motivation among PwO. Participants (N=76) completed an online survey and received a targeted COVID-19 message. Adherence to protective behaviours was significantly correlated with response efficacy, self-efficacy, attitudes, and intentions. Following message exposure, feelings of weight stigma moderated the relationship between attitudes and protective behaviours. Path analyses found that self-efficacy and attitudes predicted intentions, which predicted protective behaviours. This work will inform the development of optimally effective messages to support PwO during subsequent waves of the COVID-19 pandemic and future targeted message efforts for other health behaviours.

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Chapter One: Introduction

Throughout the Coronavirus Disease 2019 (COVID-19) pandemic, a body of research emerged to identify those who are at the greatest risk of contracting and developing the most severe outcomes of COVID-19. General trends from this area of research uncovered that individuals that are older or in long-term care facilities, immunocompromised, or have underlying health conditions, such as obesity, cardiovascular disease and diabetes, are at an increased risk for contracting COVID-19 and experiencing more severe outcomes (Jordan et al., 2020; Williamson et al., 2020; Zheng et al., 2020) such as increased rates of hospitalization, intensive care unit admission and increased duration of in-patient stay (Fisman et al., 2020; Kim et al., 2020; Mikami et al., 2020). Among these at-risk populations, People with Obesity (PwO) are a group of interest as over 30% of North Americans adults have a body mass index (BMI) greater than or equal to 30 and are classified as PwO (World Health Organization, 2021). Even after accounting for other underlying disease and sociodemographic covariates, COVID-19 PwO are hospitalized more frequently, are over-represented among severe cases, and experience worse outcomes compared to individuals without obesity (BMI < 30; Gao et al., 2020; Rychter et al., 2020). Evidence suggests that PwO are at an increased risk of complications of COVID-19, such as treatment escalation or more complex care plans, invasive mechanical ventilation, and increased risk of mortality (Popkin et al., 2020; Simonnet et al., 2020; Williamson et al., 2020). Given the increased risk for PwO, there is value in developing targeted interventions and strategies to support this population in minimizing their risk.

Protective Behaviours

Various health behaviours have been recommended that can help slow the spread of COVID-19 and reduce individual risk. Common recommendations include hand washing, face

coverings, physical distancing, reducing non-essential travel, being vigilant about general hygiene and many others. Several of the recommended health behaviours are supported by empirical research, such as regular hand-washing, which can reduce surface bacteria by up to 98% and reduce transmission of viral pathogens (Burton et al., 2011; Huang et al., 2014). In the context of COVID-19, adhering to physical distancing by reducing in-person contact and maintaining at least two meters of distance leads to a substantial reduction in transmission risk (Jarvis et al., 2020; Jones et al., 2020). For this study, protective behaviours are defined as those that have been identified as useful for slowing the spread of COVID-19 and thus reducing individual risk. After reviewing various international and government websites, the five most commonly recommended health behaviours were identified as: (a) hand washing, (b) wearing a face mask, (c) physical distancing, (d) staying home (whenever possible), and (e) creating a social "circle" (Government of Canada, 2020; Government of Ontario, 2020; World Health Organization, 2020). Throughout this work, *protective behaviours* will be used as a collective term to refer to the five health behaviours of interest listed above. Despite the government recommendations to engage in these protective behaviours throughout the first three waves of the pandemic, adherence to these recommendations has been inconsistent and sub-optimal. In Canadian samples, adherence to protective behaviours such as face masks and physical distancing has been reported to vary between 87% (Lavoie et al., 2021) to 33% (Brankston et al., 2021). Literature has also reported changes over time, specifically decreased adherence throughout the pandemic, with protective behaviours such as avoiding social gatherings decreasing by 24% between April and June 2020 (Lavoie et al., 2021). Increased attention and development of more effective strategies may therefore be required to motivate and support at-risk populations in adhering to the recommendations. There may also be value in using targeting

strategies to optimize motivation and adherence for PwO. When looking specifically at PwO, there is a lack of evidence of the uptake of protective behaviours for this population. This gap in the current literature represents an important avenue for research to better understand how PwO has responded to the COVID-19 pandemic and may provide insight into how this population would be optimally supported to engage in protective behaviours and other health behaviours.

Persuasive Messaging

Persuasive messaging is a practical strategy that can effectively encourage individuals to engage in protective behaviours (O'Keefe & Jensen, 2006, 2007; Pope et al., 2018). Although health messages have not been studied in the context of COVID-19 protective behaviours per se, persuasive messages have been effective in promoting various health behaviours in other contexts, such as physical activity, smoking cessation, hand washing, and vaccination (Gaube et al., 2020; Latimer et al., 2010; Noar et al., 2020; O'Keefe & Nan, 2012). Targeted messages are a specific type of persuasive message that provides health information relevant to a specific group of people, such as PwO (Kreuter & Wray, 2003). Targeted messages increase personal relevance and the amount of attention members of the group give the message (Cacioppo & Petty, 1982; Kreuter & Wray, 2003). Compared to generic messages, targeted messages increase the likelihood of promoting behaviour change (Hawkins et al., 2008). Targeted persuasive messages may be one valuable strategy to encourage protective behaviours among PwO.

Extended Parallel Process Model

The Extended Parallel Process Model (EPPM) is a theoretical framework that can inform the development of effective persuasive messages (Witte, 1992). This theory can also be applied to better understand how PwO perceive COVID-19 and protective behaviours. Figure 1 provides an overview of the model.

The EPPM was developed to bridge a gap in the study of fear appeals by exploring both adaptive and maladaptive responses that occur when individuals are presented with a message (Witte, 1992). Fear appeals are a type of persuasive message that utilize fear to motivate behaviour change (Witte, 1992, 1994). Typically, a fear appeal will describe the threat to elicit fear and then describe the recommended behaviours that effectively counteract the threat (Witte, 1994).

The components of the EPPM capture how individuals react to fear-inducing stimuli in messages, such as information about COVID-19. The EPPM has also been used to study pandemics in the past (Balicer et al., 2010; Barnett et al., 2009; Von Gottberg et al., 2016) and has been implemented in some COVID-19 studies to investigate how EPPM variables predict protective behaviours in community samples (Nazione et al., 2020; Shirahmadi et al., 2020). The EPPM is well-suited for this study as information on COVID-19 may unintentionally serve as a fear appeal, even if it is not directly designed that way. Although the negative outcomes of not engaging in the protective behaviours are not explicitly in the message, due to the global nature of the pandemic and the wide availability of information, these outcomes are widely known. The severity and rapid spread of COVID-19 is further highlighted by the high rates of mortality and rising number of positive cases. The promotion of protective behaviours during the COVID-19 pandemic involves navigating high levels of uncertainty and fear and therefore requires a theoretical model which can attempt to capture the unique behaviours and feelings individuals may have in response. The components of the EPPM were applied to help understand how PwO perceive COVID-19 and recommended protective behaviours. The components of the EPPM will be detailed below.

EPPM Constructs

Perceived threat is how an individual conceptualizes an external stimulus that can lead to an adverse outcome (Witte, 1992). This variable consists of two components (Witte, 1992): a) susceptibility, which refers to an individual's beliefs around their chances of "experiencing a threat" (Witte, 1995; Witte et al., 1996), or in the context of this study, beliefs around the likelihood of experiencing COVID-19, and; b) severity which is a measure of an individual's beliefs around the "seriousness of the threat" (Witte, 1995; Witte et al., 1996), which in the current context will be operationalized as beliefs about the seriousness of COVID-19.

Perceived efficacy is understood in reference to the specific behaviour(s) recommended in the message (Witte, 1992) and consists of two components (Witte, 1992): a) response efficacy which refers to an individual's beliefs around the effectiveness of a response in "preventing the threat" (Witte, 1995; Witte et al., 1996) (i.e., beliefs as to whether protective behaviours can effectively reduce the chances of getting COIVD-19) and; b) self-efficacy which refers to an individual's belief in their ability to effectively "perform" the recommended response (Witte, 1995; Witte et al., 1996), which in the current study is defined as an individual's confidence to engage in the recommended protective behaviours.

Similar to perceived efficacy, *attitudes* and *intentions* are understood in reference to a recommended behaviour (Witte, 1992). Attitudes capture an individual's affective response towards a recommended behaviour, such as if it is favourable or unfavourable, while intentions refers to an individual's motivation to engage in the recommended behaviour (Witte, 1992; Witte et al., 1996). Effective persuasive messages will generate more favourable attitudes towards a recommended behaviour which may ultimately lead to greater motivation to engage in the behaviour (Witte, 1995).

Message development

Developing effective targeted persuasive messages involves being mindful of factors that may influence compliance to health behaviours. Perceived threat and perceived efficacy are two key factors in creating persuasive messages as they work in tandem to determine if an individual will adhere to or reject the recommendations in a health message (Witte, 1995; Witte et al., 1996). The most effective messages for creating behaviour change include information about the threat coupled with high efficacy information (Witte & Allen, 2000). Research conducted throughout the COVID-19 pandemic has revealed that risk perception has a significant influence on different behavioural intentions. For example, higher levels of perceived COVID-19 risk had a negative impact on public transit usage (Bae & Chang, 2020) and were also positively associated with vaccine intentions (Sherman et al., 2020). Persuasive messages that effectively communicate risk may be useful in motivating protective behaviours (Maloney et al., 2011; Tannenbaum et al., 2015). However, when conveying risk information, it is important to consider additional factors such as the message recipient's beliefs about the efficacy of the recommended behaviour and their self-efficacy to carry out the behaviour (Witte, 1992). Efficacy perceptions of protective behaviours, such as hand washing and face masks, are an important predictor of voluntary compliance (Clark et al., 2020; Nazione et al., 2020; Vally, 2020). In addition, self-efficacy has been shown to be positively associated with positive health behaviour changes, such as healthy eating during quarantine (Constant et al., 2020). Although there is evidence to suggest that persuasive messages should consider perceptions of risk and efficacy, there is no known research to examine components of effective, targeted persuasive messages to motivate protective behaviours among PwO.

Guided by the EPPM, this study examined the relationship between *psychological factors* (e.g., threat and efficacy perception) and *protective behaviours* among PwO, as well as the effects of a persuasive targeted message on the attitudes and intentions toward protective behaviours. Targeted messages that are effective will change attitudes and intentions towards protective behaviours in PwO. The literature surrounding messaging strategies for other health behaviours, such as physical activity, have found evidence that supports the use of messages targeted to specific demographics such as women (Thai et al., 2019), women with obesity (Leone et al., 2012) and young adults (Berry & Carson, 2010) to improve attitudes and intentions towards physical activity. In PwO, targeted messages have also been found to be associated with higher levels of intentions to engage in other health behaviours, such as healthy eating (Wirtz, 2020). As such, it is expected that well-designed messages should improve attitudes and intentions toward protective behaviours among PwO. However, there is also evidence that targeted messages can increase negative affective in PwO, which can lead to reduced self-efficacy and intentions to engage in health behaviours (Derricks & Earl, 2019). The inconsistency in these findings indicates that additional research is needed to determine if targeted messages are an effective strategy in PwO that can create more positive attitudes towards protective behaviours and increase intentions to engage in these behaviours.

Weight Stigma

Although targeted messages can lead to increased feelings of relevance and ultimately greater message effectiveness for group members (Cacioppo & Petty, 1982; Kreuter & Wray, 2003), careful consideration is needed to ensure that messages are motivating to create behaviour change while avoiding possible adverse outcomes, such as stigmatizing language. Weight stigma is commonly experienced by many PwO. It can influence the way PwO think, behave, and

navigate society, including how they access health care and behave in social environments (Lewis et al., 2011). Many health promotion messages contain stigmatizing language, which is counterproductive and may deter PwO from the recommended protective behaviours in these messages (Major et al., 2014). Public health messages targeting PwO have historically been ineffective. They often place the responsibility entirely on the individual while ignoring the social, cultural and environmental factors and policies that may contribute to obesity and prioritize weight status rather than health (Salas, 2015). Stigma also creates an environment for discrimination and lack of access for PwO (Lewis et al., 2011), meaning that PwO may not ignore health messages but instead may face barriers to uptake (Flint, 2020; Pearl, 2020). The media often ignores the complex societal and social structures that are involved in obesity, instead assigning blame and placing responsibility on the individual (Flint, 2020). This type of media portrayal reproduces the weight stigma already present in society and can lead to negative behavioural responses in PwO, such as avoiding seeking health care (Flint, 2020; Pearl, 2020).

Experiences of weight stigmatization have been shown to predict poorer psychological well-being, such as decreased self-esteem and increased depression, as well as maladaptive behavioural responses in PwO (Hayward et al., 2018). Maladaptive behavioural responses can include an increased likelihood of binge eating and increased food consumption (Puhl & Suh, 2015). These maladaptive behaviours can also include decreased behavioural intentions towards health behaviours such as physical activity, as well as actively avoiding healthy eating, seeking health care, and engaging in physical activity (Hayward et al., 2018). Stigmatizing messages and information have also been shown to negatively impact behavioural intentions, behaviour, and self-efficacy towards positive health behaviours (Derricks & Earl, 2019). There is also a growing

body of evidence that indicates that not everyone is equally affected by experiences with weight stigma.

Factors such as sex, internalization of anti-fat attitudes and societal standards of attractiveness, and previous experiences with weight stigma influence how PwO are impacted by weight stigma (Hayward et al., 2018). Individuals with more frequent experiences with weight stigma were less motivated to diet, engage in physical activity and lose weight (Hayward et al., 2018). This relationship was moderated by sex, prior experiences with weight stigma and if individuals internalized weight bias, such that women, individuals with high levels of prior experiences with stigma and internalization had lower levels of positive affect following a stigmatizing experience, which was associated with lower motivation to diet, exercise and lose weight (Hayward et al., 2018). This moderation was not seen in men, individuals with less previous experiences with weight stigma or less internalization (Hayward et al., 2018). Additional research has found that PwO who reported more frequent experiences with weight stigma also reported greater avoidance of exercise and exercise-related situations (Vartanian & Novak, 2011). Internalized attitudes were also found to moderate this relationship, such that PwO with higher levels of internalization of anti-fat attitudes were more motivated to avoid exercise when they reported greater feelings of weight stigma, while this relationship in individuals with lower levels of internalization was relatively unaffected by experiences with weight stigma (Vartanian & Novak, 2011). These findings provide evidence that not all PwO are impacted by experiences with weight stigma in the same manner. Research is needed to further understand how a targeted message may affect attitudes and intentions to engage in the protective behaviours and how varying levels of weight stigma reported by PwO following

targeted message exposure may moderate the relationship between attitudes, intentions and engagement in protective behaviours.

Present Study

This study will attempt to address multiple gaps in the existing literature. The proposed study will be the first known study to specifically measure the uptake of protective behaviours for PwO. By examining the EPPM variables, this study may also provide preliminary insight into why patterns of engagement in protective behaviours emerge among PwO.

The first purpose of this study is to explore the relationship between EPPM variables and protective behaviours in PwO. The second purpose is to examine the impact of a targeted persuasive message on attitudes and intentions and investigate if feelings of weight stigma moderate the relationship between attitudes and intentions and protective behaviours.

Specific research objectives include exploring the following among PwO:

1. Self-reported engagement in protective behaviours
2. The relationship between the EPPM constructs (i.e., susceptibility, severity, response efficacy, self-efficacy, attitudes, and intentions) and protective behaviours, specifically how EPPM variables may predict protective behaviours
3. The effects of exposure to a targeted persuasive message on intentions and attitudes toward protective behaviours
4. If feelings of weight stigma following exposure to a targeted message moderate the relationship between (i) intentions and protective behaviours and (ii) attitudes and protective behaviours

Guided by the EPPM, it was hypothesized that:

1. High levels of susceptibility, severity, response efficacy, self-efficacy, attitudes and intentions will be positively associated with protective behaviours, while high levels of susceptibility and severity, coupled with low levels of response efficacy, self-efficacy, attitudes and intentions will be negatively associated with protective behaviours.
2. Specific to message exposure, it was hypothesized that:
    a. A targeted persuasive message will increase intentions and favourable attitudes towards protective behaviours
    b. Feelings of weight stigma will moderate the effects of message exposure such that positive association between both (i) attitudes and protective behaviours and (ii) intentions and protective behaviours will be weakened among PwO who experience greater feelings of weight stigma following message exposure compared to those who experience low feelings of weight stigma.

Chapter Two: Methods

Design and participants

This study employed a cross-sectional survey design to collect information on EPPM constructs and protective behaviours for PwO. Participants were recruited via e-mail from the Wharton Medical Clinic (WMC), which is a referral-based specialist clinic that supports PwO in Southern Ontario, Canada. The WMC operates based on clinical practice guidelines that specify obesity is defined as a BMI ≥ 30 kg/m2 (Wharton et al., 2020). PwO that have been referred to the WMC may be eligible for services including educational classes on nutrition and meal planning, as well as individualized guidelines for physical activity created by physicians. Some PwO may also be eligible for other services including pharmacological interventions and bariatric surgery. The WMC has a database of current and former patients that have consented to be contacted for research studies. Participants were eligible for this study if they (a) were patients at the WMC, (b) had access to an electronic device and internet to complete the online questionnaire, and (c) were able to read and understand English. This survey was open to participants of any age, as long as they met the eligibility criteria. This study has been approved by the university's ethics committee (e2017 – 166).

Procedure

Patients in the WMC database were sent a recruitment e-mail containing a brief description of the study, an informed consent form and a link to the survey. The questionnaire was hosted on REDCap (Research Electronic Data Capture; Harris et al., 2009, 2019), a secure application for creating online surveys and housing data (Harris et al., 2019). Participants reviewed the letter of information and provided informed consent electronically before proceeding with the survey. Participants were asked about the EPPM constructs (susceptibility,

severity, response efficacy, self-efficacy, attitudes, intentions) and their engagement in protective behaviours. Participants then received a targeted health message (see below). After reading the message, participants reported intentions and attitudes again, as well as feelings of weight stigma. The survey's final section collected sociodemographic information.

Measures

Socio-demographics

Participants were asked to self-report the following sociodemographic factors: date of birth, sex, height, weight, highest level of education attained, work status, ethnic origin, household income, city of residence, dwelling type, and the number of dependents. Self-reported height and weight were used to calculate body mass index (BMI). Participants also reported their knowledge and frequency of media consumption around COVID-19. Participants rated their knowledge about COVID-19 on a 5-point Likert scale from 1 (Very Poor) to 5 (Excellent), how often they consume media related to COVID-19 on a 5-point Likert scale from 1 (Never) to 5 (Always), and their primary sources of COVID-19 related information as a closed-item response (i.e. TV, social media, internet, and government organizations).

EPPM constructs.

The EPPM constructs were measured using items adapted from the Risk Behaviour Diagnosis Scale (RBD), which was specifically designed to measure each component of the EPPM (Witte et al., 1996). Unless otherwise indicated, items were scored on a 5-point Likert Scale from 1 (Strongly Disagree) to 5 (Strongly Agree).

Perceived threat consists of two components, susceptibility and severity. To assess the susceptibility component of perceived threat, participants indicated their agreement to the following two statements: 1) *It is likely that I will get COVID-19* and 2) *Compared to a person*

without obesity that is the same age and sex as me, I am more likely to get COVID-19. To assess the severity aspect of perceived threat, participants indicated their agreement to the following two statements: 1) *I believe that COVID-19 is a serious health threat for me* and 2) *Compared to a person without obesity that is the same age and sex as me, COVID-19 is a much more serious health threat for me*. Scores for each of the four items were used individually for the susceptibility, relative susceptibility, severity, and relative severity variables, respectively. Whereas the susceptibility and relative susceptibility items were only weakly correlated (r = 0.24, $p < 0.05$), severity and relative severity items had a moderate-to-strong correlation (r = 0.67, $p < 0.01$).

Perceived efficacy consists of two components, response efficacy and self-efficacy. Participants were provided with a brief definition of the protective behaviours. To assess response efficacy, participants reported their agreement to the following statement: *If I [wash my hand regularly], then I am less likely to get COVID-19,* for each of the protective behaviours. To assess self-efficacy, participants were asked to report their agreement to the following statement *I am confident I can [wash my hands regularly] over the next 7 days,* for each of the protective behaviours. An average score was calculated for the five response efficacy items and the five self-efficacy to create two overall scores. Response efficacy items and self-efficacy items both showed good internal consistency with alpha coefficients of 0.83 and 0.80, respectively (Gliem & Gliem, 2003).

Attitudes towards protective behaviours were assessed using two semantic differential scales. These items were rated on a 5-point semantic differential scale (e.g., Bad/Good, Unfavourable/Favourable) and were averaged to create an overall attitudes score. These two items showed excellent internal consistency (α=0.91; Gliem & Gliem, 2003).

Intentions to engage in protective behaviours over the next seven days was measured by asking participants to rate their agreement with the following statements: *Over the NEXT 7 days, I INTEND to* (a) *wash my hands regularly,* (b) *wear a face mask in public spaces regularly,* (c) *practice physical distancing in public spaces regularly,* (d) *stay home whenever possible,* and (e) *create and maintain a social "circle".* An overall intentions score was calculated by averaging the five items. These items show good internal consistency (α=0.80; Gliem & Gliem, 2003).

Protective behaviours that have been identified as useful for slowing the spread of COVID-19 were self-reported by participants. For this study, five protective behaviours were identified: (a) hand washing, (b) wearing a face mask, (c) physical distancing, (d) staying home (whenever possible), and (e) creating a social "circle". Participants reported their agreement with the following statements: *Over the PAST 7 days, I have* (a) *washed my hands regularly,* (b) *worn a face mask in public spaces regularly,* (c) *practiced physical distancing in public spaces regularly,* (d) *stayed home whenever possible,* and (e) *created and maintained a social "circle".* An average was calculated to create an overall protective behaviours score. These five items had acceptable internal consistency (α=0.77; Gliem & Gliem, 2003).

Weight stigma

Participants' thoughts and feelings of weight-related stigma were measured using items adapted from the Weight Bias Internalization Scale (Durso & Latner, 2008). Following exposure to the targeted message, participants read the statement *reading this information about COVID-19 made me…*followed by (a) *feel anxious about having obesity because of what people might think of me,* (b) *wish I could drastically change my weight,* and (c) *believe that society's prejudice against people with obesity is unfair.* An average score was calculated to create an

overall weight stigma score, with higher scores indicating higher feelings of weight stigma. These three items had acceptable internal consistency (α=0.77; Gliem & Gliem, 2003).

Targeted Persuasive Message

Participants received the following persuasive message targeted to PwO. This message also targeted the severity, response and self-efficacy aspects of the EPPM.

> *COVID-19 is a serious health threat for people with obesity. People with obesity face higher risk and more severe health outcomes as a consequence of COVID-19. There are some things you can do to help reduce the risk of getting COVID-19. Consider washing your hands regularly, wearing a mask in public spaces, staying home whenever possible, keeping a safe distance from others when you're out, and sticking to your social "circle" to reduce your risk! For more tips and strategies, you can visit the Government of Canada's COVID-19 webpage (https://www.canada.ca/en/publichealth/services/diseases/coronavirus-disease-covid-19.html)*

Statistical Analyses

Data were first cleaned and underwent missing data analysis. Descriptive statistics were calculated to characterize the sample. Pearson's correlations were used to determine which continuous sociodemographic and EPPM variables were significantly correlated with protective behaviours and would be included in the multivariable analysis. Categorical variables were analyzed using t-tests (for dichotomous variables) and ANOVAs (for variables with more than two levels) to determine if there was a difference in mean protective behaviour scores between the different levels of the variables. The independent variables, intentions and self-efficacy, were highly correlated. As such, a regression model was not appropriate because possible suppression effects would have reduced or changed the directionality of the relationship between the

independent variables and the dependent variable (i.e., engagement in protective behaviours) (Cohen et al., 2003). Alternatively, path analyses were used to test hypothesis 1 and explore the relationship between the EPPM constructs (susceptibility, severity, response efficacy, self-efficacy, attitude and intentions) and protective behaviours. Informed by the EPPM, two path diagrams were created to fit the data. To test hypothesis 2a, two paired-samples t-tests were used to investigate changes in intentions and attitudes following message exposure. To test hypothesis 2b, two moderation analyses were conducted using the PROCESS macro (Hayes, 2018) to determine if feelings of weight stigma moderated the relationship between a) intentions and protective behaviours and b) the relationship between attitudes and protective behaviours. All statistical analyses were performed using SPSS v27 and SPSS Amos v27 for the path analyses.

Chapter Three: Results

Data cleaning began by addressing missing data. One participant was removed because they had completed less than 20% of the questionnaire. To examine the remaining missing data, Little's MCAR test was calculated and was not significant, indicating that data were missing completely at random (Little, 1988). For continuous variables with more than 5% missing data, the average score of five imputations with ten iterations was used to replace the missing values (Cheema, 2014; Sterne et al., 2009; Tabachnick & Fidell, 2013). Simple mean imputation was used for continuous variables with less than 5% missing data (Tabachnick & Fidell, 2013). Three continuous variables had more than 5% missing data and required multiple imputations: (a) post-message intentions for wearing a mask, (b) post-message intentions of creating a social circle, and (c) post-message attitudes. The following continuous variables had less than 5% missing data (with missing data ranging from 1.3% to 3.9%) and required simple mean imputation: (a) response efficacy for wearing masks, (b) self-efficacy for wearing masks, (c) pre-message attitudes, (d) creating or maintaining a social circle over the past 7 days, (e) pre-message intentions for wearing masks, (f) pre-message intentions for physical distancing, (f) pre-message intentions for creating or maintaining a social circle, (g) post-message intentions for hand washing, (h) post-message intentions for physical distancing, and (i) post-message intentions for staying home when possible. Missing sociodemographic information ranged from 5.3% to 26.3%, however missing values were not estimated. After missing data were estimated, mean scores were calculated for response efficacy, self-efficacy, intentions, attitudes, and protective behaviours. Cook's distance scores were used to remove any outliers, however, there were no distance scores greater than one, and the remaining participants were retained (Cook, 1977). A final sample of 76 participants was analyzed.

Descriptive statistics

Data were collected from September 2020 to February 2021 during the second wave of the COVID-19 pandemic in Ontario. Participants were between 31-80 years old, with a mean age of 58.6 years old. Participants were mostly female (67.1%), university or college educated (51.3%), and identified as European/ Caucasian (72.4%). Participants were also mostly working from home (26.3%) or retired (27.6%) and had an income greater than $100,000 (23.7%). The majority of participants rated their knowledge about COVID-19 as "Good" (51.3%) and reported consuming media about COVID-19 "Very Often" (39.5%). Sources of information included TV (59.2%), social media (19.7%), internet (51.3%) and government organizations (63.2%). Only one participant reported having COVID-19, while only 27.6% of participants had been previously tested, and 30.3% of participants knew someone personally that had COVID-19.

Severity, relative severity, susceptibly and relative susceptibility were scored on a 5-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). On average, participants reported they neither disagreed nor agreed that they were likely to get COVID-19 (M=2.47) or were more likely than someone without obesity to get COVID-19 (M=2.66). Participants agreed that COVID-19 is a serious health threat (M=3.67), however on average, participants neither disagreed nor agreed that COVID-19 is a more serious health threat for PwO (M=3.39). Participants reported high levels of self-efficacy, response efficacy, attitudes, intentions, and engagement in protective behaviours, with mean scores ranging from 4.4-4.7. Table 1 provides the sociodemographic variables of the sample.

Table 1

Participant Sociodemographic Characteristics

Variable	N (%)	Mean	SD
Age		58.6	12.5
BMI		36.8*	9.7
Sex			
Male	18 (23.7)		
Female	51 (67.1)		
Missing	7 (9.2)		
Annal household income			
Less than $20,000	6 (7.9)		
$20,000-44,999	7 (9.2)		
$45,000-74,999	14 (18.4)		
$75,000-99,999	11 (14.5)		
$100,000 or greater	18 (23.7)		
Missing	20 (26.3)		
Education			
High school diploma or equivalent	15 (19.7)		
College or university degree	39 (51.3)		
Master's, doctorate, or professional degree	18 (23.7)		
Missing	4 (5.3)		
Work status			
Front line	5 (6.6)		
Laid off/ unemployed (COVID-19 related)	2 (2.6)		
Work from home or self-employed	25 (32.9)		
Full-time	5 (6.6)		
Part-time/ student	6 (7.9)		
Unemployed/ laid-off (Non-COVID-19 related)	3 (3.9)		
Retired	21 (27.6)		
Missing	5 (6.6)		
Ethnic Origin			
Southeast Asian	1 (1.3)		
West Asian	1 (1.3)		
Caribbean	2 (2.6)		
Indigenous	2 (2.6)		
European/ White	55 (72.4)		
Oceania	1 (1.3)		
Prefer not to answer	5 (6.6)		
Missing	5 (6.6)		
City of residence			
Durham Region			

Whitby	1 (1.3)
Halton Region	
Burlington	5 (6.6)
Oakville	6 (7.9)
Niagara Region	
Fort Erie	1 (1.3)
Grimsby	1 (1.3)
Niagara Falls	3 (3.9)
Niagara-on-the-Lake	1 (1.3)
Pelham	1 (1.3)
St. Catharines	8 (10.5)
Thorold	2 (2.6)
Peel Region	
Mississauga	5 (6.6)
Waterloo Region	
Cambridge	1 (1.3)
Waterloo	1 (1.3)
Hamilton	12 (15.8)
Toronto	12 (15.8)
Missing	16 (21.1)
Dwelling type	
House/ semi-detached house/ townhouse	43 (56.6)
Apartment/ condo	17 (22.4)
Missing	16 (21.0)
Number of individuals in dwelling	
1	18 (23.7)
2	21 (27.6)
3-5	18 (23.6)
6 or more	4 (5.2)
Missing	15 (19.7)
Number of dependents	
0	39 (51.3)
1	8 (10.5)
2	8 (10.5)
3 or greater	4 (5.2)
Missing	17 (22.4)
COVID-19 knowledge	
Very poor	0 (0)
Poor	0 (0)
Fair	4 (5.3)
Good	39 (51.3)
Excellent	17 (22.4)
Missing	16 (21.1)
Frequency of COVID-19 media consumption	

Never	0 (0)
Rarely	4 (5.3)
Sometimes	13 (17.1)
Very often	30 (39.5)
Always	14 (18.4)
Missing	15 (19.7)
Sources of information	
Television (e.g., news channels)	45 (59.2)
Social media (e.g., Facebook, Instagram, WhatsApp)	15 (19.7)
Internet (e.g., web sites, blogs)	39 (51.3)
Government/ Organizations (e.g., Government of Ontario, WHO)	48 (63.2)

Note. Obesity is defined as a BMI $\geq$ 30 kg/m^2 and is subclassified into Class 1 (BMI = 30-34.9), Class 2 (BMI = 35-39.9) and Class 3 (BMI $\geq$ 40).

Pearson's correlations were used to determine which EPPM constructs and continuous sociodemographic factors were correlated with protective behaviours. The results from this analysis indicated that participation in protective behaviours was significantly ($p < 0.01$) correlated with response efficacy ($r = 0.46$), self-efficacy ($r = 0.68$), attitudes ($r = 0.46$), and intentions ($r = 0.92$). No continuous sociodemographic variables (age, BMI) were significantly correlated with protective behaviours. Table 2 provides the correlation matrix.

Table 2

Correlation Matrix for Significant EPPM Constructs and Protective Behaviours

	1. Protective Behaviours	2. Response Efficacy	3. Self-Efficacy	4. Intentions	5. Attitudes
1	1	.461**	.681**	.915**	.459**
2	--	1	.492**	.386**	.272*
3	--	--	1	.732**	.442**
4	--	--	--	1	.457**
5	--	--	--	--	1

* $p \leq .05$. ** $p \leq .01$.

Three categorical sociodemographic variables (sex, work status and dwelling type) showed a statistically significant difference in protective behaviours between the levels of each variable. The independent samples t-test for sex found that there was a statistically significant difference in the mean protective behaviours scores such that participants that identified as female had significantly higher levels of protective behaviours (M = 4.73, SD = 00.38) compared to participants that identified as male (M = 4.34, SD = 0.76), $t(20.13) = 2.05$, $p = 0.05$. The one-way ANOVA for work status found a significant difference in the mean protective behaviours scores across the different work status categories, $F(9,61) = 3.97$, $p = .001$. A Tukey post hoc test revealed that one group, participants that were laid off or unemployed for reasons related to COVID-19, had significantly lower mean protective behaviours scores compared to all other groups, with mean differences ranging from 1.3 to 2.0. There were no statistically significant differences between any of the other groups. The independent samples t-test for dwelling type

revealed there was a statistically significant difference in the mean protective behaviours score such that participants that reported residing in a house, semi-detached house or townhouse had higher levels of protective behaviours (M = 4.69, *SD* = 0.47) compared to participants that reported living in an apartment or condo (*M* = 4.32, *SD* = 0.62), $t(23.6) = 2.20$, $p = 0.04$. The remaining categorical sociodemographic variables (education, ethnic origin, annual household income, city of residence, number of dependents, self-rated knowledge about COVID-19, frequency of consumption of information related to COVID-19 and experiences with either having, being tested for or knowing someone with COVID-19) did not have significant differences in mean protective behaviours for the different levels of the variables. Table 3 provides the results from the t-tests and ANOVA for the categorical sociodemographic variables.

Path analysis

To test hypothesis 1, path analyses were used to explore the relationship between the EPPM constructs and protective behaviours. The EPPM informed both of the path diagrams created. The following fit indices and cut-offs were used to evaluate the models and were selected based on previous literature and statistical consulting with the Institute for Social Research at York University: a) Root Mean Square Error of Approximation (RMSEA) ≤ 0.05, b) Comparative Fit Index (CFI) ≥ 0.90, c) Tucker-Lewis Index (TLI) ≥ 0.90, d) Standardised Root Mean Squared Residual (SRMR) ≤ 0.07 (Hu & Bentler, 1999). The first model included only the variables significantly correlated with protective behaviours: a) self-efficacy, b) response efficacy, c) attitudes, and d) intentions. This first model, $\chi^2(3) = 7.45$, $p = 0.06$, failed to meet the RMSEA guideline (0.14), however, the remaining fit indices, CFI (0.98), TLI (0.93) and SRMR (0.03), were met, so the model was retained. In this model, intentions were significantly predicted by self-efficacy ($\beta = 0.63$, $p < 0.001$) and attitudes ($\beta = 0.11$, $p = 0.05$). Protective behaviours were

significant predicted by intentions ($\beta = 0.90$, $p < 0.001$). Figure 2 provides the path coefficients for Model 1.

A second exploratory model was created. This model was also guided by the EPPM, specifically the first and second appraisal described by Witte et al. (1996). In the first appraisal, individuals assess the health information to see if they perceive a threat. If a threat is identified during the second appraisal, the efficacy of the recommended behaviours and self-efficacy for those behaviours is evaluated. The second model was built to reflect these two appraisals. The first level of the path diagram contains the constructs involved in the first appraisal of threat (i.e., severity and susceptibility). Using the EPPM framework, these constructs were hypothesized to predict the constructs involved in the second level appraisal (i.e., attitudes, response efficacy and self-efficacy). Following the structure of the EPPM, the second level appraisal constructs were then hypothesized to predict intentions, which then predicted the uptake of protective behaviours. The second model, $\chi^2(10) = 47.13$, $p < 0.001$, failed to meet the RMSEA (0.22), CFI (0.85), TLI (0.68) and SRMR (0.17) guidelines. However, as this analysis was exploratory, the model was retained with the understanding that this model would have reduced statistical power. Upon examination of the path coefficients, results from this model are similar to Model 1. In this model, intentions were predicted by attitudes ($\beta = 0.11$, $p = 0.03$) and self-efficacy ($\beta = 0.63$, $p < 0.001$), and intentions subsequently predicted protective behaviours ($\beta = 0.90$, $p < 0.001$) The addition of severity predicted attitudes ($\beta = 0.16$, $p = 0.05$) and response efficacy ($\beta = 0.15$, $p = 0.02$), while susceptibility only predicted attitudes ($\beta = -0.22$, $p = 0.05$). Figure 3 provides the path coefficients for Model 2.

Paired samples t-test

To test hypothesis 2a, two paired sample t-tests were conducted to investigate the impact of a targeted persuasive message on intentions and attitudes. The first paired samples t-test found that there was no significant change in intentions from pre-message (M = 4.68, SD = 0.52) to post-message (M = 4.70, SD = 0.58), $t(75) = -0.57$, $p = .57$. Similarly, the second paired samples t-test found there was no significant change in attitudes from pre-message (M = 4.70, SD = 0.77) to post-message (M = 4.71, SD = 0.77), $t(75) = -0.12$, $p = .90$.

Moderation analysis

To test hypothesis 2b, two moderation analyses were conducted to investigate the impact of weight stigma on the relationship between a) intention and protective behaviours and b) attitudes and protective behaviours. The first moderation analysis revealed that feelings of weight stigma did not moderate the relationship between post-message intentions and protective behaviours, β = -0.07, 95% CI [-0.18, 0.03], t = -1.36, p = 0.18. The second moderation analysis found that feelings of weight stigma moderated the relationship between post-message attitudes and protective behaviours, β = -0.14, 95% CI [-0.25, -0.02], t = -2.36, p = 0.02. At lower levels of stigma, there is a stronger relationship between post-message attitudes and intentions, β = 0.48, 95% CI [-0.27, 0.68], t = 4.63, $p < 0.001$, which remains positive but weakens when the level of stigma is higher, β = 0.21, 95% CI [0.05, 0.36], t = 2.68, $p < 0.01$.

Chapter Four: Discussion

This was the first known study to specifically measure the uptake of protective behaviours of PwO during the COVID-19 pandemic. This study was also novel in the application of the EPPM to study protective behaviours and targeted messaging in this population.

Patterns of Engagement in Protective Behaviours

The analysis of various sociodemographic characteristics revealed patterns in the uptake of protective behaviours for PwO, specifically when looking at sex, dwelling type, and work status. The findings from this study indicate that those who identify as women had higher levels of protective behaviours when compared to those who identify as men. These findings are consistent with literature that has found that women have higher levels of health-seeking and are more likely to engage in health behaviours, such as healthy eating and physical activity, that are associated with improved health and longevity (Courtenay, 2000; Tol et al., 2014). These findings are also consistent with research that has been conducted with PwO, which has found that a higher proportion of women with obesity were on a modified or fat-reduced diet for weight loss compared to men with obesity (Ball et al., 2003). These findings may indicate the need to specifically develop strategies to target men with obesity to motivate and support their adherence to protective behaviours.

When looking at dwelling type, participants who live in a house, semi-detached house or townhouse had higher levels of protective behaviours compared to participants who lived in either an apartment or condo. With respect to work status, only participants that were unemployed due to reasons related to COVID-19 had significantly lower levels of protective behaviours compared to all other participants. These findings also may reflect an underlying relationship between protective behaviour adherence and socioeconomic status (SES). Emerging

evidence suggests that lower SES individuals may have increased exposure to COVID-19 because of poor and crowded housing conditions and precarious employment in frontline jobs, which in turn may influence their ability to perform protective behaviours (Coroiu et al., 2020; Patel et al., 2020). For example, living in a crowded dwelling with reduced space may affect the ability to successfully physically distance (Coroiu et al., 2020; Patel et al., 2020). These findings are supported by this study's results wherein participants who live in more densely populated dwelling types, such as condos or apartments, reported lower levels of protective behaviours. Many frontline minimum wage jobs, including labour or retail, do not provide the option to work from home and involve increased in-person contact. Individuals of a lower SES may feel pressure to continue working out of fear of losing their jobs, risking further economic instability. Those with lower SES are more reliant on public transportation, which increases time spent in public spaces, further increasing their risk of contracting COVID-19 (Patel et al., 2020). These studies provide context on the complex socioeconomic factors that may influence if an individual is able to engage in protective behaviours.

The study sample was primarily participants who were university or college educated. This sample may represent a higher level of health literacy than a sample of PwO with lower levels of education. There is evidence that higher levels of health literacy are associated with higher levels of health behaviours such as physical activity and healthy eating (Aaby et al., 2017). For women with obesity specifically, level of education has been found to be a significant predictor of performance of health-promoting behaviours, such as improved nutrition, physical activity and stress management (Fisher & Kridli, 2014). Given that the sample was relatively highly educated, their adherence to protective behaviours could be higher than the general population of PwO.

Participants in this study were also mostly White. Previous literature has found that the pandemic has disproportionally impacted Black, Indigenous and People of Colour (BIPOC) communities, and many BIPOC individuals have had worse COVID-19 outcomes when compared to white individuals (Khunti et al., 2020; Pan et al., 2020). PwO that are BIPOC individuals also encounter other situations that would not be experienced by white PwO, such as racism within their social environment and the healthcare setting. While the sample of PwO recruited for this study would have been impacted by the pandemic and weight stigma, their experiences regarding protective behaviours may be drastically different from the intersectional experiences of the PwO who are members of BIPOC communities.

EPPM Constructs and Protective Behaviours

The primary purpose of this was study was to explore the relationship between EPPM constructs and protective behaviours, specifically how EPPM variables may predict protective behaviours. It was hypothesized that high levels of susceptibility, severity, response efficacy, self-efficacy, attitudes and intentions would be positively associated with protective behaviours. In contrast, high levels of susceptibility and severity, coupled with low levels of response efficacy, self-efficacy, attitudes and intentions were hypothesized to be negatively associated with protective behaviours. Preliminary correlational analysis found that engagement in protective behaviours was positively correlated with the following EPPM constructs: response efficacy, self-efficacy, attitudes, and intentions. The findings from this study are consistent with literature that has found a positive association between self-efficacy, response efficacy and intentions with engagement in health behaviours such as healthy eating and physical activity (Constant et al., 2020) and smoking cessation (Chen & Chen, 2021).

Two path models were created to test these hypotheses. In the first path model, response efficacy, self-efficacy and attitudes were found to significantly predict intentions. Intentions then significantly predicted engagement in protective behaviours. The findings from the first model are supported by previous literature that has found that self-efficacy, response efficacy and attitudes all predict intentions to engage in other health behaviours, such as physical activity and use of contraceptives (Campo et al., 2012; Constant et al., 2020).

Although intentions predicting engagement in health behaviours is not a novel finding, the results from this study may contribute to an understanding regarding the intention-behaviour gap. The intention-behaviour gap is a phenomenon that is often observed in health psychology that describes a situation where although an individual may intend to engage in a specific health behaviour, they never actually perform the behaviour (Sniehotta et al., 2005). In the current study, it was interesting to observe that there was virtually no intention-behaviour gap. That is, intentions were very highly predictive of engagement in protective behaviours. There are many possible reasons for the lack of the intention-behaviour gap observed in this study. Firstly, the protective behaviours are relatively easy to perform compared to other health behaviours, such as physical activity. It is arguably less daunting and certainly would require less effort for most individuals to wear a face mask or wash their hands compared to engaging in regular physical activity, for example. In addition, protective behaviours are currently a behavioural standard that is enforced socially and even legally, such as wearing a mask and physically distancing in most public spaces. In the current societal environment, protective behaviours are not only expected but also often supported. This includes hand sanitizer being readily available, mask mandates, gathering limits, and guidelines for physical distancing. The findings from this study may indicate that in addition to optimizing health messages, creating optimal environments for health

behaviours may play a crucial role in translating intentions into actions. Creating the optimal environment may involve removing systemic barriers that may impact adherence to health behaviours such as access and financial costs while supporting facilitating factors like social norms.

In the second model, the relationships from the first model were retained as response efficacy, self-efficacy, and attitudes predicted intentions, which then predicted protective behaviours. In this model, severity and susceptibility were added. Severity predicted both attitudes and response efficacy, while susceptibility only predicted attitudes. Similar to the first model, a direct effect of self-efficacy, response efficacy and attitudes on intentions was maintained. The second model also revealed an indirect effect of severity and susceptibility on intentions through attitudes and response efficacy. Once again, the findings from this model are consistent with a large body of evidence that indicates that self-efficacy is one of the strongest predictors of intentions for health behaviours (Bauman et al., 2012; Rhodes et al., 2017). The results from the current study also support previous research conducted in women with obesity that found self-efficacy to be a significant predictor of health-promoting behaviours such as improved nutrition, physical activity and stress management (Choo & Kang, 2015; Fisher & Kridli, 2014). Although the important role of self-efficacy is consistent with the broader literature around health behaviours, the findings from this model are contrary to EPPM theory which posits that the combination of high levels of threat perception (severity and susceptibility) and efficacy perception (response and self-efficacy) predict intentions (Witte, 1992). In this model, neither severity nor susceptibility predicted self-efficacy. While there were indirect pathways through attitudes and response efficacy, high levels of severity and susceptibility were not required for increased intentions. The results from this study indicate that health messages

should focus on increasing self-efficacy for protective behaviours rather than focusing on information on severity or susceptibility. Moving forward, health message design may benefit from a shift away from paradigms rooted in theories such as Prospect Theory (Kahneman & Tversky, 1979), that highlight the need to present risk information and frame messages using positive and negative outcomes.

Impact of a Targeted Persuasive Message

The second purpose of this study was to examine the impact of a targeted persuasive message on PwO. It was hypothesized that a targeted message would increase intentions and favourable attitudes towards protective behaviours. To test this hypothesis, paired-samples t-tests were used to compare intentions and attitudes before and after exposure to a targeted message. There was no significant change in attitudes or intentions following message exposure.

There are many possible reasons why the changes in attitudes and intentions following message exposure were not significant. One possible reason is that a ceiling effect occurred as the baseline level of intentions and attitudes were already quite high, with mean scores of 4.68 and 4.70 on a 5-point scale, respectively. This may introduce the possibility that even if the message was well designed and may have significantly increased intentions and attitudes in a sample with lower baseline mean scores, there was no room for a significant increase in this sample. Another possible reason is that the content of the message was not successful in targeting constructs that would create changes in intentions and attitudes. From the path analyses conducted, self-efficacy and response efficacy were found to be the best targets for increasing intentions. While the targeted message did include the information that "there are things you can do to help reduce the risk of getting COVID-19", additional strategies to boost self-efficacy may have been required to significantly increase intentions. In addition, the targeted message did not

contain any specific information on the efficacy of the protective behaviours, which may have boosted intentions by increasing response efficacy. For example, providing statistics around the efficacy of protective behaviours, such as the reduction of the transmission of COVID-19 by face masks or the percentage of pathogens killed by hand washing, may have better targeted response efficacy. According to the EPPM, an increase in attitudes could be driven by increased perceptions of severity and decreased perceptions of susceptibility. Although the message provided information on the severity of COVID-19 for PwO, there was no information about susceptibility included in the message. The message that participants were exposed to may not have led to significant increases in attitudes and intentions, as the optimal constructs revealed in the analysis were not targeted.

Another possible reason is that messages may not have targeted effectively to PwO. Additional research is needed to investigate the efficacy of other types of health messages, such as tailored or framed messages in PwO. Both tailored and framed messages have been found to be effective in promoting other health behaviours such as physical activity (Latimer et al., 2010) and smoking cessation (Hébert et al., 2018), however additional research is needed to explore the efficacy when promoting protective behaviours to PwO. Based on the findings from the present study, targeting self-efficacy may be the optimal strategy to boost intentions and subsequent adherence to protective behaviours. Additional factors such as attitudes and response efficacy may provide secondary targets that can work collaboratively with self-efficacy to boost intentions and adherence to protective behaviours.

Additional analyses were conducted to determine if feelings of weight stigma moderated the relationship between intentions and protective behaviours or between attitudes and protective behaviours. It was hypothesized that feelings of weight stigma would moderate the effects of

message exposure such that the positive association between attitudes and protective behaviours and between intentions and protective behaviours would be weakened among PwO who experience greater feelings of weight stigma. Two moderation analyses were conducted to address these hypotheses. These analyses found that while weight stigma did not moderate the relationship between intentions and protective behaviours, it did moderate the relationship between attitudes and protective behaviours. Specifically, the positive relationship between attitudes and engagement in protective behaviours was weakened as feelings of weight stigma increased. No other known literature has specifically investigated the moderating role of weight stigma in the relationship between attitudes, intentions, and adherence to protective behaviours in PwO. The results from the stigma-attitudes moderation analysis are consistent with literature showing that PwO are differentially impacted by experiences of weight stigma (Hayward et al., 2018). Previous literature has identified various factors, such as past experiences with weight stigma and internalization of anti-fat attitudes, that impact how PwO respond to weight stigma (Hayward et al., 2018). While the items in this study allowed for the comparison between PwO with varying levels of weight stigma, this study could not investigate the source, perception of intensity, and timing of weight stigma experienced by this sample. Additional research may be needed to unpack the complex relationship between protective behaviours and weight stigma further, including what factors contribute to feelings of weight stigma for PwO specifically in the context of COVID-19.

Theoretical and Pragmatic Implications

The findings from this study have implications for the application of the EPPM to the study of protective behaviours and health behaviours more broadly among PwO. The EPPM posits that when exposed to a message, an individual will first appraise the threat information,

and only if a high level of threat is detected, they will move to the second appraisal (Witte, 1992). Results from the present study indicate that high levels of threat may not be needed to move from the first to the second appraisal. Although PwO reported low threat perception levels, they moved into the second appraisal and reported high response efficacy and self-efficacy levels for the recommended behaviours. These findings indicate it may be possible for individuals to "skip" or be forced to bypass the first appraisal and instead use only their perceived efficacy to form intentions and influence subsequent behaviour.

The theoretical implications outlined above also have pragmatic implications for the design of targeted messages. In contrast to the beliefs of the EPPM, providing threat information may not be the optimal strategy in a health message. Within the context of the current study, self-efficacy was the strongest predictor of intentions. Even when severity and susceptibility are included in the model, they did not predict self-efficacy. If increasing self-efficacy is the best strategy for increasing intentions, there will need to be additional investigation into the optimal strategies for boosting self-efficacy. Strategies for boosting self-efficacy also need to be evaluated in PwO specifically. A systematic review and meta-analysis investigating the relationship between behaviour change techniques and physical activity found only four techniques significantly associated with positive changes in self-efficacy in PwO (Olander et al., 2013). These strategies were action planning, time management, self-monitoring of behavioural outcomes and social support. The same review also found that some behaviour change strategies increased behavioural outcomes, such as an increase in physical activity, but did not increase self-efficacy (Olander et al., 2013). Further research is needed to understand how messages can be designed with optimal strategies to boost self-efficacy. Within the context of COVID-19

protective behaviours, there is a need to further understand strategies for boosting self-efficacy among PwO.

Indeed there is a lack of knowledge around the factors that would influence self-efficacy for protective behaviours and whether these factors can be easily manipulated. When compared to other health behaviours, protective behaviours are relatively simple to perform. For example, physical distancing requires very little effort and is especially easy if one has the capacity (i.e., can work from home) and motivation (i.e., willingness to distance from friends and family). However, the motivation and capacity to perform this behaviour may not be easy to acquire or increase with strategies designed for other health behaviours. Traditional strategies for boosting self-efficacy like action planning and time management may not apply to all of the protective behaviours. There are also various social contextual factors that might affect self-efficacy and render the traditional strategies for increasing self-efficacy ineffective. For example, although someone might be motivated and have high intentions to engage in physical distancing if they are working a frontline job or rely on public transportation strategies like creating a plan will not help them to perform protective behaviours. While there is not a simple solution for some of the barriers encountered when trying to engage in protective behaviours, these are important considerations for creating health messages and future research.

When designing health messages, there also needs to be considerations made for weight stigma. The results from this study indicate that regardless of the message content, PwO experience and internalize weight stigma differently. When designing studies to evaluate the impact of health messages, there may be a need to look at a change in stigma to control for individuals with a higher or lower baseline level of stigma due to past experiences. The results from this study highlight that as researchers who are not part of this community and do not

experience weight stigma and discrimination, there needs to be greater input from PwO when creating messages. Working with PwO is an important step that is needed to create messages that address their needs and provide the information that is important to their community.

Limitations and Future Directions

The present study is not without limitations. Firstly, the data collected in this study were entirely self-report. As a result, participants in this study may have been impacted by recall bias. This is important to consider as the primary variable of interest (i.e., protective behaviours) required participants to reflect on their adherence over the past seven days. Participants in this study may have also been consciously or unconsciously responding in a socially desirable way. Since these are behaviours that many national and international organizations recommend, participants may have felt pressure to indicate higher levels of engagement in the protective behaviours.

Another considerable limitation is that the sample for this study was recruited from only one community partner, the WMC. While the WMC has four clinics across southern Ontario, the participant database represents PwO who are currently or have previously received treatment for weight management. These participants may be more health-conscious and have higher levels of health-seeking behaviour when compared to other PwO. As a result, this sample of PwO may have higher levels of protective behaviours compared to a sample of PwO that have not previously received or are not currently receiving weight management treatment. The participants in this sample also reported levels of testing for COVID-19 (27%) that were lower compared to the general Ontario population in January – May 2020 (64% for females and 36% for males; Stall et al., 2020) but were much higher than the general Canadian population (2-9%; Lapointe-Shaw et al., 2020) in March – April 2020. However, the results from these studies may

need to be interpreted with caution as factors such as the time during the pandemic when the data were collected, availability of testing, and eligibility criteria that may have impacted the accessibility of COVID-19 testing. Findings from the present study may be generalizable to PwO that live in Ontario, but not to PwO that live in other provinces and face different circumstances. The percentage of participants that received a COVID-19 test may also reflect the time during which the data for this study were collected and may reduce the generalizability of these results to other timepoints during and after the pandemic.

Another significant limitation is the homogeneity of the sample, which is especially evident when looking at the sociodemographic breakdown. The study sample was mostly women who were university or college-educated and were White, which is not representative of the underlying population. Participants were also mostly retired or working from home and had limited experiences with COVID-19, including being tested or knowing someone with COVID-19. Working from home or being retired may have increased the ease of some protective behaviours, such as hand washing, physical distancing and reducing non-essential trips outside the household. The lack of personal experiences with COVID-19 in the sample may also help to explain why PwO generally did not report high levels of susceptibility and severity of COVID-19. The majority of the participants in this sample also reported having an annual household income greater than $45,000, with the largest percentage of the sample reporting an income greater than $100,000. As mentioned previously, the relationship between SES and COVID-19 is quite complex and can significantly influence adherence to protective behaviours. This sample does not represent PwO from a lower SES and the barriers they may face during COVID-19 when trying to engage in protective behaviours. As such, the results from this study may not be

generalizable to all PwO and may represent a sub-section of the population with higher adherence to protective behaviours.

The methodology used in this study is another limitation. This study was cross-sectional in nature, meaning the data were collected from each participant at one specific timepoint during the pandemic. This study design could not account for changes in adherence to protective behaviours and EPPM constructs that may have occurred throughout the pandemic. As this study only employed quantitative methods, the data collected could not capture unique patient-centred information, which may have provided insight into intersectionality and other barriers and facilitators to protective behaviours. Specifically, when looking at variables like weight stigma, depending on previous experiences with weight stigma and levels of internalized weight stigma, PwO can respond differently to stigmatizing information (Hayward et al., 2018). Although quantitative questionnaire items provided an estimate of weight stigma, the role of factors such as past experiences and internalization may require further exploration in this population.

Finally, a substantial limitation was the simplification of the operationalization of PwO (i.e., using BMI $\geq 30 kg/m^2$), as there is much more nuance to obesity than what is captured by BMI. Obesity is a disease characterized as a chronic, progressive and relapsing condition (Bray et al., 2017). While this study and many other conducted during the COVID-19 pandemic have simplified PwO to be defined by BMI, there may be variability in health perception and risk within the same weight status. This may include a subset of PwO identified by BMI that are healthy compared to a subset of PwO with similar BMI that may have comorbidities that influence COVID-19 outcomes. Adherence to protective behaviours may therefore be impacted by perceptions of risk informed by individual health status, not by BMI as the present study has assumed. The results from this study may be limited as the sample collected was only defined by

BMI and did not consider the comorbidities or other circumstances that may impact how PwO view themselves and their health status.

Future studies may benefit from utilizing strategies to diversify the recruitment of PwO. This may include strategies to recruit PwO that are not currently or have previously attended a weight management clinic. It would also be beneficial to recruit PwO with more diverse ethnic origins and socioeconomic statuses. An important consideration for future studies is also the operationalization of obesity, which would benefit from the inclusion of other metrics in addition to BMI, such as waist circumference and comorbidities of the participants. Methodological changes, such as ecological momentary assessment of protective behaviours, may help reduce recall bias and allow for a more accurate depiction of adherence to the protective behaviours. In addition, the collection of longitudinal data would allow for the analysis of patterns of adherence to protective behaviours over time. Collecting data over a period of time may provide further insight into the barriers and facilitators of protective behaviour and what factors influence EPPM constructs. Future studies would also benefit from employing a multi-method approach, such as the inclusion of a qualitative follow-up interview which would allow for a more in-depth exploration of barriers and facilitators of adherence to protective behaviours in this population. The collection of qualitative data may also allow for a more in-depth understanding of the role of stigma in protective behaviour adherence and the complex factors that influence how PwO experience and respond to stigmatizing experiences. Given the significant role of self-efficacy in increasing intentions, future studies may also investigate strategies to boost self-efficacy for protective behaviours in PwO. It may also be of interest to compare the impact of exposure to different types of health messages, such as tailored or framed health messages on intentions and attitudes towards protective behaviours in PwO. This study can also inform the development and

evaluation of targeted messages built around EPPM constructs such as self-efficacy to promote vaccination and ongoing adherence to protective behaviours.

Chapter Five: Conclusion

This study has many implications for health message design and future research. This was the first known study to specifically explore patterns of adherence to protective behaviours in PwO. These preliminary findings may guide future exploration into subsets of this population, such as men with obesity, that may require additional support and motivation to engage in protective behaviours. The results from this study may also inform the design of health messages to promote protective behaviours as well as other public health behaviours (i.e., vaccination) during the ongoing COVID-19 pandemic or future pandemics. Given that self-efficacy was the most significant predictor of changes in intentions to engage in protective behaviours, it may serve as the optimal target for health messages. Response efficacy and attitudes are other constructs that can be targeted as well to increase intentions. Severity information in health messages may also increase intentions indirectly by increasing response efficacy. The findings from this study indicate that targeting constructs that increase intentions may also be beneficial as this construct directly predicts engagement in protective behaviours. The results from this investigation may also provide useful insight for future qualitative work, which will continue exploring factors that impact the efficacy of health messages while further understanding nuances around stigma, socioeconomic and cultural factors for consideration in optimal message design. Specifically, knowledge gained from this study highlights areas of interest when looking at barriers and facilitators of protective behaviours in PwO, such as feelings of weight stigma. This study may also have implications for creating health messages for motivating ongoing adherence to protective behaviours, as well as protective behaviours for future outbreak planning. Finally, the findings from this study may help to inform approaches targeting other at-risk groups and health messaging for other behaviours, such as vaccination and physical activity, which may warrant investigation into the application of the EPPM in these populations.

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Appendices

Appendix A: Letter of Information and Consent Form

Informed Consent Form
Wharton Weight Management (WMC) Clinic Longitudinal Study
COVID-19 Messaging Supplementary Questionnaire

Researchers:
Chris Ardern, Bethune College, York University, E-mail: cardren@yorku.ca
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Purpose of the Research: The study is a study conducted by York University which is intended to understand beliefs about COVID-19 risk. The study is intended to inform the development of messaging regarding COVID-19 risk.

What you will be asked to do: For this study, you will be asked to complete an online questionnaire that will take approximately 15 minutes.

Benefits and Risks and Discomforts: There are no known risks associated with participating in this study. The results of this study may serve to benefit future patients and improve public health messaging regarding COVID-19 risk.

Voluntary Participation: Your participation is completely voluntary, and you may stop participating at any time. Your decision not to volunteer will not influence your current or future relationship or care given at The Wharton Medical Clinic and Weight Management Centre or your relationship with York University.

Withdrawal from the Study: You can stop participating in the study at any time, for any reason, if you so decide. Your decision to stop participating or refusal to answer particular questions will not affect your relationship with the researchers, York University, or any other group associated with this project. In the event you withdraw from the study, all associated data collected will be immediately destroyed if requested.

Confidentiality: All information you supply during the research will be held in confidence, and your name will not appear in any report or publication of the research. Your data will be safely stored on a password-protected computer, and only research staff will have access to this information. Data will be kept for ten years after the last publication, after which it will be securely destroyed, archived or kept for future research. Confidentiality will be provided to the fullest extent possible by law.

Questions About the Research? If you have questions about the research in general or about your role in the study, please feel free to contact Dr. Rebecca Bassett-Gunter (rgunter@yorku.ca)

or Dr. Kuk (jennkuk@yorku.ca). This research has been reviewed and approved by the York University's Ethics Review Board and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, York Research Tower, York University (416-736-5914 or ore@yorku.ca).

Legal Rights and Consent:
I consent to participate in the aforementioned study. I understand the nature of this project and wish to participate. I am not waiving any of my legal rights by participating. Clicking "I consent" below indicates my consent.

I consent | I do not consent

Would you like to be contacted about other research opportunities on weight management or health by the York University research team? □ Yes □ No

If so, please write your preferred contact info (e-mail or telephone number)

Appendix B: Socio-demographics

The following questions will help the researchers to learn more about you.

What is your date of birth?

_____

What is your sex?

- ◯ Female
- ◯ Male
- ◯ Prefer not to answer
- ◯ Not listed (please specify)

Please specify your sex.

_____

What is your height in feet and inches OR meters? For example, if you are 5 feet and 5 inches, please write 5'5'' OR 1.65m (only one is required)

_____

What is your weight in pounds OR kilograms? For example, please write 165 lbs OR 75 kg (only one is required)

_____

Please indicate your highest level of education.

- ◯ Less than high school
- ◯ High school diploma or equivalent
- ◯ College or University degree
- ◯ Master's, Doctorate or Professional degree

Please indicate your current work status. Please select all that apply.

- ☐ Front line worker
- ☐ Laid off/ unemployed (due to COVID-19 related reasons)
- ☐ Working from home
- ☐ Self-employed
- ☐ Full-time
- ☐ Part-time
- ☐ Student
- ☐ Unemployed (due to reasons unrelated to COVID-19)
- ☐ Not listed (please specify)

Please specify your current work status.

_____

What is your ethnic origin? Please select all that apply.

- ☐ African
- ☐ East Asian
- ☐ Central Asian
- ☐ South Asian
- ☐ Southeast Asian
- ☐ West Asian
- ☐ Caribbean
- ☐ Indigenous
- ☐ Central or South American
- ☐ European
- ☐ Oceania
- ☐ Prefer not to answer
- ☐ Not listed (please specify)

Please specify your ethnic origin.

_____

The following questions will ask about your household and the individuals that live in your household.

What type of household do you live in?

- ◯ House/ semi-detached house/ townhouse
- ◯ Apartment/ condo
- ◯ Not listed (please specify)

Please specify what type of household you live in.

_____

How many individuals live in your household?

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6
- ◯ 7
- ◯ 8
- ◯ 9
- ◯ 10
- ◯ 11+ (please specify)

Please specify how many individuals live in your household.

_____

How many dependents live in your household?

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6
- ◯ 7
- ◯ 8
- ◯ 9
- ◯ 10
- ◯ 11+ (please specify)

Please specify how many dependents live in your household.

_____

Please indicate the annual income for your household.

- ◯ Less than $20,000
- ◯ $20,000-44,999
- ◯ $45,000-74,999
- ◯ $75,000-99,999
- ◯ $100,000 or greater

Has your annual household income changed due to COVID-19 related reasons?

- ◯ It has increased
- ◯ It has stayed the same
- ◯ It has decreased
- ◯ Not listed (please specify)

Please specify whether your annual household income has changed due to COVID-19 related reasons.

_____

Which city do you live in?

- ◯ Halton Hills
- ◯ Milton
- ◯ Oakville
- ◯ Burlington
- ◯ Caledon
- ◯ Brampton
- ◯ Mississauga
- ◯ Georgina
- ◯ East Gwillimbury
- ◯ King
- ◯ Whitchurch Stouffville
- ◯ Newmarket
- ◯ Aurora
- ◯ Richmond Hill
- ◯ Vaughan
- ◯ Markham
- ◯ Brock
- ◯ Uxbridge
- ◯ Scugog
- ◯ Pickering
- ◯ Ajax
- ◯ Whitby
- ◯ Oshawa
- ◯ Clarington
- ◯ Toronto
- ◯ Ottawa
- ◯ Hamilton
- ◯ Not listed (please specify)

Please specify which city you live in.

_____

The following questions will ask about some of your media consumption habits.

	Very poor	Poor	Fair	Good	Excellent
How would you rate your knowledge about COVID-19?	◯	◯	◯	◯	◯

What is/are your primary source(s) for COVID-19 related information? Please select all that apply.

- ☐ Television (e.g., news channels)
- ☐ Social Media (e.g., Facebook, Instagram, WhatsApp)
- ☐ Internet (e.g., websites, blogs)
- ☐ Government/ Organizations (e.g., Government of Canada/ Ontario, WHO)
- ☐ Not listed (please specify)

Please specify your primary source(s) for COVID-19 related information.

_____

	Never	Rarely	Sometimes	Very often	Always
How often do you consume media that is related to COVID-19?	◯	◯	◯	◯	◯

Appendix C: COVID-19 Experience

Please answer the following questions.

	Yes	No
Have you had COVID-19?	○	○
Have you ever been tested for COVID-19?	○	○
Has anyone you know personally had COVID-19?	○	○

Appendix D: EPPM Variables

The following items were adapted from the Risk Behaviour Diagnosis Scale. All items are scored on a 5-point Likert Scale (1= Strongly Disagree, 2= Disagree, 3= Neither disagree nor agree, 4= Agree, 5= Strongly Agree) unless otherwise indicated.

Perceived Threat

Susceptibility

Please indicate your agreement with the following statements.

1. It is likely that I will get COVID-19.

1	2	3	4	5
Strongly Disagree				Strongly Agree

2. Compared to a person without obesity that is the same age and sex as me, I am more likely to get COVID-19.

1	2	3	4	5
Strongly Disagree				Strongly Agree

Severity

3. I believe that COVID-19 is a serious health threat for me.

1	2	3	4	5
Strongly Disagree				Strongly Agree

4. Compared to a person without obesity that is the same age and sex as me, COVID-19 is a much more serious health threat for me.

1	2	3	4	5
Strongly Disagree				Strongly Agree

Perceived Efficacy

Response Efficacy

The following questions will ask you about some protective health behaviours that are recommended by the Government of Canada and the Government of Ontario to help reduce the risk of COVID-19.

Hand washing refers to washing your hands with soap and water for at least 20 seconds or using an alcohol-based hand sanitizer when soap and water are not available.

Wearing a face mask refers to the use of any medical or non-medical masks that fully cover your nose and mouth.

Physical distancing refers to maintaining a 2-meter (or 6-foot) distance from others when in public spaces and limiting physical contact, such as handshakes or hugs.

Staying home (whenever possible) means doing your best to avoid public spaces and reducing non-essential travel whenever possible.

Creating a social "circle" refers to safely expanding the number of people that you come into close contact with. This strategy involves establishing a group of individuals (including those from outside your household) who can interact with one another without physical distancing. This also involves creating an agreement to physically distance with anyone that is outside your "circle".

1. If I wash my hands regularly, then I am less likely to get COVID-19.

1 2 3 4 5
Strongly Disagree Strongly Agree

2. If I wear a face mask in public spaces regularly, then I am less likely to get COVID-19.

1 2 3 4 5
Strongly Disagree Strongly Agree

3. If I practice physical distancing in public spaces, then I am less likely to get COVID-19.

1 2 3 4 5
Strongly Disagree Strongly Agree

4. If I stay home whenever possible, then I am less likely to get COVID-19.

1 2 3 4 5
Strongly Disagree Strongly Agree

5. If I create and maintain a social "circle," then I am less likely to get COVID-19.

1 2 3 4 5
Strongly Disagree Strongly Agree

Self-Efficacy

The following questions will ask about how CONFIDENT you are to perform protective health behaviours over the NEXT 7 DAYS.

Over the NEXT 7 days, I am confident I can…

1. I am confident I can wash my hands regularly over the next 7 days.

1	2	3	4	5
Strongly Disagree				Strongly Agree

2. I am confident I can use a face mask in public spaces regularly over the next 7 days.

1	2	3	4	5
Strongly Disagree				Strongly Agree

3. I am confident I can practice physical distancing in public spaces over the next 7 days.

1	2	3	4	5
Strongly Disagree				Strongly Agree

4. I am confident I can stay home whenever possible over the next 7 days.

1	2	3	4	5
Strongly Disagree				Strongly Agree

5. I am confident I can maintain a social "circle" over the next 7 days.

1	2	3	4	5
Strongly Disagree				Strongly Agree

Attitudes

The following questions will ask about your ATTITUDE towards protective health behaviours.

I feel that the recommended protective health behaviours are…

1	2	3	4	5
Bad		Neutral		Good

1	2	3	4	5
Unfavourable		Neutral		Favourable

Intentions

The following questions will ask you about your INTENDED protective health behaviours over the NEXT 7 DAYS.

As a reminder, protective health behaviours are defined as:

Hand washing refers to washing your hands with soap and water for at least 20 seconds or using an alcohol-based hand sanitizer when soap and water are not available.

Wearing a face mask refers to the use of any medical or non-medical masks that fully cover your nose and mouth.

Physical distancing refers to maintaining a 2-meter (or 6-foot) distance from others when in public spaces and limiting physical contact, such as handshakes or hugs.

Staying home (whenever possible) means doing your best to avoid public spaces and reducing non-essential travel whenever possible.

Creating a social "circle" refers to safely expanding the number of people that you come into close contact with. This strategy involves establishing a group of individuals (including those from outside your household) who can interact with one another without physical distancing. This also involves creating an agreement to physically distance with anyone that is outside your "circle".

Over the NEXT 7 days, I INTEND to…

1. Wash my hands regularly

1 2 3 4 5
Strongly Disagree Strongly Agree

2. Use a face mask in public spaces

1 2 3 4 5
Strongly Disagree Strongly Agree

3. Maintain physical distancing in public spaces

1 2 3 4 5
Strongly Disagree Strongly Agree

4. Stay home whenever possible

1 2 3 4 5
Strongly Disagree Strongly Agree

5. Maintain my social “circle”

1 2 3 4 5
Strongly Disagree Strongly Agree

Protective Health Behaviours

The following questions will ask about the PAST 7 DAYS.

As a reminder, protective health behaviours are defined as follows:

Hand washing refers to washing your hands with soap and water for at least 20 seconds or using an alcohol-based hand sanitizer when soap and water are not available.

Wearing a face mask refers to the use of any medical or non-medical masks that fully cover your nose and mouth.

Physical distancing refers to maintaining a 2-meter (or 6-foot) distance from others when in public spaces and limiting physical contact, such as handshakes or hugs.

Staying home (whenever possible) means doing your best to avoid public spaces and reducing non-essential travel whenever possible.

Creating a social "circle" refers to safely expanding the number of people that you come into close contact with. This strategy involves establishing a group of individuals (including those from outside your household) who can interact with one another without physical distancing. This also involves creating an agreement to physically distance with anyone that is outside your "circle".

Over the PAST 7 days, I have regularly...

1. Washed my hands

1	2	3	4	5
Strongly Disagree				Strongly Agree

2. Used a face mask in public spaces

1	2	3	4	5
Strongly Disagree				Strongly Agree

3. Maintained physical distancing in public spaces

1	2	3	4	5
Strongly Disagree				Strongly Agree

4. Stayed home whenever possible

1	2	3	4	5
Strongly Disagree				Strongly Agree

5. Maintained my social “circle”

1	2	3	4	5
Strongly Disagree				Strongly Agree

Fear Control Responses

Defensive Avoidance

1. When I read this information about COVID-19, my first instinct was to do something to keep myself from getting COVID-19
    a. True
    b. False

Issue Derogation

2. When I first read this information about COVID-19, I thought it was exaggerated.

1	2	3	4	5
Strongly Disagree				Strongly Agree

Perceived Manipulation

3. When I first read this information about COVID-19, I felt it was manipulative.

1	2	3	4	5
Strongly Disagree				Strongly Agree

Appendix E: Weight Stigma

1. Reading this information about COVID-19 made me…
    a. Feel anxious about having obesity because of what people might think of me

1	2	3	4	5
Strongly Disagree				Strongly Agree

    b. Wish I could drastically change my weight

1	2	3	4	5
Strongly Disagree				Strongly Agree

    c. Believe that society's prejudice against people with obesity is unfair

1	2	3	4	5
Strongly Disagree				Strongly Agree

Appendix F: Health Message

The following information is related to COVID-19. Please review the information below and answer the questions that follow.

COVID-19 is a serious health threat for people with obesity. People with obesity face higher risk and more severe health outcomes as a consequence of COVID-19. There are some things you can do to help reduce the risk of getting COVID-19. Consider washing your hands regularly, wearing a face mask in public spaces, practicing physical distancing in public spaces, staying home whenever possible, and maintaining your social "circle" to reduce your risk! For more tips and strategies you can visit the Government of Canada's COVID-19 webpage: https://www.canada.ca/en/public-health/services/diseases/coronavirus-disease-covid-19.html

1. Is there anything in the above message that you feel would be a challenge for you or which doesn't support your personal circumstances? If so, why? If not, why?

Figure 1

The Extended Parallel Process Model adapted from Witte (1992)

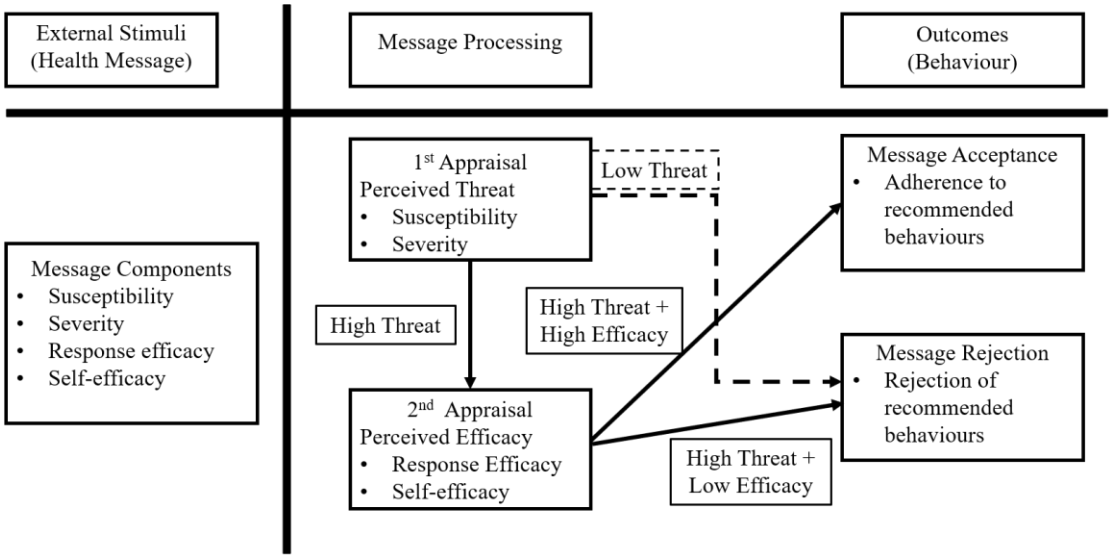
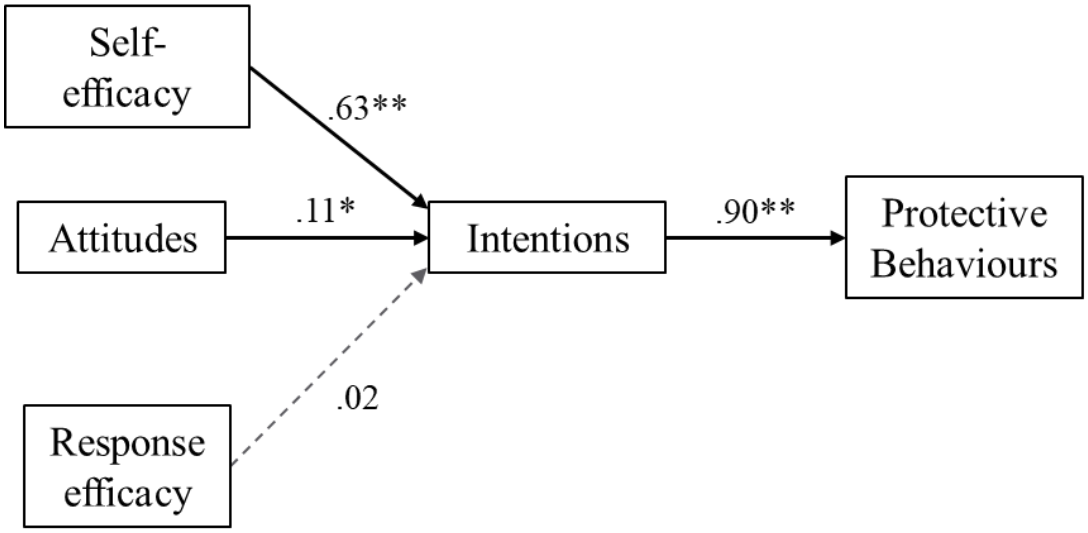


Figure 2

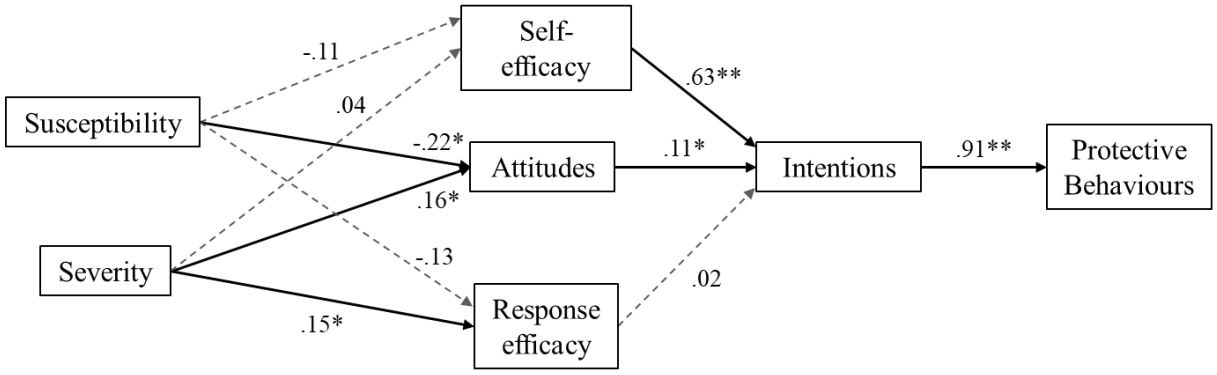
Path Coefficients for Model 1



Note. Significant paths are indicated with solid lines, while non-significant paths are indicated with dashed lines. *$p<.05$, **$p<.001$.

Figure 3

Path Coefficients for Model 2



Note. Significant paths are indicated with solid lines, while non-significant paths are indicated with dashed lines. *$p<.05$, **$p<.001$.