Mental Imagery Interventions to Promote Face Covering Use During the COVID-19 Pandemic: Study Protocol for a Randomized Controlled Trial.

Dominic Conroy (✉ d.conroy@uel.ac.uk)

University of East London <https://orcid.org/0000-0002-7356-2800>

Research Article

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Abstract

Background

The 2020 COVID-19 pandemic has witnessed wide-ranging efforts to minimize the spread of the virus and to protect those most vulnerable to becoming unwell following viral infection. Core COVID-19 preventive measures include social distancing, regular hand washing and wearing face coverings in public places. Understanding links between social cognitive factors relating to beliefs/skills is important in the context of the COVID-19 pandemic, as this can suggest which factors might be targeted via behavior change interventions to promote adherence to COVID-19 preventative behaviors. In this context, mental imagery exercises - self-directed imagining an anticipated outcome or processes linked to a defined behavior/activity - offer a well evidenced, relatively simple behavior change intervention. In the mental imagery intervention reported in this protocol, individuals will be randomly assigned to one of four separate conditions (outcome imagery, process imagery, outcome and process imagery, control).

Methods

The primary objective of this randomized controlled study is to assess the effectiveness of a mental imagery intervention on face covering behavior, as a defined core COVID-19 preventative behavior. Participants will consist of UK-based adults of any age. Participants will be randomized to complete an 'outcome imagery' or a 'process imagery' exercise, both exercises (i.e. a combined condition) or neither exercise (i.e. a control condition). A total of 260 individuals will be recruited into the study. Outcomes for all study condition arms will be assessed at baseline (T1), immediately post-intervention (T2), and at a 1-month follow-up (T3).

The primary outcome is frequency of face covering behavior at T2 and T3. Secondary outcomes include intervention effects on face covering attitudes, social norms, perceived behavioral control and barrier self-efficacy at T2 and T3. Putative moderators of intervention effects are conscientiousness, narcissism and 'light triad' personality traits.

Discussion

This trial will contribute toward the currently sparse evidence base concerning behavior change techniques designed to promote COVID-19 preventative behaviors in general population and targeted settings.

Trial registration

ClinicalTrials.gov (U.S. National Library of Medicine), NCT04583449. Retrospectively registered on 20 October 2020.

Introduction

Background and rationale {6a}

The 2020 COVID-19 pandemic has witnessed wide-ranging efforts to minimize the spread of the virus and to protect those most vulnerable to becoming unwell following viral infection. The three core 'COVID-19 preventive measures' include social distancing, regular hand washing and wearing face coverings in public places [1]. Despite scientific debate around the evidence base in support of using face coverings in the context of the COVID-19 virus [2,3]. The current scientific consensus is that face coverings are an important mechanism for protecting others than face covering wearers themselves, and that even limited wearing of face coverings among the general public is likely to decrease viral transmissibility and, therefore, will save lives [4-6]. The UK government made using face coverings in defined indoor public areas (e.g. on public transport, in shops/supermarkets, in places of worship) a legal requirement in July 2020 and is enforced with potentially substantial fines (up to £6,400/\$8,700) [7].

Behavioral science has already guided understanding of how COVID-19 preventative measures, including face covering adherence, may be predicted. For example, evidence from varied continental settings has suggested threat perceptions may

predict adherence to COVID-19 preventive behaviors [8-11]. Given that face coverings primarily offer protection to individuals other than the wearer, individual threat perceptions and psychological theories concerned with risk susceptibility/vulnerability (e.g. Protection Motivation Theory; the Health Belief Model) may have less predictive utility in the context of the 2020 pandemic. Social-cognitive models have been tested to explain how variability in core beliefs relating to wearing face coverings might predict face covering adherence. For example, measuring whether individual's hold (un)favourable beliefs about wearing face coverings (i.e. attitudes); perceived beliefs held by important others (e.g. friends and family) about wearing face coverings; or an individual's perceived behavioral control or self-efficacy in the context of wearing face coverings [12,13]. Various integrated social cognition models have been assessed as frameworks for predicting COVID-19 preventive behaviors [14-16]. For example, evidence has suggested that greater levels of preparedness to avoid foreseeable obstacles linked to a specific behavior are predictive of increased COVID-19 preventative behavior adherence at one week follow up [14].

Understanding links between social cognitive factors relating to beliefs/skills is important in the context of the COVID-19 pandemic, as this can suggest which factors might be targeted via behavior change interventions to promote adherence to COVID-19 preventative behaviors. At the time of writing few studies have tested interventions designed to elicit behavioral change in the context of COVID-19 preventative behaviors. Unpublished evidence revealed no difference in the impact of five health communication messages each of which emphasized a particular psychological 'lever' linked to COVID-19 preventative behaviors (e.g. self-protection, 'sunk costs' - i.e. energies already invested in fighting the pandemic; disgust at non-adherent behavior or easing cognitive load - i.e. message simplification) [17]. Given this paucity of empirical research exploring behavior change interventions, despite the clear role for behavioral science in the context of COVID-19 preventative behavior, it was of interest to test the efficacy of a mental imagery behavior change intervention. Mental imagery exercises are well evidenced, relatively simple behavior change interventions in the context of behaviors relevant to promoting physical health [18] and have been described by Conroy and Hagger as "self-directed imagining or visualizing specific events, actions or outcomes, including concomitant feelings and responses, with the express purpose of increasing motivation toward a target action or task" (p. 669). Mental imagery interventions involve exercises requiring visualization and may also involve a written component relating to visualized health-related action. Mental imagery exercises can involve focusing on anticipated positive/beneficial outcomes of an action (outcome imagery) or imagery relating to the anticipated strategies/preparation that would be required to successfully execute a pre-defined action (process imagery).

While encouraging adherence to subsequent behavior is the gold standard by which behavior change interventions should be assessed, interventions can also be assessed in terms of their proven capacity to modify social cognitive 'proxies' of behavior including those defined above (e.g. attitudes towards face coverings; skills involved in successfully wearing face coverings where required, etc.). In addition to belief/skill-based factors, variability in an individual's adherence to wearing face coverings varies in association with what 'type' of person that individual is in dispositional terms was also of interest. For example, a relatively conscientious person might be expected to be more likely to routinely wear a face covering to protect nearby others from the risk of viral infection [19]. Accordingly, personality traits relevant to COVID-19 preventative behaviors including 'the light triad' of Kantianism (i.e. treating people as valued in and of themselves), Humanism (i.e. valuing the dignity and worth of individuals) and Faith in humanity (i.e. beliefs that people are fundamentally good) [20] and conscientious, described above, were of interest. However, choosing to wear a face covering (or not) might vary in association with an individual's vanity/egotistical self-image and therefore we will also assess whether/how intervention effects vary in association with narcissism [21].

This paper presents the study protocol for a three-part imagery intervention designed to encourage adherence to COVID-19 preventative behaviors. Participants are prompted to engage in the following three steps. In part 1, participants will be provided with information about the defined COVID-19 preventative target behavior (i.e. wearing a face covering) as applied to a U.K. cultural context. In part 2, participants will be asked to visualize themselves wearing a face covering (the precise emphasis of this imagery exercise will vary depending on study condition). In part 3, participants will be requested to record specific components derived from completing this imagery exercise (again, precise emphasis depending on condition) in written form.

Objectives {7}

Goals and objectives

Drawing on recent meta-analytic conclusions which have substantiated the value of mental imagery interventions in the context of health behaviors [18] and a template approach for preparing rigorously developed, well designed mental imagery interventions [22], it was planned to develop a theory-based behavioral intervention to promote face covering adherence, and more favourable social cognitions toward face covering adherence, in a UK general population sample. Individuals recruited will be randomly assigned to one of four separate conditions (outcome imagery, process imagery, both outcome and process imagery, control). Participants assigned to an imagery condition will be provided with information about the defined COVID-19 preventative target behavior; will be asked to visualize themselves wearing a face covering; and will be requested to record specific features of imagery generated during the imagery exercise in written form. The control condition will receive a health warning message drawn from a pool of standard/representative UK government messages alone (representing a 'usual care' face covering warning control condition). The primary goal of this RCT is to evaluate the efficacy of a mental imagery intervention designed to promote face covering adherence on face covering behaviour at T3. The secondary goal of this RCT is to evaluate the efficacy of the imagery intervention on social cognitions at T2 and T3.

Specific objectives

1. To assess the impact of mental imagery interventions relative to a control condition comparing baseline measures at time 1 (T1) with measures taken immediately post intervention at time 2 (T2); and at a one month follow up at time 3 (T3) relative to T1.
2. To assess more favourable social cognitive indicators of face covering adherence at T2 relative to T1; and at T3 relative to T1.
3. To assess relevant social cognitive factors (e.g. attitudes, normative beliefs, self-efficacy) as mediators of intervention effects on behaviour and cognitions at T2 and T3 (relative to T1).
4. To examine personality traits as moderators of intervention effects at T3.
5. To explore variability in imagery ability (how capable individuals are at visualizing future actions) as a moderator of intervention effects at T3.

Hypotheses

It is hypothesized that individuals assigned to any imagery intervention condition will report, at T2 and T3:

H1. Significantly higher levels of self-reported face covering relative to the control.

H2. Significantly higher intentions to wear face coverings in public places where these are required, relative to the control condition.

H3. Significantly more favourable attitudes, subjective norms, barrier self-efficacy and perceived behavioral control linked to face covering wearing.

H4. Finally, that imagery intervention effects will be conditional on being more conscientious, less narcissistic, and being characterised by higher levels of light triad personality traits.

Trial design {8}

Methods/design

This study protocol is reported in accordance with Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) standard protocol items for clinical trials [23,24].

Design

An experimental, prospective design will be adopted. Participants will be randomized to one of four conditions (outcome imagery; process imagery; outcome and process imagery; control 'face covering warning' condition). Mental imagery interventions will be evaluated against the control condition immediately post-intervention (T2) and at four-week follow-up (T3). The evaluation will adopt a 2 (outcome imagery vs no outcome imagery) x 2 (process imagery vs no process imagery) x 3 (time: T1, T2, T3).

Methods

Participants, interventions and outcomes

Study setting {9}

Setting

This study will take place exclusively in the UK. While differences exist between guidelines and legal requirements across different UK national settings (e.g. in Scotland compared with England) these differences are relatively minor. Restricting focus to the UK alone is important given that government guidelines and restrictions linked to the pandemic as well as the trajectory of the pandemic itself can vary considerably across national settings. The UK has suffered relatively badly during the pandemic with, at the time of writing, over three million confirmed cases of COVID-19, over 305,000 COVID-19 related hospitalizations and over 85,000 deaths associated with COVID-19 recorded since 31st January 2020 [25]. Therefore, restricting the focus of the intervention reported in this article to the U.K. alone, as a national setting on which the impact of the pandemic has been relatively severe, is warranted.

Participants

Participants will be adults aged 18 years or older. All individuals participating in the study will need to reside in the UK at the time of completing both questionnaires (i.e. at T1/baseline and at T3/four-week follow-up). Participants can reside in any national setting in the UK including England, Northern Ireland, Scotland and Wales. Informed consent will be acquired, via a Qualtrics survey interface, immediately before the T1 response.

Eligibility criteria {10}

- UK resident at time of completing questionnaires at baseline (T1) and follow-up (T3)
- Completion of the full questionnaire at both time points
- Satisfactory level of engagement with the mental imagery exercise
- Regular (minimum of 2-3 times per week) exposure to indoor public places where face coverings would be required (under UK law)

Who will take informed consent? {26a}

SPIRIT guidance: Who will obtain informed consent or assent from potential trial participants or authorized surrogates, and how (see Item 32).

[details provided in Section 9 above]

Additional consent provisions for collection and use of participant data and biological specimens {26b}

Not applicable as no additional consent provisions for collection and use of participation data and biological specimens were collected as part of this trial.

Interventions

Explanation for the choice of comparators {6b}

Outcome and process imagery exercises were chosen as the standard variants used in mental imagery intervention studies applied to physical health behaviors. A combination condition (i.e. outcome and process exercises presented in sequence) was included to test (a) whether synergies between imagery exercises effected study outcomes and (b) to assess effects of intervention length on study outcomes. The health message control condition was included on the basis that this is the standard visual/verbal health promotion warning encountered by UK citizens during the pandemic from July 2020 to the time of writing.

Intervention description {11a}

The mental imagery intervention described in this protocol consists of two distinct imagery exercises - an 'outcome imagery' exercise and a 'process imagery' exercise. All imagery materials and written exercises will be hosted via an online questionnaire. Each type of imagery exercise comprises three parts. In part 1, participants will receive information about wearing face coverings in indoor public places. Specifically, imagery condition participants will read the following text defining face covering use in the context of the COVID-19 pandemic: 'In the context of the coronavirus (COVID-19) outbreak, a face covering is something which safely covers the nose and mouth. You can buy reusable or single-use face coverings. You may also use a scarf, bandana, religious garment or hand-made cloth covering but these must securely fit round the side of the face'. In part 2, participants will be asked to visualize themselves wearing a face covering where this is required by UK law (i.e. in indoor public places). The importance of imagining distinctive, personally relevant visual imagery will be underscored in the passage providing instructions to all imagery condition participants. In part 3, participants will be asked to write about the mental images associated with the imagery exercise that they have completed. Participants will be randomized to one of four conditions (outcome imagery; process imagery; outcome and process imagery; control 'face covering warning' condition).

Outcome imagery condition

Outcome imagery condition participants will be asked to visualize themselves successfully wearing a face covering in all required public places/situations over coming week, and to imagine how they would feel (i.e. positive outcomes of having successfully worn face coverings where required to do so). Outcome imagery participants will then be asked to write in a free-text box how they would feel having successfully worn a face covering in required indoor public places/situations over the week ahead.

Process imagery condition

Process imagery condition participants will be asked to visualize the kinds of strategies involved in successfully wearing a face covering in all required public places/situations over the coming week. Process imagery participants will then be asked to write in a free-text box about the kinds of strategies that would be involved in successfully wearing a face covering in all required indoor public places/situations over the coming week.

Combined imagery condition

A third experimental condition will receive both outcome and process imagery exercises to read and complete in sequential order. The sequence will be 'outcome exercise' followed by 'process imagery' for all combined imagery condition participants. Following this sequence for all participants in this condition is based on the rationale that to imagine factors involved in successfully wearing face coverings where required it is intuitive to have first reflected on potential advantages/positive outcomes of doing so.

Control condition

A fourth condition will involve viewing a UK Government public health message circulated on social media as an image concerning the importance of wearing face covering while in public places. This message was selected as a representative online message available on social media (<https://twitter.com/GOVUK/status/1286304635767140352>) in early August 2020

at which time the intervention was under development. The image is representative of UK Government public health guidance on wearing face coverings in public places during the COVID-19 pandemic [7].

Criteria for discontinuing or modifying allocated interventions {11b}

Not applicable as the intervention set-up did not require the facility for participants to be discontinued or for allocated interventions to be modified as part of this trial.

Strategies to improve adherence to interventions {11c}

Not applicable as no strategies to improve adherence to interventions were included as part of this trial.

Relevant concomitant care permitted or prohibited during the trial {11d}

Not applicable as variability in permitted/prohibited concomitant care, to the extent that it meaningfully applies to this intervention, was not monitored as part of this trial.

Provisions for post-trial care {30}

Not applicable as provisions for post-trial care were not made as part of this trial.

Outcomes {12}

All measures will be recorded using the institutional/departmental version of Qualtrics (<https://uelpsyh.eu.qualtrics.com>). The primary outcome measure is self-reported face covering (T3). The secondary outcome measures include face covering intention, attitude, subjective norms, perceived behavioral control and barrier self-efficacy (T2, T3).

Behavioral measure

Self-reported face covering adherence will be measured using a single item based on previously published work [26], and adapted for a UK policy/guidelines context. Participants will read the following text: "In the past week, when you have gone outside your home for work, grocery shopping, or other activities that involved using public transport, visiting shops/supermarkets, being in enclosed public spaces where social distancing may be difficult, or being in public spaces where you come into contact with people you do not normally meet, how often did you wear a cloth face covering that covered your nose and mouth?" and will provide an appropriate response (1=Never, 5=Always).

Psychological measures

Participants will complete belief- and skill-based measures derived from two social-cognitive theories: social cognitive theory [27] and the theory of planned behavior [28]. These theories were appropriate given their centrality to behavioral science research conducted in a public health context to date [29,30] as well as their proven validity in application to viral pandemics as a discrete public health issue [31,32]. All constructs will be measured on multi-item scales derived based on standard psychometric guidelines [33,34]. All self-reported psychological measures will be gauged at T1, T2 and T3. Definitions will be provided in scales where required including definitions of 'face coverings' ("*In the context of the coronavirus (COVID-19) outbreak, a face covering is something which safely covers the nose and mouth. You can buy reusable or single-use face coverings. You may also use a scarf, bandana, religious garment or hand-made cloth covering but these must securely fit round the side of the face*") and 'public spaces where this is required' ("*on public transport; in shops and supermarkets; in enclosed public spaces where social distancing may be difficult; in public spaces where you come into contact with people you do not normally meet*").

Intention

Intention to wear face coverings where required will be measured by presenting participants with the stem 'Over the next week, wearing a face covering while in public spaces where this is required is something...' followed by three items (e.g. I intend to do). Responses will be provided on 5-point scales (1=Strongly disagree, 5= Strongly agree).

Attitudes

Attitude towards face covering behavior will be measured by presenting participants with the stem 'Wearing a face covering while in public spaces where this is required over the next week is something...' followed by three pairs of response anchors (e.g. 1=Not worthwhile, 5=Worthwhile).

Subjective norms

Subjective norms will be measured using four items in total. This scale will comprise two injunctive norm items (e.g. 'Most people who are important to me (e.g., friends, family) would want me to wear a face covering while in public spaces where this is required over the next week'); and two descriptive norm items (e.g. 'Most people who are important to me (e.g., friends, family) will be wearing a face covering while in public spaces where this is required over the next week'). Responses to all subjective norm items will be provided on 5-point scales (1=Strongly disagree, 5= Strongly agree).

Perceived behavioral control

Perceived behavioral control (PBC) towards face covering behavior will be measured by three items in total. For one item, participants with the stem 'How much personal control do you think you have in wearing a face covering while in public spaces where this is required over the next week' (1= No control at all, 5=Complete control). For two further items, participants will be preceded by the stem 'For me to wear a face covering while in public spaces where this is required over the next week is' followed by two response options (e.g. 1=Impossible, 5=Possible).

Barrier self-efficacy

Barrier self-efficacy towards face covering behavior are adapted from a 6-item scale reported in previous work [34] and in line with self-efficacy scale construction guidelines [35]. Participants will respond to the stem 'Rate your degree of confidence in wearing a face covering while in public spaces where this is required under the following conditions' followed by six response items (e.g. 'When I feel stressed/frustrated'; 'When accessing my face covering is difficult') and using appropriate response options (i.e. 1=Cannot do at all, 5=Highly certain can do).

Personality traits

Personality trait measures will be taken at T1. Preceding all personality items, participants will read the stem 'Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age'. Participants will then complete scale-specific items as described below.

Conscientiousness

Conscientiousness will be measured using a validated scale [19]. Participants will read a further stem 'Typically, I:', after which they will provide responses to ten items (e.g. 'Am always prepared') including four reverse scored items (e.g. 'Make a mess of things'). Appropriate response options will be used (i.e. 1= Very inaccurate of me, 5=Very accurate of me).

Narcissism

Narcissism will be measured using a scale previously reported elsewhere [21]. Participants will provide responses to 16 items (e.g. 'People always seem to recognize my authority'). Appropriate response options will be used (i.e. 1= Very untrue of me, 5=Very true of me).

Light triad personality traits

Light triads personality traits will be measured using scale reported previously [20]. Participants will complete 12 items in total (4 per trait) relating to Faith in humanity (e.g. 'I think people are mostly good'); to Kantianism (e.g. 'I prefer honesty over charm') and to Humanism (e.g. 'I tend to treat others as valuable'). Appropriate response options will be used (i.e. 1= Very inaccurate of me, 5=Very accurate of me).

Covariates

Demographic measures and COVID-19 related activity

Demographic measures will be collected at T1 including: (i) sex (0=male, 1=female, free text box for other sex); (ii) age (recorded in years); (iii) ethnicity (free text box for self-identified ethnicity); and (iv) occupation (free text box for occupation-related information). An additional measure was included to record recent use of public spaces where COVID-19 protective behaviors would be required by UK law. This measure will consist of three items (e.g. I use public transport on a daily basis) followed by appropriate response options (1=Very inaccurate of me; 5= Very accurate of me).

Imagery ability

Dispositional differences in Imagery ability will be measured an 'imagery fidelity' measure described elsewhere [36]. Participants will read the stem statement: 'When I think about wearing a face covering while in public spaces where this is required over the next week the imagery around this that occurs to me is:' and will then provide responses using four appropriate items (e.g. 1=Not clear, 5= Clear).

Data quality

Three questions were included in the T1 survey to check attentive responding [37,38]. These items will be set up so that a correct response would only be possible following careful reading of the item (e.g. 'please choose option four to ensure you are paying attention'). Participants who did not provide the correct response to these three items will be excluded from the final dataset.

Participant timeline {13}

[The participant timeline is reflected in the SPIRIT diagram included as Figure 1 in this submission]

Sample size {14}

Statistical power and sample size

An a priori power analysis was conducted using G*Power V.3.1 for an ANCOVA model estimating fixed effects, main effects and interactions [38]. A medium effect size ($f=0.25$) with power set to 0.80 and alpha set to 0.01 (adjusted given multiple tests and therefore to control for type I error rate inflation) was sought. Inclusion of six covariates was specified. Power analysis indicated that a minimum required sample size of 254 was required. The study aim is to recruit 520 individuals at baseline/T1 to meet a required sample size of 260 at follow-up/T3 (allowing for 50% attrition).

Recruitment {15}

Recruitment

Participant recruitment will be completed by the first author in collaboration with a research colleague based at another UK Higher Education institution. Participants will be recruited via a university email circular messages to staff and students, and via social media (e.g. Twitter and Facebook posts). Recruitment drives will take place twice each week to maximize the possibility of an even spread of responses throughout the study recruitment phase.

Assignment of interventions: allocation

Sequence generation {16a}

After participants have completed demographic, psychological and behavioral measures at baseline (T1) they will be randomized to the outcome imagery exercise, the process imagery exercise, a combined condition (comprising the outcome and process imagery exercises) or a control condition. Randomization will be conducted via a Qualtrics randomizer features embedded in the T1 survey. The Qualtrics randomizer uses a Mersenne Twister pseudorandom number generator approach which is a widely used approach employed within standard statistical packages (e.g. IBM SPSS, Microsoft Excel). This approach follows a random method by which the randomization sequence cannot be determined until participant assignment has occurred. The researcher team were blind to group assignment throughout the data collection process.

Concealment mechanism {16b}

[details provided in Section 16a above]

Implementation {16c}

[details provided in Section 16a above]

Assignment of interventions: Blinding

[details provided in Section 16a above]

Who will be blinded {17a}

[details provided in Section 16a above]

Procedure for unblinding if needed {17b}

Not applicable as unblinding was not included as a feature within this trial'.

Data collection and management

Plans for assessment and collection of outcomes {18a}

Data collection and management

Participant names will not be included in the dataset and will be assigned a study ID. All data will be downloaded in secure form to institutional cloud services (i.e. OneDrive). All data will be backed-up securely and all data an analysis files will be securely password protected and encrypted. Throughout project activities, data files and printed materials that are no longer required will be destroyed. Email address data will be stored in a separate document in an encrypted folder and will be destroyed once recruitment is completed. Range and consistency checks will be conducted on all questionnaire data promptly by the research team. Because questionnaire data will be collected using a 'Force Response' setting on Qualtrics there will be no missing data for this study. No interim or sub-group analyses are planned.

Ethics and registration

Ethical approval for this research was granted from University of East London Research Ethics Committee on 13th August 2020 (ID: ETH2021-0006). Ethical approval involved producing a Data Management Plan which outlines details and procedures for maintaining participant details confidential, and for secure storage and disposal of study data. The trial design process was methodical, involving iterative stages of development and peer review commentary feedback and, as a result, no protocol modifications are anticipated. However, should protocol amendments be required, institutional ethical amendments will be submitted promptly, and associated trial documentation amended as required in all locations. A public-facing study

protocol is available for this study: 'Mental Imagery to Increase Face Covering Use in UK-based Public Places During the COVID-19 Pandemic' (ClinicalTrials.gov ID: [NCT04583449](#)). Once data collection is completed, supplementary files will be added making a participant-level dataset available to the research community.

Plans to promote participant retention and complete follow-up {18b}

Not applicable as plans to promote participant retention and complete follow-up were not included in this trial.

Data management {19}

[details provided in Section 18a above]

Confidentiality {27}

[details provided in Section 18a above]

Plans for collection, laboratory evaluation and storage of biological specimens for genetic or molecular analysis in this trial/future use {33}

Not applicable as no biological specimens were collected as part of this trial.

Statistical methods

Statistical methods for primary and secondary outcomes {20a}

Planned statistical analyses

Hypotheses stated previously will be tested via a series of ANCOVAs. Intervention condition will be a between-participants variable (outcome, process, combined, control) and time will be a within-participants variable (T1, T2, T3). The primary outcome (face covering behavior) and secondary outcomes (intention, attitude, subjective norms, PBC, barrier self-efficacy) will be assessed as separate dependent variables. Consistent with previous mental imagery interventions, demographic variables will be included as covariates. Where statistically significant time x group interaction effects are demonstrated from ANCOVA analyses, simple effects analyses will be conducted using estimated marginal means. The alpha level will be set at 0.01 for all analyses to control for Type I error rates. Moderation effects of personality traits on study intervention effects will be assessed using the PROCESS software macros (V.3.4) on IBM SPSS (V.26).

Interim analyses {21b}

[details provided in Section 20a above]

Methods for additional analyses (e.g. subgroup analyses) {20b}

[details provided in Section 20a above]

Methods in analysis to handle protocol non-adherence and any statistical methods to handle missing data {20c}

[details provided in Section 20a above]

Plans to give access to the full protocol, participant level-data and statistical code {31c}

[details provided in Section 20a above]

Oversight and monitoring

Composition of the coordinating centre and trial steering committee {5d}

[details provided in Section 20a above]

Composition of the data monitoring committee, its role and reporting structure {21a}

[details provided in Section 20a above]

Adverse event reporting and harms {22}

Adverse event reporting and harms

Risks great than daily living incurred through participating in this trial are not anticipated. As a result, no discomfort or adverse events are anticipated for this study. However, in the study debrief form, participants will be provided with three potential routes for providing feedback (via the lead researcher), and/or for seeking support. Specifically, participants will read the following text: 'If you have any issues that have arisen through participating in this study, you may wish to contact the short-term counselling and psychological therapies team based at (author institution) and you may wish to contact The Samaritans, a national helpline, which is a free, anonymous service on 116 123'.

Frequency and plans for auditing trial conduct {23}

[details provided in Section 22 above]

Plans for communicating important protocol amendments to relevant parties (e.g. trial participants, ethical committees) {25}

[details provided in Section 18a above]

Dissemination plans {31a}

Dissemination plans

The results of project analyses will be published in English language peer-reviewed journals. Academic articles will be authored by the current protocol author and by two collaborators based at another UK-based Higher Education institution. Articles will be disseminated to key stakeholders (academics, public health policy makers and practitioners, non-governmental organizations who might make use of the face covering intervention) immediately following publication. In addition, a report containing study results using non-technical language will be produced to circulate to all relevant stakeholders. Contact details for requesting study results will be made available on study materials (i.e. the information sheet and debrief page). Trial materials will be available online via ClinicalTrials.gov.

Discussion

The purposes of the mental imagery intervention described in this protocol is, primarily, to increase adherence to a defined COVID-19 preventative behavior (i.e. wearing face coverings on all occasions in public places where this is legally required). The secondary purposes of this protocol-defined intervention is to encourage more favourable intentions, attitudes, subjective norms, perceived behavioral control and to enhance barrier self-efficacy as a result of being allocated to the intervention (vs. allocation to a control condition). The broader aim is to develop the evidence base for behavioral science and behavior change techniques applied to the context of COVID-19 preventative behaviors and COVID-19 preventative social cognitions in the interests of safeguarding public health from the harms posed by the spread of the virus.

Expert opinion from the Scientific Pandemic Influenza Group on Behaviours (SPI-B) has informed the UK's Scientific Advisory Group for Emergencies (SAGE) on how behavioral science can help encourage COVID-19 adherent behaviors among specific demographics. For example, a previous SPI-B report has highlighted the need for discrete interventions designed to target young people with behavioral adherence health messages focused on varied factors including informing/educating but also on presenting messages which "enable positive behaviours" (e.g. how face coverings should be worn) [40]. A great advantage of mental imagery interventions is that they hold the possibility of strengthening links between thought and goal-directed

action [41] potentially involving a neural basis whereby the rehearsal of actions helps foster more consistent subsequent behavior [42]. The intervention described in this protocol is designed to target key theoretical determinants related to health-adherent behaviors involving beliefs/skills and will, therefore, also contribute to theoretical understanding through developing the evidence base relating to effective strategies to promote health behavior change. Such evidence will form an important component part of efforts to understand how behavioral science can contribute to controlling the spread of COVID-19 both in the general population and in target regions/demographics of concern.

Finally, we acknowledge the trade-offs involved in deciding on the focal parameters of the current study. A key strength of the study is that it adopts a factorial approach in which different kinds of mental imagery intervention – i.e. outcome imagery exercises, process imagery exercises, both in combination – will be tested in the context of adherence to wearing face coverings. Another strength is the range of theory-based social cognitive outcomes assessed in the intervention. By gauging this range of belief- and skill-based outcomes it will be possible to develop understanding of the motivational pathways involved in successfully intervening in the context of COVID-19 preventative behaviors. A limitation of the planned study is the focus on a single behavior change technique (BCT) intervention. There are many interventional strategies incorporating defined BCTs which would apply to promoting wearing face coverings as a defined COVID-19 preventative behavior including implementation intentions [43], self-monitoring and providing opportunities for social comparison [44-46]. Aligned with commentary in the behavioral science literature it is also acknowledged here that wide ranging structural and cultural factors beyond intra-individual (e.g. motivational, dispositional) factors are involved with COVID-19 adherent behaviors including moral decision-making, leadership and stress and coping [47,48]. On this basis, a mental imagery intervention could only realistically be employed as one component of a broader coalition of interventional approaches designed to address psychological, social and systematic/cultural factors. These areas of discussion notwithstanding, the paucity of any high-quality research in this area supports the focus on a single intervention in depth rather than multiple interventions in comparison at the current time. Should evidence support the mental imagery intervention described in this protocol, it will be important to apply the intervention to clustered COVID-19 preventative behavior (e.g. wearing face coverings *and* social distancing *and* hand washing) and by comparing effects of different types of behavior change interventional strategies.

Trial status

Enrolment for this study began on 19 August 2020 and will end around 14 April 2021. This study protocol is Version 2.0, dated 9 September 2020.

Abbreviations

[All in-text abbreviations have been defined]

Declarations

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[There are no acknowledgements to make]

Authors' contributions {31b}

DC is the sole author of this protocol and oversaw all aspects of the study.

Funding {4}

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Availability of data and materials {29}

Data and materials will be shared upon request to Dominic E. Conroy, University of East London, London, UK.

Ethics approval and consent to participate {24}

Ethical approval for this research was granted from University of East London Research Ethics Committee on 13th August 2020 (ID: ETH2021-0006). Informed consent will be obtained from study participants.

Consent for publication {32}

Informed consent for this study will incorporate consent for participant data responses to be used in analyses from which report write ups will be submitted for publication.

Competing interests {28}

The author declares that he has no competing interests.

Authors' information (optional)

School of Psychology, University of East London, Arthur Edwards Building, Water Lane, Stratford, London, UK, E15 4LZ.

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Figures

	Enrolment	Baseline (T1)	Post- intervention (T2)	1-month follow-up (T3)
ENROLMENT:				
Eligibility screen	X			
Informed consent	X			
Allocation		X		
INTERVENTIONS:				
<i>Outcome imagery</i>
<i>Process imagery</i>
<i>Combined imagery</i>
<i>Health warning control</i>
ASSESSMENTS:				
<i>Demographics</i>		X		
<i>Covid-19 related activity</i>		X		X
<i>Self-reported face covering adherence</i>		X	X	X
<i>Intention</i>		X	X	X
<i>Attitudes</i>		X	X	X
<i>Subjective norms</i>		X	X	X
<i>Perceived behavioural control</i>		X	X	X
<i>Barrier self-efficacy</i>		X	X	X
<i>Personality traits</i>		X		
<i>Imagery ability</i>		X		X

Figure 1

Standard Protocol Items. Recommendations for Interventional Trials (SPIRIT): Schedule of enrolment, interventions, and assessments for trial of mental imagery about wearing face coverings