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Comparing cognitive-behavioural psychotherapy and psychoeducation for non-specific symptoms associated with indoor air: a randomised control trial protocol

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ABSTRACT

Introduction: Indoor air-related conditions share similarities with other conditions that are characterised by medically unexplained symptoms (MUS)-a combination of non-specific symptoms that cannot be fully explained by structural bodily pathology. In cases of indoor air-related conditions, these symptoms are not fully explained by either medical conditions or the immunological–toxicological effects of environmental factors. The condition may be disabling, including a non-adaptive health behaviour. In this multifaceted phenomenon, psychosocial factors influence the experienced symptoms. Currently, there is no evidence of clinical management of symptoms, which are associated with the indoor environment and cannot be resolved by removing the triggering environmental factors. The aim of this study is to compare the effect of treatment-as-usual (TAU) and two psychosocial interventions on the quality of life, and the work ability of employees with non-specific indoor air-related symptomatology.

Methods and analyses: The aim of this ongoing randomised controlled trial is to recruit 60 participants, in collaboration with 5 occupational health service units. The main inclusion criterion is the presence of indoor air-related recurrent symptoms in ≥2 organ systems, which have no pathophysiological explanation. After baseline clinical investigations, participants are randomised into interventions, which all include TAU: cognitive-behavioural psychotherapy, psychoeducation and TAU (control condition). Health-related quality of life, measured using the 15D-scale, is the primary outcome. Secondary outcomes include somatic and psychiatric symptoms, occupational factors, and related underlying mechanisms (ie, cognitive functioning). Questionnaires are completed at baseline, at 3, 6 and 12-month follow-ups. Data collection will continue until 2017. The study will provide new information on the individual factors related to indoor air-associated symptoms, and on ways in which to support work ability.

Ethics and dissemination: The Coordinating Ethics Committee of the Hospital District of Helsinki and Uusimaa, Finland, has granted approval for the study. The results will be published in peer-reviewed journals.

Trial registration number: NCT02069002; Pre-results.

Strengths and limitations of this study

- Evidence-based treatments that may effectively reduce indoor air-associated medically unexplained or functional symptoms, and support the health-related quality of life are urgently needed.
- We use manualised treatments for the condition.
- The study protocol is carried out with occupational health services through multicentre collaboration.
- Difficulties in the recruitment process may challenge the implementation of the study.
- The length of the follow-up may lead to participant drop out.

INTRODUCTION

Medically unexplained or functional symptoms (MUS) consist of a combination of symptoms without pathophysiology.[1–4] These non-specific symptoms may occur concurrently with similar disease symptoms and in various organ systems, including respiratory systems.[5 6]

A combination of indoor air-associated symptoms, including respiratory, mucosal and skin, as well as general symptoms, are common in non-industrial work environments.[7] In some patients, symptoms persist despite building up remediation or removal of the factors that provoke indoor air symptoms;[8–13] these are not explained by either asthma or other medical conditions, and thus remain medically unexplained.[8 13]

In addition to MUS, non-specific chronic symptoms associated with indoor air overlap with the idiopathic environment intolerance (IEI) proposed by the International Programme on Chemical Safety (IPCS).[14] IEI is defined as multiple, recurrent symptoms associated with various environmental factors that are generally tolerated at low levels, as well as with significant lifestyle or functional impairments related to these symptoms.[14–16] Both functional symptomatologies and IEI may lead to considerable disability and diminish the quality of life.[17]

Psychological factors such as cognitive functioning, perceptions of health outcomes, and emotional issues are associated with poorer physical health outcomes[18] and combine with MUS and IEI. Illness perceptions and worry, for example, have been shown to lead to higher symptom reports in chronic diseases, such as asthma,[5 19] in concordance with MUS[20–22] and IEI.[23 24] Challenging these dysfunctional illness perceptions may improve health outcomes.[18] As in the treatment of chronic medical disorders, such as asthma, individual factors related to health behaviour[25] must be taken into account in indoor air-related symptomatology.

Moreover, in MUS, predisposing factors (ie, negative affectivity and early life experiences) and perpetuating factors (ie, cognitive processes including external or a monocausal attributional styles, illness worry and rumination, illness behaviour and emotional distress) are related to symptom maintenance.[26–28] These factors interact with prolonged physiological activation to produce symptoms of chronic stress.[29] The findings also support the hypothesis that worry and perseverative cognition are related to the enhanced activity of physiological markers that act directly on somatic symptoms, including pain, coughing and breathing difficulties.[30] The vicious circle of cognitive, behavioural, physical and emotional factors has been shown to predict MUS.[22]

Indoor air-associated symptoms are influenced by physical, psychosocial and personal factors, often through multiple mechanisms.[31 32] Thus, the management of symptoms associated with indoor air requires a multifactorial approach (figure 1). In randomised controlled trials of MUS, cognitive-behavioural interventions, including patient education, activity regulation strategies and illness attribution replacement from monocausal or catastrophising to more adaptive strategies, have shown to be effective for patients suffering from MUS.[27 33–36] The goal of cognitive-behavioural psychotherapy (CBT) is to identify factors that maintain

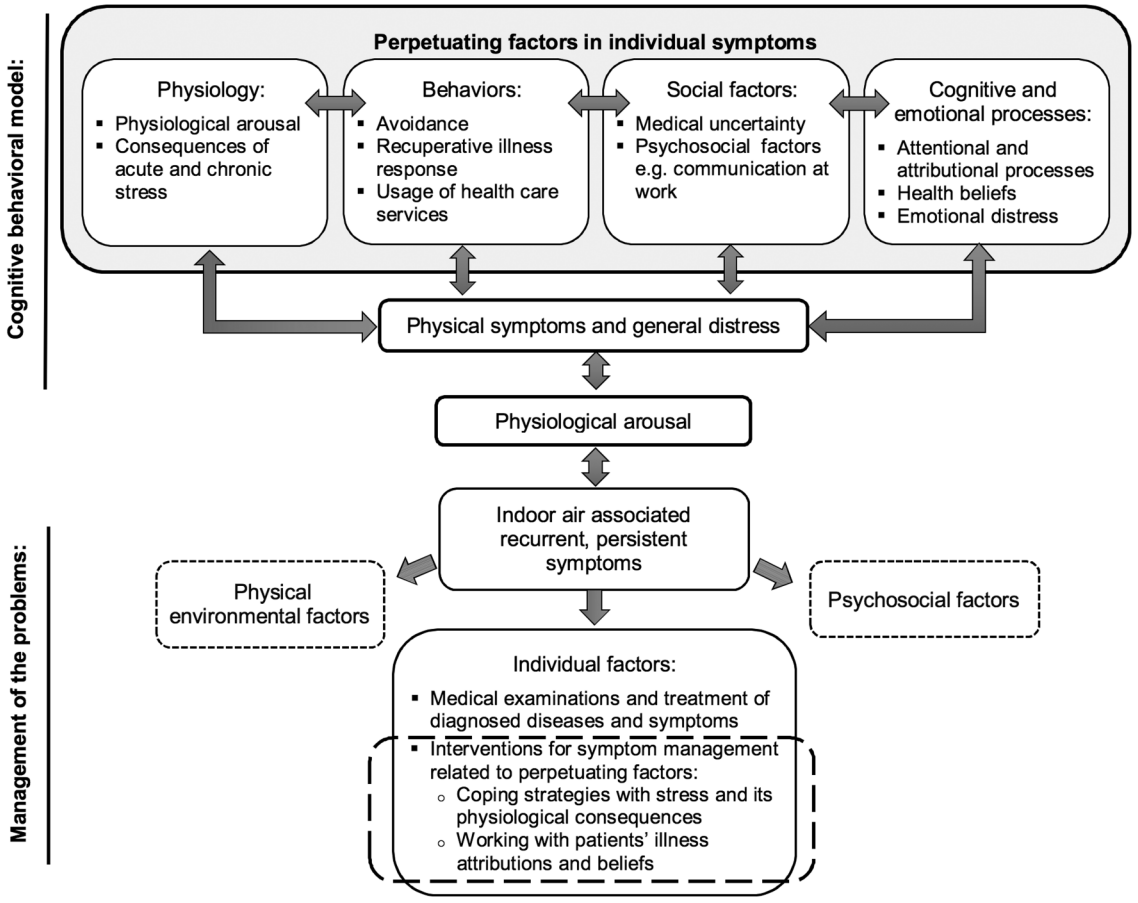

Figure 1 Cognitive-behavioural model of hypothesised cycle of symptom perpetuation (extended after Deary *et al*[27]) and the focus of the present RCT study (encircled). The focus is part of a multifactorial approach to managing symptoms associated with indoor air. RCT, randomised controlled trial.

symptomatology, and support adaptive attributional styles and patient strengths so that quality of life is mediated via better health behaviour and symptom regulation. In addition, a relaxation technique called applied relaxation (AR)[37] has shown to be effective in reducing physiological arousal related to stress through relaxation and support of stress management.[38] So far, information regarding effective treatment options for indoor air-associated persistent symptomatologies is scarce.[13 39]

In this study, we hypothesise that non-specific symptoms associated with indoor air share features with MUS, and could be treated according to similar principles. In our previous study, tertiary care patients with symptoms associated with indoor air that had features of MUS did not respond to limited counselling.[13] A plausible explanation might have been the long symptom history, which requires more intensive interventions. The aim of the present clinical trial is to investigate the effectiveness of two psychosocial treatments in comparison to treatment-as-usual (TAU) for persistent indoor air-associated symptoms among occupational primary healthcare patients. The primary outcome is improved quality of life. The secondary aim is to investigate whether the treatments decrease patients' overall symptoms and improve work ability, and to identify the psychological factors that affect the patients' responses to the treatment.

METHODS

Study population

The participants of this study are recruited from occupational health service (OHS) units and their eligibility is assessed by an occupational physician (OP) and an occupational health nurse (OHN). The participants must have recurrent multiorgan symptoms that are attributed to workplace indoor air, including respiratory symptoms and disability with no medical explanation. For symptom definition we use the IEI criteria (table 1) according to which the obvious medical diseases and exposure-related factors that could explain the symptoms, and affect the outcome of the intervention are excluded from OHS before enrolment (table 1. Exclusion criteria). Patients enrolled at the Finnish Institute of Occupational Health (FIOH) undergo an additional clinical evaluation of respiratory symptoms to distinguish asthma symptoms from functional respiratory symptoms.

Study design

This study is an ongoing randomised controlled superiority trial (RCT) of three parallel groups. The original

Table 1 Inclusion and exclusion criteria of study

Criteria	Description
Inclusion	
Age and gender	Age 25–58 years, female and male
Symptom definition*	(A) Self-reported symptoms attributed to indoor work environment (non-industrial workplaces) include (1) respiratory symptoms, and (2) symptoms in at least one of the other organ systems, (B) Symptoms recurrently (1) occur in more than one indoor environment, or (2) continue despite measures at the workplace to solve the indoor air problem (eg, work arrangements and/or workplace reparations), and (C) Symptoms are not adequately explained by medical reasons (symptoms are medically unexplained)†
Symptom duration	Onset of recurrent symptoms with disability of ≤3 years before the study
Work	Employed for ≥3 years before the study
Sick leave	At least 1 day of sick leave due to indoor air symptoms during the preceding 6 months
Language	Fluent Finnish (writing/reading/speaking)
Exclusion	
Sick leave duration	≥6 months of sick leave due to indoor air symptoms during the preceding 2 years and currently unable to work
Changes in work	Changes in work (eg, retirement, study leave, pregnancy, etc.) during the study
Medical reasons†	Some serious and/or acute untreated medical disease or illnesses: A. Somatic disease that explains the symptoms (eg, uncontrolled asthma, and/or disease causing disability) B. Psychiatric disorder (depression, moderate or severe; bipolar disorder; psychotic disorders; obsessive-compulsive disorders; eating disorders; and/or severe personality disorders) C. Alcohol and/or drug dependency or abuse D. Developmental disorders
Psychotherapy	Psychotherapy (current or ended during two preceding years)
Other	Patient refusal; not actively participating in work life (retired or unemployed)

*IEI-criteria modified from Lacour *et al*.[15]
†Based on evaluation of occupational physician. Other criteria may also be evaluated by occupational health nurse.
IEI, idiopathic environment intolerance.

study plan included four arms: individual CBT, psychoeducation, TAU and group 'administered' AR. The arm (AR) requiring group formation was excluded from the protocol due to difficulties in the recruitment process (figure 2). The study is carried out by FIOH in collaboration with five large OHS units, including three public and two private enterprises in the district of Helsinki and Uusimaa, Finland. The inclusion and exclusion criteria were piloted in OHS A before enrolment. The participant flow, data collection and intervention programme timeline is outlined in figure 2.

Before enrolling participants for the intervention, the OPs and OHNs participate in a 1–1.5-hour training session led by the researchers (AV, SS). Each recruiter receives a personal recruitment manual including the following: a description of the study procedure, inclusion/exclusion criteria, patient information, informed consent, questionnaire on indoor air factors and arrangements at the workplace and prepaid envelopes for returning the enrolment documents. The manual also contains a non-identifiable inquiry to collect the reasons for refusing to participate in the study despite meeting inclusion criteria. Information letters (eg, in OHS unit and on the intranet) are available for the use of OHS to inform employees and employers of ongoing study collaboration. The researchers are regularly in contact with the recruiters during enrolment in order to maintain the recruitment.

Before informed consent, participant candidates receive oral and written information on the study from

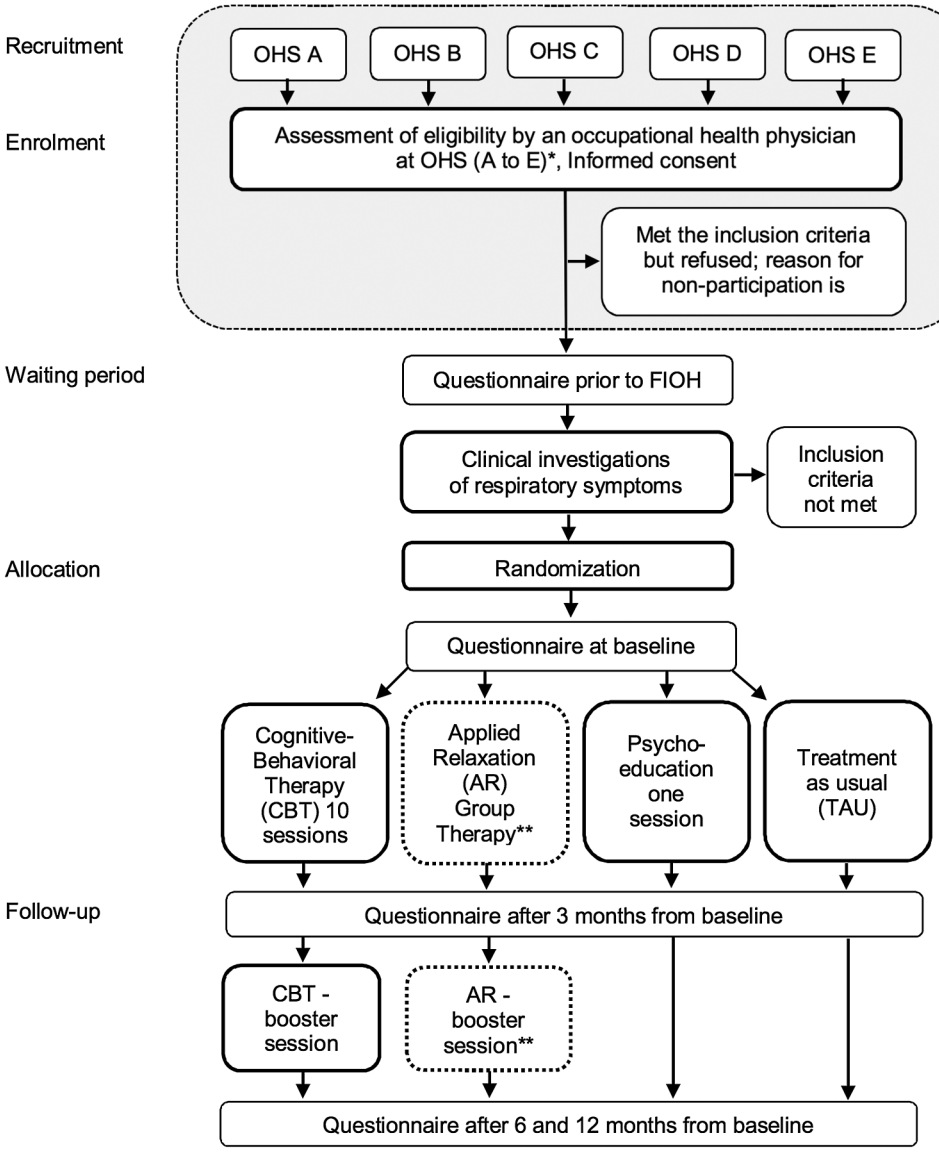

Figure 2 Flow chart of study. *OHS (A to E) join the study consecutively: (A and B) in January 2014, (C) in June 2014, (D) in August 2014, and (E) in March 2015. Participant recruitment began: (A and B) in 24th February 2014, (C) in July 2014, (D) in September 2014 and (E) in May 2015. **AR Group Therapy discontinued during study due to slow, prolonged recruitment process. FIOH, Finnish Institute of Occupational Health; OHS, occupational health service.

their OHS specialists. All recruited participants prefill a questionnaire and attend a medical evaluation of respiratory symptoms at FIOH, which includes a 2-week diurnal measurement of peak expiratory flow and bronchial hyperresponsiveness.[40 41] A respiratory physician (HS) evaluates the results, and each participant receives a report. In cases of uncontrolled asthma or if other exclusion criteria are revealed, the participant is excluded.

Before the participants are recruited, they are allocated into the three arms of the study by preprogrammed randomisation into numerical listing. The groups are stratified to contain participants from different OHS units, workplaces and genders with an allocation ratio of 1:1:1. After the clinical investigations, investigators (SS and AV) allocate eligible participants into either intervention conditions or the control (TAU) conditions that are next in order in listing after stratification. Each group contains 20 individuals. The first author contacts participants by telephone and email to inform them of their allocation after randomisation. During the study, all participants receive TAU based on individual needs from their OHS. Participants are asked for permission to use their medical records for evaluating TAU during the study. They reply to web-based questionnaires through a secure internet connection at baseline, and then at follow-up at 3, 6 and 12 months. The confidentiality of the participants is protected by using an encryption key for personal details in the data.

The participants are recruited during the period from February 2014 to autumn 2016 (the closing date will be decided in early autumn 2016 after recruitment status is updated, and this will be sometime at the end of 2016). The aim was to recruit 80 participants in total. During the first 6 months, seven eligible participants were recruited who constituted 30% of the 6-month aim. During the next 6 months, 11 eligible participants were recruited. After 1 year of recruitment, the low number of participants (N=18) showed that it was difficult to find eligible individuals. Therefore, so as not to overextend the waiting period and logistics of the interventions, the AR group therapy arm of the study was discontinued, and participants were randomised into the two individual interventions and TAU. In May 2015, after agreement with the study steering group (April 2015), and approval from Ethics Committee's for the change in the study plan , the AR arm was removed from study interventions to ensure completion of the study. Thus, the number of recruited participants decreased to a total of 60. The follow-up results are expected 12 months after the last recruited participant enters the study (approximately, in the spring of 2017), and the preliminary results are expected during 2017.

Intervention

The intervention programmes were developed at FIOH on the basis of previously studied intervention protocols for multiple similar symptomatology conditions.[13 33 34 36 38 42] All interventions are described in detail in the intervention manuals (in Finnish). Depending on the participants' approval, all CBT and psychoeducation sessions are recorded for post hoc reliability, and checked to ensure intervention integrity so that the intervention is implemented as intended.[43]

Individual CBT

CBT consists of 10 manualised sessions. The first 90 min introduction is followed by nine 45 min individual sessions at weekly intervals, and the last two sessions at 2-week intervals. One booster session will be conducted 3 months after treatment ends. The sessions include information on stress-related exacerbation of indoor air-associated symptoms and personal health behaviour factors integrated into the patients' own symptomatology; cognitive restructuring behavioural training for patients' health-promoting behaviour at home between the sessions; imagery rescripting; and relapse prevention (table 2). CBT sessions are delivered by three psychologists licensed to be psychotherapists. The psychologists

Table 2 Summary of contents of CBT sessions

Sessions	Contents
1	Treatment overview and description of treatment as intervention focusing on behavioural training and monitoring. Situation analysis, patient's symptoms and establishing rapport. Setting of personal goals for the intervention and filling of first part of symptom-emotion-cognition-monitoring form.
2–3	Discussion on how stress affects patients' health and physiological consequences of stress. Coping strategies for stress and stress decreasing activities. Working with illness worries and symptom-perception interaction.
4–5	Personal strengths and the vicious circle of symptom behaviour. Patient's dysfunctional health and indoor air related beliefs, for example, catastrophising and cognitive restructuring.
6–7	Evaluation of goals, discussion of obstacles that interfere with achieving them. Validation of frustration and support of meaningful activities. Patient stress-reducing techniques and work-related activities.
8–9	Health-related information and discussion on how to react to contradictory information regarding health-related issues. Increased awareness of emotions and how these affect symptom perception.
10	Identifying warning signs that may affect recurrence of symptoms and working with patients to plan future actions if symptoms recur.
11	Follow-up and booster session 3 months after intervention.

CBT, cognitive-behavioural psychotherapy.

had clinical experience of 6–13 years, during which they had undergone 4 years of psychotherapy training (cognitive, cognitive-behavioural and integrative psychotherapy), and had worked as psychotherapists for 0.5–7 years before the study. To ensure treatment integrity,[43] the psychotherapists attended training sessions before the treatment and were supervised during the treatment. Training was arranged by the researchers (AV, SS), and detailed intervention materials, which specified the content of each session (eg, dosage), were provided.

Individual psychoeducation intervention

This is one manualised 90 min individual session delivered by a psychologist (SS) and a specialist in occupational medicine (AV). The intervention includes (1) an overview of the main indoor exposures, (2) general information on the symptoms and health risks associated with the indoor environment, and (3) information regarding factors that affect individual health behaviour and symptom management (table 3).

AR group therapy

The original study plan included an arm with AR group therapy delivered by two psychologists. This consisted of seven manualised face-to-face sessions: one 120 min group session followed by six 90 min sessions, as described earlier.[37 44] The sessions were planned to be delivered at weekly intervals, the last two sessions at 2-week intervals, and a booster session 3 months after the treatment ended. The intervention was intended to include behavioural training focusing on AR techniques, and a discussion of AR as a coping strategy that can be used in cases of acute symptoms, and for symptom and relapse prevention. As described earlier, AR was later removed from the protocol due to difficulties in the recruitment process.

Ethics, data protection and dissemination

The interventions are blind to the data collected and the characteristics of individuals. The confidentiality of the participants is protected by an encryption key to personal data. The key is stored separately. All data are treated and implemented according to national data security laws. The results will be published in a peer-reviewed journal and presented at conferences.

Table 3 Outline of psychoeducation

Session	Contents
90 min	Information and discussion on: ▶ Factors related to indoor air-associated symptoms: environment, risk communication and management of the problems, reflection on individual situation; ▶ Explanation of indoor air-associated symptoms and diseases based on current scientific knowledge; ▶ Physiological consequences of acute and chronic stress; ▶ Stress management: reducing physiological arousal through adaptive activities and decelerating vicious circle of emotion-behaviour-symptom-cognitions.

Outcome measures

The study is designed to evaluate the effectiveness of different psychosocial interventions for the health-related quality of life, measured using the 15D scale as the primary outcome.[45 46] The 15D is a generic, 15-dimensional standardised measure composed of physical, mental and social well-being. The dimensions include mobility, vision, hearing, breathing, sleeping, eating, speech, elimination, usual activities, mental function, discomfort and symptoms, depression, distress, vitality and sexual activity. Each dimension has five grades of severity (1=the highest/best level; 5=the lowest/worst level). In this study, the 15D is used as a single sum score measure with values from 1 (full health) to 0 (dead) as a primary outcome, but a profile can also be presented as descriptive data. In addition, we also measure secondary outcomes such as work ability and job strain, cognitive and emotional functioning and psychiatric symptoms (table 4). Background information, such as medical history and work ability, is also collected. The description and chronology of the assessments are shown in table 4.

Sample size

Sample size was calculated in order to detect a clinically significant difference between the treatment arms in primary outcome measure 15D, the single index score ranging from 0 (dead) to 1 (full health). As a measure of clinical significance, we used a SD of 0.03, as based on a nationally representative standardisation of the 15D scale.[75] According to the power analyses, an estimate of the required sample size is N=20 eligible participants per group. It was assumed that ~30% (one of three) recruited patients would not meet the inclusion criteria when examined at FIOH. It is further assumed that the follow-up attrition will be ≤20%. Thus, to achieve a significance level of 0.05 when requiring 80% power, a sample size of N=17 participants per group is needed to find a clinically significant difference of SD=0.03 in 15D between the arms.

Plan of statistical methods

Before the analyses, the group allocation (TAU, psychoeducation or CBT) will be concealed at FIOH by a researcher who is not involved in the trial. Summary statistics (frequencies, means and SD) of baseline and follow-up data will be analysed and reported. The level of significance will be set at $p<0.05$. Categorical outcomes will be analysed using the χ^2 test or Fisher's exact test. When appropriate, we will use the t-test and the Mann-Whitney U test to compare the baseline and follow-up outcomes of

Table 4 Assessments and their time schedule

Assessment and evaluation method		Time of measurement (months)				
		<0	BL	3	6	12
Primary outcome						
15D instrument*[45 46]	Q		X	X	X	X
Secondary outcomes						
Occupational functioning						
Self-assessed work ability[47]	Q	X		X	X	X
Job strain[48 49]	Q	X				X
Need for Recovery (NRF)[50]	Q		X	X	X	X
Psychiatric symptoms						
Generalised Anxiety Disorder 7 (GAD-7)*[51]	Q		X	X	X	X
Insomnia Severity Index (ISI)*[52], In Finnish[53]	Q		X	X	X	X
The Symptom Checklist-90 (SCL-90)*[54 55] In Finnish[56]	Q		X	X	X	X
The Patient Health Questionnaire (PHQ-9)[57]; In Finnish[58]	Q		X	X	X	X
Cognitive and emotional functioning						
The Acceptance and Action Questionnaire-II (AAQ-II)[59 60] in Finnish, Tuomisto M. 2007 and 2011	Q		X	X	X	X
Illness Worry Scale (IWS)[61 62]	Q		X	X	X	X
Penn State Worry Questionnaire (PSWQ)[63] in Finnish, Tuomisto M. 2002	Q		X	X	X	X
Strategy and Attribution Questionnaire (SAQ)*[64]	Q		X		X	X
Assessment of treatment alliance and satisfaction						
Working Alliance Inventory (WAI)†[65 66]	Q					
Treatment satisfaction‡[67]	Q			X	X	X
Background variables						
Demographics (age, gender, marital status, education)	Q	X				
Clinical characteristics						
Health, diagnosed diseases and medication	Q	X				X
Alcohol Use Disorders Identification Test (Audit)*[68]	Q	X				X
Asthma Control Test (ACT)§[69]	Q	X				X
General symptoms	Q	X	X	X	X	X
Peak Expiratory Flow (PEF)-measurements for 2 weeks[41]	L	X				
Bronchial hyper-responsiveness[40]	L	X				
The Quick Environmental Exposure and Sensitivity Inventory (QEESI)[70]	Q	X				X
Home environment	Q	X				X
Work characteristics and occupational functioning	Q	X				X
The Holmes and Rahe stress scale[71]	Q	X			X	X
Personality and social functioning functions						
Short Five (S5) personality inventory*[72]	Q	X				
The Inventory of Interpersonal Problems (IIP)[73]	Q	X				X
Sense of Coherence (SOC-13)*[74]	Q	X				X

*Psychometric properties of the Finnish population are good.
†In the Cognitive Behaviour Therapy arm, the participants and the psychotherapists fill the Working Alliance Inventory (WAI) after first, fifth and last (10th) session.
‡In the psychoeducation arm, the participants answer the 5-question Treatment Satisfaction questionnaire.
§The Finnish version of the ACT. The ACT is a trademark of Quality Metric Incorporated 2002 GlaxoSmithKline.
BL, baseline; L, medical investigation; Q, questionnaire.

the groups. Analysis of variance or covariance will be used for multiple comparisons of the groups, and for examining changes in the groups. Item-level missing or error values due to coding are not expected because of the computerised forced protocol for the questionnaire. We will use both analysis of study completers and an intent-to-treat-analysis, meaning that each missing value is replaced by the last observed value of that questionnaire to handle drop-out data. Post hoc analysis will be used to evaluate the individual factors related to the effectiveness of the interventions, and additional per protocol analysis will also be conducted. Statistical analyses will use the latest version of IBM-SPSS for Windows (SPSS Illinois, Chicago, Illinois, USA) software.

DISCUSSION

This study examines the efficacy of psychosocial interventions among primary patients with OHS who have symptoms associated with indoor air in multiple organ systems and a disability with no medical explanation. In addition, the study aims to identify the psychological factors that affect the patients' response to the treatment. The focus is to decrease the non-specific

symptoms and disability associated with the indoor environment. Our previous study among tertiary care patients with long-lasting symptoms and disability showed that psychosocial factors also[32] have a substantial influence on the symptoms experienced in indoor environments.[13] This RCT is conducted to provide evidence of the benefit of early intervention for OHS patients. To the best of our knowledge, there are no previous studies in similar settings.

The strength of this study is that the participants are recruited from OHS, which is part of Finland's overall primary healthcare and covers almost 90% of the working population.[76] OHS focuses on preventing work-related diseases, and promotes health and work ability through measures at workplaces. For a great deal of employees, OHS also provides general healthcare and treatment. This enables us to evaluate the usefulness of the psychosocial interventions in the OHS context. In this study, the participants are clinically investigated by the recruiting OPs, and the additional clinical examination at FIOH ensures that there is no medical condition behind the patient's symptomatology and disability. Detailed data of the measures taken at the workplace and the participants' health status are also recorded. The longitudinal follow-up design increases the strength of the evaluation's effectiveness.

The possible health effects of physical, biological and chemical factors in the indoor environment have been extensively studied but, so far, the role of toxicological mechanisms in the real life human exposure situations for these problems has remained ambiguous.[24 77] Along with these indoor environmental factors, it is crucial to understand the patients' illnesses and recovery processes. Compared to the standard treatment for chronic diseases, such as asthma, the results provide evidence of the potential benefit of psychosocial management programmes that measure, for example, asthma-specific quality of life and reduced asthma severity scores.[78 79] Our focus is on individual factors related to the recovery process and outcome.

Certain study limitations deserve attention. Occupational and organisational changes may have an impact on motivation to participate and stay in the study. Possible changes in OHS systems (eg, if the employer changes OHS provider during the study) may also affect the recruiting process. In addition, selection bias may exist if those who volunteer to participate are, for example, more interested in psychosocial treatment than the non-participating employees. Some data show that patients' expectations may affect treatment outcomes.[80 81] On the other hand, 10 CBT sessions, including homework and practising, requires longer commitment to treatment than limited psychoeducation. This might increase the drop-out rate in the CBT group. Moreover, during the waiting period, participants are contacted, clinically examined and randomised; this may have a placebo effect on a patient's condition. This in turn may weaken intervention effects.

In spite of the public concern regarding building related health problems, until now, the study recruitment has been unexpectedly slow. Challenges in recruitment processes indicate that cultural models and the population's attitudes to indoor air-related symptoms need to be evaluated. In biomedical healthcare settings, underestimation of the psychosocial dimensions of the distress associated with somatic syndromes and a patient's fear of stigmatisation may lead to under-treatment of the illness.[82] Moreover, patients with MUS and IEI typically provide monocausal or definitive attribution to environmental or biological factors.[20 28] However, taking only one perspective of these multifaceted phenomena in MUS and IEI cases would diminish effective treatment options, and thus challenge the present study which focuses on improving stress reduction and health behaviour. These societal factors might bias the study population. The participants are chosen using well-defined inclusion and exclusion criteria in order to diminish heterogeneity among the study participants, and to avoid evident confounding factors that may affect the trial. In this study, we compare psychosocial interventions to standard treatment and we can estimate the individual factors related to the effectiveness of the interventions in post hoc analysis within the treatment groups. We cannot, however, examine the effectiveness of the interventions themselves or, for example, determine which aspects (special contents, intervention length, etc) explain the possible differences between the groups.

Our randomised controlled trial will provide new information on the possible beneficial effects of psychosocial interventions on non-specific symptoms associated with indoor air. The results will hopefully improve evidence-based practices that intervene in indoor air-associated symptomatologies.

TRIAL STATUS

This study has been registered at the ClinicalTrials.gov registry (NCT02069002). Patient enrolment began on 24 February 2014, and is planned to continue until approximately the end of 2016 (based on the steering group's decision taken on 6 April 2016). Results from the study are expected in 2017.

ETHICS AND DISSEMINATION

The Coordinating Ethics Committee of the Hospital District of Helsinki and Uusimaa, Finland, has granted approval for this study (number 107/13/03/00/13). The study is registered and data is handled in accordance with the Personal Data Act (523/1999). FIOH is the data controller.

The results will be published in peer-reviewed journals. All results will be reported without any identifiable personal information. Participation in the study will have no effect on the participants' healthcare. Neither OHS nor the participant's employer will receive any information on study participation, or any personal study results.

No side effects or serious risks are expected from participation in psychoeducation or cognitive behavioural psychotherapy. However, if any should occur during the treatment, the participants will be offered individual counselling from the medical person in charge of the study, and be referred for relevant treatment elsewhere, if considered appropriate.

STUDY MONITORING

The research trial procedures will be audited by the steering group every 6 months. The steering group monitors and evaluates data management and if necessary, requests changes to the protocol. If the protocol is modified, the approval of the ethics committee is requested, and the ClinicalTrials.cov registry is informed. All authors will be given access to the cleaned data sets. A separate data-monitoring committee was not considered necessary as the risks to participants were expected to be minimal.

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Collaborators Collaboration was with the following occupational health service units: The Occupational Health Centre of the city of Espoo, Terveystalo healthcare service company (Finland), Mehiläinen Oy healthcare service company (Finland), The Occupational Health Centre of the city of Vantaa, The Occupational Health Centre of the city of Helsinki.

Contributors TP conceived the study idea and finalised the research plan in collaboration with SS, AV, MS, KK, HJ, HS and Christer Hublin. SS provided statistical expertise. SS and AV participated in the recruitment of the OHS. SS and AV are responsible for the management and co-ordination of the study, and questionnaire data collection. SS wrote the first version of the manuscript with AV. TP, MS, KK, HS, and HJ helped in drafting of the manuscript. All authors provided feedback on the drafts, and read and approved the final manuscript. TP is the guarantor of the study.

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Competing interests None declared.

Patient consent Obtained.

Ethics approval The Coordinating Ethics Committee of Hospital District of Helsinki and Uusimaa, Finland approved the trial study protocol and its change in May 2015 (107/13/03/00/13).

Provenance and peer review Not commissioned; externally peer reviewed.

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