

NORWEGIAN UNIVERSITY OF LIFE SCIENCES



Nature contact during working hours; Benefits related to
stress reduction, health and sick leave.

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Master of Public Health 2013

30 credits

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Acknowledgements

First, I wish to thank all the employees participating in the questionnaire, and their management for approving participation in the research.

Due to a maternity leave, the process of working with this master degree thesis has lasted for a long period of time. It has been more challenging and time consuming than I expected, and this makes it satisfying to be so close to reaching the goals. On that occasion, I have many people I wish to thank for their support and good wishes.

I am very grateful to my two supervisors, Ruth Kjørsti Raanaas and Grete Patil at the Norwegian University of Life Sciences. I am thankful for the opportunity to collaborate with such skilled researchers and for your faith in my capability as a researcher. Ruth Kjørsti, I am grateful that you always have been available whenever I needed help! You have given me good guidance through all parts of the process, and I have learned so much about all parts of the research process, including statistical analysis and academic writing, from you. Grete, I am grateful for your help in gathering companies to participate in the research, and for constructive suggestions throughout the research process.

I want to thank my children, Adele and Sander, for brightening up my every day, and for providing a much needed, positive distraction from the master thesis. Further, I want to thank my husband, Anders, for giving me time and space to focus on my thesis, and for support and backup throughout the process. Next, I want to thank my mother, without her babysitter services, I would never have been able to finish my master degree. Finally I would like to thank my husband and mother again, my sister, brother in law, other family members and friends for having interest in my research, provide motivation and practical guidance, as well as helping me to relax throughout the process.

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Abstract

Background: Occupational health research emphasizes the significance of health promotion. Besides emphasis on improving social support, changes in the physical environments like providing nature contact at work through installation of indoor plants, window view to nature and outdoor breaks can be considered as health promoting initiatives.

Objective: To investigate if nature contact at work is associated with less job stress, less subjective health complaints and less sick leave. Further, to study if the possible associations between nature contact and the health outcomes could be explained by the social climate at work, expressed as perceived organizational support.

Method: Data were collected through a web based cross sectional questionnaire survey at seven different office workplaces in southern Norway (n=707, 40 % response rate).

Results: Regression analysis reveal that greater amount of indoor nature contact at work is statistically significant associated with less job stress, less subjective health complaints and less sickness absence. Noteworthy, the associations with job stress and sickness absence is mediated through elevated perceived organizational support while the association between indoor nature contact and subjective health complaints is partly mediated through elevated perceived organizational support. Outdoor nature contact showed no reliable association with the outcomes in this population.

Conclusions: Indoor nature contact at work is positively associated with employee health. The social climate at the work place is an important mediator explaining some of the underlying mechanisms induced by nature contact at work, and this finding is new to the field. This study indicates that extending nature contact in the physical work environment adds to the specter of possible health promoting initiatives in office work places.

This study consists of two parts: An article by Bjoernstad and colleagues (in prep) which is submitted to the journal “Work”, and a thesis. The thesis is extended with a more extensive theoretical background as well as broad methodological considerations.

Sammendrag

Bakgrunn: Arbeidsmedisinsk forskning fremhever betydningen av helsefremmende arbeid. I tillegg til fokus på sosial støtte, kan endringer i det fysiske arbeidsmiljøet som sørger for kontakt med naturen på arbeidsplassen, blant annet ved installasjon av innendørs planter, vindu med utsikt til natur og utendørs pauser, sees på som helsefremmende tiltak.

Mål: Å undersøke om kontakt med naturen på arbeidsplassen er assosiert med mindre jobb stress, mindre subjektive helseplager og mindre sykefravær. Videre, å undersøke om de mulige assosiasjonene mellom kontakt med naturen og helseutfallene kan forklares av det sosiale klimaet på arbeidsplassen, uttrykt som egenoppfattet støtte fra organisasjonen.

Metode: Data ble samlet inn ved hjelp av en web-basert tverrsnittstudie utført ved sju ulike kontorarbeidsplasser i Sør-Norge (n= 707, 40 % svar).

Resultater: Regresjonsanalyser viser at høyere grad av kontakt med naturen på arbeidsplassen er statistisk signifikant assosiert med mindre jobbstress, mindre subjektive helseplager og mindre sykefravær. Spesielt interessant er det at assosiasjonen mellom innendørs kontakt med naturen og jobbstress og sykefravær er mediert via økt egenoppfattet støtte fra organisasjonen. Assosiasjonen mellom innendørs kontakt med naturen og subjektive helseplager er delvis mediert via økt egenoppfattet støtte fra organisasjonen. Utendørs kontakt med naturen viste ingen signifikant assosiasjon med helseutfallene i denne populasjonen.

Konklusjon: Innendørs kontakt med naturen på arbeidsplassen er positivt assosiert med de ansattes helse. Det sosiale miljøet på arbeidsplassen er en viktig mediator som forklarer noe av mekanismene som induseres av kontakt med naturen på arbeidsplassen, og dette er et nytt funn. Denne studien indikerer at å øke kontakt med naturen i det fysiske arbeidsmiljøet hører til blant mulig helsefremmende initiativ på kontorarbeidsplasser.

Denne studien består av to deler: en artikkel av Bjørnstad og medarbeidere (under utarbeidelse), som er sendt inn til tidsskriftet "Work", og en kappe. Kappen er utvidet med en mer utfyllende teoretisk bakgrunn i tillegg til en bred metodologisk drøfting.

Content

Acknowledgement	ii
Abstract	iii
Sammendrag	iv
Figures and tables	vi

1.0 Introduction.....	1
1.1 Workplace health promotion	1
1.2 Nature contact at work as workplace health promotion	2
1.2 Theoretical background.....	3
1.3 Previous findings	5
1.4 Aims of the study.....	6
2.0 Materials and method	9
2.1 Recruiting of workplaces and the included final sample.....	9
2.2 The Nature Contact Questionnaire as a measure of nature contact	9
2.3 The Job Stress Survey as a measure of job stress	10
2.4 The Subjective Health Complaint Inventory as a measure of subjective health complaints	11
2.5 The QPS-Nordic scale as a measure of Perceived Organizational Support	12
2.6 Sick leave	12
2.7 Statistical analysis:.....	13
3.0 Ethical aspects	15
4.0 Results	16
4.1 Summary of main results.....	16
5.0 Discussion	17
5.1 Reliability	17
5.2 Validity.....	18
5.2.1 Statistical conclusion validity	18
5.2.2 Construct validity.....	21
5.2.3 Internal validity.....	24
5.2.4 External validity	26
5.3 Benefits of nature contact at work for stress, health and sick leave	27
5.4 The mediating role of perceived organizational support.....	30
5.4 Implications for further studies.....	32
6.0 Conclusions with implications for practice recommendations	33

7.0 References.....	35
8.0 The article.....	40
9.0 Appendix.....	75
9.1 Appendix 1: The questionnaire	75
9.2 Appendix 2: Example of the invitation letter to participate in the questionnaire.....	86
9.3 Appendix 3: Regional Committees for Medical and Health Research Ethics	87

List of figures and tables

Thesis

Figure 1: Mediation model describing the possible paths for the relationship between nature contact, perceived organizational support and the health outcomes	8
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Article

Figure 1: Mediation model describing the possible paths for the relationship between nature contact, perceived organizational support and the health outcomes	70
Table 1: Demographic variables at the different workplaces	67
Table 2: Zero order correlations, means, range and standard deviations for the variables included in the regression analysis of the association between nature contact at work (NCQ outdoor, NCQ indoor) and job stress (JSS), subjective health complaints (SHC), self- reported sick leave and perceived organizational support (POS) including control variables: gender, age and office type.	68

Table 3: Regression analysis examining the association between job stress, subjective health complaints (SHC) with four subscales, self-reported sick leave, or perceived organizational support (POS) and contact with outdoor and indoor nature contact at work. Model I include gender, age, office type (control variables) and reported contact with outdoor (NCQ outdoor) and indoor (NCQ indoor) nature. In model II POS is added for mediation analysis.

69

1.0 Introduction

Work through employment is a substantial part of the daily lives of the adult population. Employment promotes employee health, but may also foster negative effects (Wilcock 2010). Stress and related health consequences are more prevalent today than in the past, and work is attributed as a primary stressor (Horan 2002, Eiken et al. 2008). Stress, a non-specific response of the body to any demand placed upon it (Selye 1956 in: Küller 1991), rises when there is imbalance between demands and an individual's available coping resources (Lazarus & Folkman 1984). Job stress mediates between an aggregate of demands from workplace factors and diverse immediate and long term outcomes. Perceived stress is found to correlate strongly with subjective health complaints (Wiklund et al. 2012). Subjective health complaints without objective signs or symptoms are today the most common cause of sick leave in Norway, and it covers more than half of the days lost to sickness absence (Anderson 1999, Rikstrygdeverket 2003, Ihlebæk et al. 2004). Days of sick leave in Norway steadily rises (SSB 2011), and the study and promotion of healthy workplaces is thus of most importance.

1.1 Workplace health promotion

Public health is defined as “the science and art of promoting health, preventing disease and prolonging life through the organized efforts of society (Nutbean 1998). Occupational health research in particular, deals with the interactions between people's occupations and related health consequences. Within occupational health research, as well as other areas within public health, it has traditionally been more usual to study the negative associations with health rather than the positive (Wilcock 2010). This tradition is based within the western scientific medical model of health in which health is viewed as absence of disease (Naidoo & Wills 2009). Finding the causes for ill health dominates, and thus an emphasis on finding risk factors and eliminating them. Based within this pathogenic view of health, workplaces traditionally focused on detecting hazards and alleviating health risk factors (Naidoo & Wills 2009).

With the Ottawa Charter for Health Promotion (WHO 1986), health promotion was defined as the process of enabling people to increase control over, and to improve, their health. The

central theme was promotion of health by maximizing the health values of every day settings, including where people work (WHO 1986). Health was described as a positive concept emphasizing social and personal resources, as well as physical capacities (WHO 1986). The focus of health promotion was moved away from prevention of specific diseases towards positive health and well-being of whole populations (Naidoo & Wills 2009). Subsequently, workplace health promotion was broadened to include enhancement of health strengthening factors. This shift is towards a salutogenic approach to health which focuses on why some people remain healthy despite adverse circumstances and exposure to stressors (Antonovsky 1987 & 1996, Naidoo & Wills 2009).

1.2 Nature contact at work as workplace health promotion

Workplace health promotion is today seen as the combined efforts of employers, employees and society to improve the health and well-being of people at work (European Network for Workplace Health Promotion 1997). To counteract possible work related impact on stress, many employers today emphasis on workplace health promotion. Health promoting principles, like enhancing the social climate, have recently become increasingly prevalent in a growing number of workplaces, and a focus on the employee experience has come to the forefront (Mills et al. 2013). Another strategy in health promotion is environmental modification, a physical change to the workplace environment (Largo-Wight et al. 2011a). The importance of environments supportive of health in health promotion was highlighted by the Ottawa Charter for Health Promotion (WHO 1986).

Plants in the office setting is increasingly prevalent (Raanaas et al. 2012), and professional firms that install and maintain plants at office workplaces exists. Purposeful use of nature contact at work, like adding an indoor office plant, or providing windows with natural daylight, may be ways to modify the workplace environment to promote employee health (Largo-Wight et al. 2011a). Nature contact at work has previously been shown beneficial in a few but growing number of empirical studies (e.g. Fjeld 2000, Bringslimark et al. 2007, Evensen et al. 2013), but more in depth studies are needed to develop recommendations for practice. The purpose of this study is to investigate the associations between nature contact at work at office workplaces and employee health outcomes related to stress.

1.2 Theoretical background

The job strain model, commonly called demand-control-support model (Karasek 1979, Karasek & Theorell 1990), is the most cited approach in research on psychosocial workplace factors. The model attributes outcomes such as stress and health to the interaction between work demands, the worker's control over the execution of tasks and other aspects of work (decision latitude) and social support from supervisors and co-workers (Karasek 1979, Karasek & Theorell 1990). Several studies have found the model to predict diverse health outcomes (e.g. Johnsen & Hall 1988, Karasek & Theorell 1990, Kristensen 1996, Dolard et al. 2000).

The Human Environment Interaction Model (Küller 1991) describes the interaction between the person and the environment more broadly. According to the model, stress can be defined as a generalized response to different environmental factors (Selye 1956 in: Küller 1991). The model states that physiological activation at any time is affected by the physical environment, for instance at the workplace, and partly by the social environment and the activities the person engage in. Hence, both work tasks and the physical and social environment at work will contribute to physiological activation, or stress level. Employees with high levels of stress, might, according to Küller (1991), suffer from too high levels of activation. High levels of activation may in the long run lead to adverse psychological, social and even medical consequences (Küller 1991).

Another theory states that the physical environment that we encounter in our direct surroundings can affect our activation level. According to the Stress Recovery Theory developed by Roger Ulrich (1983 & 1999, Ulrich et al. 1991), exposure to natural environments reduces stress through lower levels of activation. His psychophysiological stress reduction theory explains that nature's particular aesthetic appeal in itself evokes positive affect in people. Positive emotions may block negative affect, and hence have a restorative effect in stressful situations. Following this, adding elements of nature to office workplaces may induce positively valued changes in cognition and emotion, which again have positive impact on stress level, health and well-being of the employees (Grinde & Patil 2009). The beneficial effects of natural environments are commonly explained with reference to the biophilia-hypothesis which states that humans as a result of the evolution subconsciously seek connections with natural elements (Wilson 1984). Biophilia could for instance manifest as a desire to have plants in the office environment or an urge to utilize outdoor recreation areas in breaks.

Enhancing the social climate is another way to promote the working environment, and according to the Human Environment Interaction Model (Küller 1991), the social climate and the physical environment are connected. Social support at work refers to overall levels of helpful social interaction available at work from both co-workers and supervisors (Karasek & Theorell 1990). Social relations at work might affect employee well-being through diverse buffering mechanisms between psychological stressors at work and adverse health outcomes related to stress (Karasek & Theorell 1990). Social support may be divided into perceived available social support and the actual support received. Perceived available support refers to a person's own perception of potential access to social support, whereas received support refers to the reported receipt of support, usually during a specific time frame in response to stressful circumstances (Barrera 1986, Uchino 2009). Perceived availability of support is more highly related to positive outcomes related to stress buffering than actual support received (e.g. Uchino 2004 & 2009).

Perceived organizational support, in particular, refers to the extent to which the employees perceive that their organization cares about their well-being and appreciates their contribution (Eisenberger et al. 1986), and thereby the part of social support that refers to overall levels of social interaction at work from supervisors. The topic is well studied by Eisenberg and colleagues, and their research shows that employees' commitment to the workplace is strongly influenced by their perception of the workplace's commitment to them. Perceived organizational support is influenced by the frequency, extremity and judged sincerity of statements of praise and approval from the management and thus depend on the same attributional processes that people use generally to infer the commitment by others to social relationships (Eisenberg et al. 1986). Other rewards such as pay and influence over organizational policies affects perceived organizational support to the extent that they signified the organization's positive evaluations of the employee. Together various aspects of an employee's treatment by the organization form an expectancy in the degree of social support the employee would expect of the organizations in a variety of situations. Higher perceived organizational support leads to more satisfied employees and less absenteeism (Eisenberger et al. 1986, Eisenberger et al 2001, Mills et al. 2013), and the mechanisms behind this are further explained by Eisenberger and colleagues (1986); elevated perceived organizational support raises the employee's expectancy that greater effort towards meeting organizational goals will be rewarded. This is referred to as the effort-outcome expectancy. To the extent that perceived organizational support meets the employee's need for praise and

approval, organizational membership will be incorporated into the employee's self-identity, and a positive emotional bond to the organization develops. Together an effort-outcome expectancy and a positive emotional bond increase the employee's efforts to meet the organization's goals through greater performance and less absenteeism.

Nature contact in office settings may thus promote employee health directly by influencing the employees to help avoid excessive levels of activation and stress (Küller 1991, Ulrich 1983 & 1999, Ulrich et al. 1991), as well as indirectly through elevated perceived organizational support and thus elevated social support.

1.3 Previous findings

Previous studies indicate that different types of nature contact at work is related to less stress and less health complaints. Largo-Wight and colleagues (2011a) utilized a cross sectional questionnaire survey, on a sample of office workers from Northern Florida, to examine the associations between nature contact experienced at work and employee stress and health. They found a significant negative association between nature contact and stress, and nature contact and general health complaints, indicating that as nature contact during working hours increases, perceived stress and general health complaints decreases. Outdoor nature contact, e.g. taking breaks from work outdoor, was significantly associated with both reductions in stress and general health complaints. Indoor nature contact, e.g. access to window with view to outside, was only significantly associated with reduction in general health complaints, and the associations were weaker than those for outdoor nature contact. Findings in a study by Kaplan (1993) indicate that employees with an office window with elements of view to nature felt less frustrated and reported higher overall health. Psychological benefits were not fostered with only window view to built elements, even with no obstruction of natural light. Individuals in windowless offices were found to compensate for the lack of view of nature from their workplace by decorating their offices with indoor plants and pictures of natural landscapes, in a cross sectional questionnaire survey conducted at workplaces in Norway (Bringslimark et al. 2011). No significant association between the presence of plants at the office and perceived stress among the employees were found in the same study, however, the participants reported only moderate levels of stress (Bringslimark et al. 2007). Field studies have reported reduction in health complaints among office workers after installing foliage plants or both foliage plants and lighting that simulates daylight in their indoor working

environments (Fjeld 2000, Evensen et al. 2013). The biggest reduction was obtained for neuropsychological symptoms, e.g. fatigue, feeling heavy headed, dizziness and concentration problems (Fjeld 2000). Experimental studies in laboratories with measurements of biological responses to different workplace environments (e.g. brain waves, finger skin temperature) have revealed that the combination of nature view and plant engendered the lowest mean level of stress as measured by level of alpha activity (Chang & Chen 2005). Among highly stressed women watching flowering geraniums promoted faster and more complete stress recovery than watching non-flowering geraniums or no flowers (Kim & Mattson 2002). A study conducted by Hartig (1993 in Ulrich 1999) suggests that persons with higher levels of stress have the greatest effect of looking at nature settings dominated by vegetation rather than built environment without nature, in terms of positive physiological and emotional changes (blood-pressure recording and emotional self-reports).

To our knowledge, the association between nature contact at work and sick leave is rarely studied. A study by Bringslimark and colleagues (1997), utilizing a cross sectional questionnaire survey, found that the number of indoor plants proximal to a worker`s desk had a small but statistically reliable association with sick leave.

We have not been able to find previous studies examining the associations between nature contact at work and the social climate and social support at the workplace. People-plant relationships in office workplaces, however, have been studied with a qualitative, explorative and inductive case study design by Thomsen and colleagues (2011). Findings include that plants influence the social climate and interaction among the employees. Further, employees look at and maintain ornamental plants at the office setting to relax in stressed situations. In relation to individual well-being, plants influenced general- and physical well-being of the employees, and fostered a relaxed feeling. However, poorly maintained plants generally brought about negative comments and lacked positive impact.

1.4 Aims of the study

Occupational health research emphasizes the significance of health promotion and identifying factors that are positively associated with employee health. Besides emphasis on improving social support, changes in the physical environments, like providing nature contact at work through installation of indoor plants, window view to nature and outdoor breaks, can be considered as health promoting initiatives. The reviewed studies suggest that different types

of nature contact at work can provide benefits such as stress reduction, improved general health and less sick leaves. Nature contact, however, can take many forms, and previous studies have operationalized nature contact differently. The lack of consensus in the field in how to measure nature contact has made previous researchers ask whether the different studies are investigating the same phenomenon (e.g. Bringslimark et al. 2009, Thomsen et al. 2011). In depth information about real-life nature contact in office settings is needed to qualify and guide further research, and to provide recommendation on how to utilize nature contact in design and practice of healthy work places.

Earlier studies examining relationships between nature elements at work and stress have not used stress measures specific to only work related circumstances (e.g. Bringslimark et al. 2007, Largo-Wight et al. 2011a). In the present study we wanted to use a comprehensive measure related to the experience of nature in the workplace setting, and a work specific stress measure. The specific research questions are: is nature contact during work hours related to less job stress, less subjective health complaints and less sick leave among office workers? In addition, we wanted to explore the underlying mechanisms or processes that nature contact at work may induce. Therefore, we examined if eventual associations between nature contact and the health outcomes might be explained by the social climate at work expressed as perceived organizational support. Possible paths for the relationships between nature contact at work and the health outcomes are presented in Figure 1:

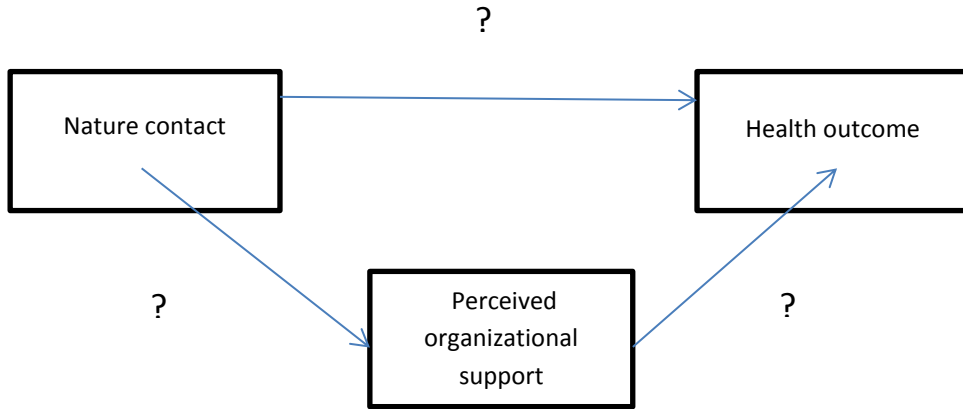


Figure 1: Mediation model describing the possible paths for the relationship between nature contact, perceived organizational support and the health outcomes.

2.0 Materials and method

The data for this study were collected through a cross sectional questionnaire survey conducted at a number of office workplaces in Southern Norway. Materials and methods are described in the article (Bjoernstad et al. in prep). Here, additional information about recruiting of workplaces and the different scales will be presented, as well as an elaboration of some of the statistical analysis.

2.1 Recruiting of workplaces and the included final sample

Ideally, a power analysis, that determines the appropriate sample size needed to achieve adequate power for significant results, should be conducted before a study is performed (Cohen 1992). A power analysis is based on the effect size from similar studies. In line with the method for power analysis we used the effect- and sample sizes from similar studies to guide us in setting a goal for how many employees to include in the study, however a full power analysis was not performed. Previous research and theory have indicated that the associations between the nature contact variables and the outcomes under study could be small. In order to get enough statistical power, we therefor sought to survey as many employees as possible to reach within the limits of the time and resources available to us. We relied on the goodwill of companies to allow their employees to complete the survey during working hours. Companies that previously had taken interested in research within the field of nature contact at work were contacted, as well as a random sample of office workplaces known to the researchers. In the end we were able to send the survey to 1769 employees (40% respond rate N=707 answers). The two most similar studies (Bringslimark et al. 2007, Largo-Wight et al. 2011a) had a sample size of 605 (60.3% respond rate N=385) and 1622 (30% respond rate N=503) employees respectively, so our sample size should be sufficient. See the article (Bjoernstad et al. in prep) for further details about the participants and procedure of the study.

2.2 The Nature Contact Questionnaire as a measure of nature contact

Nature contact at work was measured with The Nature Contact Questionnaire, NCQ (Largo-Wight et al. 2011b). NCQ is presented in detail in the article (Bjoernstad et al. in prep),

additional information about the item development and creation of subscales will now be described.

No previous developed tool to measure everyday nature contact exists, but previous researchers have developed individual questions to measure specific forms of nature contact, for instance availability of windows and number of indoor plants. The creators of NCQ (Largo-Wight et al. 2011b) reviewed the existing literature on the health benefits of nature contact among all populations, and appropriate, previously used items that measured nature contact were adopted and modified. On top of that, additional items were created in order to measure actual nature contact previously shown to promote health. Based on theoretical background and previous finding, the items were organized into one of the three subcategories of nature contact at work defined by the researchers (Largo-Wight et al. 2011b), outdoor nature contact, and direct and indirect indoor nature contact. In addition, a principle component analysis was performed by the inventors of NCQ (Largo-Wight et al. 2011b). Three distinct factors corresponding to the subscales hypothesized after theory was revealed, and these findings provided additional support for the pre hypothesized subscales. However, several items, for instance number of live plants, did not load on any factor although they were expected to do so. The reason why some items did not load on any NCQ factor although they based on theory were expected to, is according to the scale-inventors (Largo-Wight et al. 2011b) unclear, and needs to be further investigated. Live plants were of particular interest to the research group, so we choose to follow theory (Ulrich 1983 in Ulrich et al. 1991) and previous research (e.g. Kaplan 1993, Fjeld 2000, Chang & Chen 2005, Bringslimark 2007, Evensen 2013) rather than the component analysis when we decided which items to include in the subscales in our study (see the article Bjoernstad et al. in prep for details about items in the subscales).

2.3 The Job Stress Survey as a measure of job stress

Job stress was measured by the Norwegian version of the Job Stress Survey (JSS-N) (Spielberger & Vagg 1999, Spielberger & Håseth 2004). See the article (Bjoernstad et al. in prep) for a presentation of the instrument, while some additional information will be provided here. The JSS is a comprehensive instrument developed to assess both severity and frequency of work-related stress in particular. A factor analysis of all the stressor events performed by the test inventors (Spielberger & Håseth 2004) revealed that JSS-N actually measures two

main sources of job stress, namely job press (10 items) and lack of support (10 items), in addition to the combined measure (all 30 items). Job press is described as stress associated with the job itself, while lack of support is described as stress associated with lack of support from supervisors, coworkers or the policies and procedures of the organization. JSS-N may be divided in a total of nine scales describing either separately or combined severity and frequency of the stressor events of the combined measure of job stress, or job press and lack of support in particular. For the purpose of this study we choose to only utilize the total measure of job stress combining severity and frequency of all the 30 stressor events, the job stress index. This decision was taken to avoid the study to be too extensive. Further studies of the same material could explore the other scales as well.

The total job stress index measure was utilized to determine the level of job stress in the group of employees under study compared to the norm data. Perceived organizational support consists of elements of social support related to support from supervisors. Subsequently, both perceived organizational support as a predictor variable, and the job stress index as outcome variable, contained elements of social support related to supervisors, and a certain association is thus expected. To be able to rule out this expected association, the five items in the job stress index related to both severity and frequency of lack of social support from supervisors were excluded from the job stress measure before conducting statistical analysis. The items related to lack of social support from coworkers were still included.

2.4 The Subjective Health Complaint Inventory as a measure of subjective health complaints

Subjective health complaints were measured by the Subjective Health Complaint inventory (SHC) (Eriksen et al. 1999). SHC is presented in the article (Bjoernstad et al. in prep), additional information regarding construction of the subscales will be presented here.

Based on previous applications of the scale and interpretability, the five subscales of musculoskeletal pain, pseudo neurology, gastrointestinal problems, allergy and flu were created by a forced five-factor factor analysis with Varimax rotation (Eriksen et al. 1999). In addition to the total sum score and the sum scores of the subscales, the SHC inventory originally asks of the duration of each health complaints during the last month. In the present study we choose not to include this question, and thus the total score taking both severity and duration into account could not be made. This choice was made to reduce the total number of

items in the survey so it would not be too comprehensive and time consuming to answer for the employees under study. In addition to dichotomization of the answers in the subscales as not having complaints and having complaints, the test inventors recommend calculating mean and 95 % CI of the mean for individuals with scores above zero on each of the subscales (Eriksen et al. 1999). This was not performed in the present study since our goal was to study the associations between nature contact and subjective health complaints rather than an extensive presentation of the prevalence of subjective health complaints in the population under study.

2.5 The QPS-Nordic scale as a measure of Perceived Organizational Support

Perceived organizational support was measured by a sub scale from the General Nordic Questionnaire (QPS-Nordic), a general questionnaire for measuring psychological and social factors at work (Lindström et al. 2000). The sub scale was briefly presented in the article (Bjoernstad et al. in prep). Additional information about the questionnaire follows.

QPS-Nordic consists of 129 questions of which 80, based on factor analysis, compose 26 sub scales (Lindström et al. 2000). For the present study we only included the three questions making up the subscale of perceived organizational support. The subscale was originally named human resource primacy, but for the purpose of this study we choose to rename it perceived organizational support. The reason for this was that we found it difficult to grasp the concept and meaning behind human resource primacy. The same topic is covered more in depth by a survey of perceived organizational support by Eisenberg and colleagues (1986), and the concept of perceived organizational support is more self-explanatory than human resource primacy and thus more easily understood. Ideally we should have utilized the scale by Eisenberg and colleagues, but the QPS-Nordic scale was chosen to avoid the questionnaire to be too comprehensive.

2.6 Sick leave

Sick leave was measured with two single items. See the article (Bjoernstad et al. in prep) for details.

2.7 Statistical analysis:

Statistical methods are described in the article (Bjoernstad et al. in prep). More in depth information about some of the analysis will here be presented.

Our preliminary analysis assessed the normality of the data following guidelines from Pallant (2007). Multicollinearity was used to identify if the independent variables showed some relationship with the dependent variables, and to check that the correlation between the independent variables was not too high (Pallant 2007). In addition the results of the collinearity diagnostics were checked. Two values are the results of the collinearity diagnostics: tolerance, an indicator of how much of the variability of the specified independent that is not explained by the other independent variables in the model, and VIF that is just the inverse of the Tolerance value (Pallant 2007). Tolerance values for the independent variables range from 0,904-0,988, VIF values range from 1,012-1,106, and thus did not violate the Multicollinearity assumption (Tolerance value being less than 0,10 or a VIF value above 10) (Pallant 2007).

The strength and directions of the relationships between two variables was investigated using Pearson`s correlation (r) for continuous variables, and Spearman`s Rank Order Correlations (ρ) if both variables were non-parametric. The correlations presented in the article are bivariate correlations, also called zero-order correlations. The sign in the front of the correlation indicates whether there is a positive correlation, e.g. as indoor nature contact increases, perceived organizational support increases, or a negative correlation, e.g. as indoor nature contact increases job stress decreases (Pallant 2007).

Multiple regression was utilized to investigate how much of the variance in the continuous outcomes; job stress, subjective health complaints total, sick leave days and perceived organizational support that could be explained by each of the nature contact variables, controlling for age, gender and type of office. We utilized the unstandardized regression coefficients, B , as the result from the multiple regression analysis. Precision of the associations (B) were assessed using 95 % confidence intervals. Since all values in the confidence interval will be on the same side of zero whenever an association is significant, a significant finding also allows us to specify the direction of the association (Lane 2013). The sign in front of the B thus indicates whether there is a positive association between the outcome and the nature contact variable, e.g. as indoor nature contact increases perceived

organizational support increases, or a negative association, e.g. as indoor nature contact increases, subjective health complaints total decreases (Tabachnick & Fidell 2007).

On the dichotomized SHC subscales and the doctor assigned sick leave outcome, logistic regression was performed with both nature contact variables as predictor variables, controlling for age, gender and type of office. In this study, logistics regression attempts to model the probability of being in one of the categories of the outcomes (yes or no to doctor assigned sick leave and SHC subscales), when the value of the predictor variable (nature contact variables) increases by one unit (Tabachnick & Fidell 2007). These values are the odds ratios (OR), and describe the strength of the association between the outcomes and the predictor variables (Pallant 2007). Precision of the associations (OR) were assessed using 95 % confidence intervals. Whenever the confidence interval do not contain the value of one, the result is statistically significant at $p < 0.05$ (Pallant 2007). OR below one indicates a negative association, e.g. as indoor nature contact increases, the OR for belonging in the yes category of the SHC subscales or doctor assigned sick leave decreases, while OR above one indicates a positive association (Pallant 2007).

3.0 Ethical aspects

The Regional Committees for Medical and Health Research Ethics evaluated the study, and considered it not to require approval according to the Norwegian Act on medical and health research since the survey was completely anonymous.

4.0 Results

The results from the study are described in the article (Bjoernstad et al. in prep). Only a summary of the main results will here be provided.

4.1 Summary of main results

The Indoor Nature Contact variable has a small, but significant, negative association with job stress, subjective health complaints and days of sick leave in the group of employees under study. These findings indicate that the greater amount of indoor nature contact at work, the less job stress, subjective health complaints, and days of sick leave taken. Noteworthy, the associations with job stress and sickness absence is not direct but mediated through elevated perceived organizational support, while the association with subjective health complaints is both direct and mediated through elevated perceived organizational support.

The Outdoor Nature Contact variable correlates weakly, at most, with the outcomes, and the regression analysis revealed no reliable association with either of the outcomes under study.

5.0 Discussion

This chapter starts with a discussion of methodological considerations focused on reliability and validity. Next, there will be an elaboration of the discussion of the research questions also presented in the article (Bjoernstad et al. in prep).

5.1 Reliability

The reliability of a test scale indicates how free it is from random errors (Pallant 2007). Test-retest reliability and internal consistency are indicators of a scale's reliability. Test-retest reliability- and internal consistency reliability values for the different scales utilized in the study are presented in our article (Bjoernstad et al. in prep). This chapter will only elaborate a few sections concerning low values.

The test-retest reliability of a scale is assessed by administering it to the same person on two different occasions, and then calculating the correlations between the two different scores. High test-retest correlations usually indicate a more reliable scale, but the nature of the construct measured by the scale needs to be taken into consideration (Pallant 2007). Some construct do not remain stable over time, and test-retest reliability is thus likely to be low (Ihlebaek et al. 2004). The low test-retest reliability for the SHC subscale of musculoskeletal pain ($r=0.55$) is a result of a suspected variation in experienced musculoskeletal pain (Ihlebaek et al. 2004). The same variation is not expected in experienced allergy, gastrointestinal problems, or problems within the subscale of pseudo neurology, and the test-retest reliability of these subscales were thus higher (See our article Bjoernstad et al. in prep for details)(Ihlebaek et al. 2004).

Internal consistency, measured by Cronbach's coefficient alpha (α), assesses the degree to which the items that make up the scale are all measuring the same underlying attribute (Pallant 2007). Cronbach's α values ranges from 0-1, with higher values indicating greater reliability, and provide and indications of the average correlations among all the items that make up the scale (Pallant 2007). The Cronbach's α values of both the NCQ subscales are below the standard of $\alpha > 0.7$ (Cortina 1993) on subscales, however, internal consistency may not be a relevant indicator of reliability for the NCQ (Largo-Wight et al. 2011b). Since internal consistency reliability (α) is a measure of the similarity of instrument's items to each

other as measured by average correlations, it is not an appropriate measure to questionnaires that seek to obtain information about the occurrence of unrelated events or behavior (Strickland 1999). Thus, the NCQ measures objective counts of different nature contacts and internal consistency may not be a relevant measure. When internal consistency is inappropriate, test retest is the best reliability indicator (Strickland 1999). Test- retest reliability for the original scales were satisfactory ($r=0.75$, $r=0.9$) (Largo-Wight et al. 2011b, Pallant 2007). Another aspect concerning the Cronbach's α values of the NCQ subscales, is that α values increases with an increasing number of items in the scale (Cortina 1993). The outdoor and indoor nature contact subscales consists of only three and five items respectively, and this might partly explain the low alphas. According to Crocker & Algina (1986), mean inter-item correlation may be a more appropriate estimate of the reliability of small scales, with values in the range of 0.1-0.5 being acceptable. The mean inter-item correlation of the outdoor nature contact scale is 0.13 and of the indoor nature contact it is 0.14, and this is in the lower acceptable range.

5.2 Validity

Validity refers to the truth of, correctness of, or degree of support for an inference (Shadich et al. 2002). Validity is not absolute, but made up by a judgment about the extent to which relevant evidence supports the inference as being true or correct. Usually such evidence comes from both theory and empirical findings, and the consistency of the evidence is important (Shadich et al. 2002).

5.2.1 Statistical conclusion validity

Statistical conclusion validity is the validity of the covariation component of causal inference, and concerns whether the variables of interest covary and if so, how strong they covary (Shadich et al 2002). To address whether the two nature contact variables in the study and the outcomes related to job stress and health covary, a null hypothesis (no relationship between the variables), significance testing was performed. The result was a p-value (probability value) that a difference of the size obtained (or larger) would have occurred by chance in a population of no real difference. It is common to describe a covariance as statistically significant if $p<0.05$, and otherwise nonsignificant. In addition we reported $p<0.01$ and $p<0.001$.

Two types of errors related to the statistical significance of the covariation between the variables may occur, type I error and type II error. A type I error is the incorrect rejections of a true null hypothesis, and the result is a conclusion of relationship between variables that do not exist. Failing to recognize a true relationship of covariation between variables represents a type II error (Shadich et al. 2002). Sample size is related to statistical power (Shadich et al. 2002). Small samples have less statistical power, and more often fail to recognize a true covariance (type II error), while large samples represents greater variability in the observed values, and thus a possible risk of accepting a covariance as significant when it is not (type I error) (Shadich et al. 2002, Bjørndal & Hofoss 2008). Previous research within the field has indicated that the associations between nature contact at work and the outcomes are rather small. In order to get enough statistical power to avoid type II errors, we therefore sought to survey a bigger group of employees than most prior similar studies had done (e.g. Bringslimark et al. 2007, Largo-Wight et al. 2011a).

Effect size and confidence intervals were provided in addition to give information about the magnitude of covariation, and the precision of the estimates of the associations. As Shadich and colleagues (2002) points out, confidence intervals are important to distinguish between situations of low statistical power, and hence wide confidence intervals, and situations with precise but small sizes of the association, the latter which occurred in the present study. In addition to being statistically significant, associations need to be clinically significant (Man-Son-Hing et al. 2002). Clinical significance is often based on cost-benefit analysis that sets the minimal clinical important difference needed to justify the costs involved in implementation of the recommendations under study (Man-Son-Hing et al. 2002). For the present topic it would concern eventual costs of implementing nature contact recommendations up against eventual savings related to improvement in the outcomes related to stress and health, and thus fewer sick leaves. If the costs of utilizing nature contact at work exceed the possible savings, one could argue that the results were not clinically significant, despite statistically significant. In addition, human aspects also belong in cost-benefit analysis so any inconvenience for the employees involved should be taken into consideration, as well as possible beneficial effects besides those directly saving money for the workplace involved (Man-Son-Hing et al. 2002). The associations found in this study are small, but they may still be clinically significant. Adding plants to the workplace environment and open blinds at windows to passively utilize view to nature elements and natural daylight, are cheap and easy to carry out, and may have great practical significance when aggregated over a large number

of employees over a life time of employment. Further studies with suitable design are needed to set the minimum difference needed for clinical importance.

Methodological literature in general recommends avoiding dichotomization of continuous measures since this leads to a restriction in range with subsequent negative consequences for statistical validity, like loss of effect size and power (Shadich et al 2002, McCallum et al. 2002). The data on all the subjective health complaints subscales in the study was skewed with mean scores close to zero. We therefore followed the recommendations by the test creators and dichotomized them (Eriksen et al. 1999). According to McCallum and colleagues (2002), dichotomization may be justified in situation like this where the distribution of a count variable is extremely highly skewed, with a large number of observations at the most extreme score. Nevertheless, such dichotomization still involves a loss of all information about variation among those individual not at the extreme scale point (McCallum et al. 2002). The subjective health complaints total scale was treated as a continuous variable, while the dichotomization of the subscales were well justified, so the loss of statistical validity in the results involving subjective health complaints, is likely not substantial.

Most of the participants answered all the questions in the survey (see Bjoernstad et al. en prep for details), however, some answers were missing. In particular, average hours spent daily on the primary work desk, and the questions in the indoor nature contact scale, had missing values. What to do with missing values is a well debated topic in the methodological literature (e.g. Shadich et al. 2002, Pallant 2007). Following recommendations from Pallant (2007) the exclude cases pairwise option in SPSS was used, meaning that participants were excluded from analysis if the data required for the particular analysis was missing. Substituting missing values with samples mean, or different types of missing modeling were other options, however, these methods either make strong distributional assumptions unlikely to be true in all setting, or rely on additional data not available in this study (Shadich et al. 2002). Since we wanted to investigate possible beneficial links between nature contact at the office workplace and employee health, we in addition excluded the 87 respondents that spent less than four hours on their primary workplace from further analysis. The chosen approach for dealing with missing data, together with the exclusion of respondents that spent less than four hours on their primary workspace, lead to a narrower sample size, and thus a possible weakening of the statistical conclusion validity. The final sample size, however, was still more than sufficient to do the analysis.

Excluding respondents with missing values may also possible lead to loss of information, and subsequently a risk of different results than what would have been obtained if all respondents were included. Many respondents were excluded due to not answering the questions concerning hours spent daily on the primary workspace, or for spending less than four hours daily on their primary workspace. Our target group for the study was office employees that spent most of their time at the primary workspace. The employees excluded for spending less than four hours on the primary workspace, thus anyway do not belong in the target group. One can speculate that this is the case also for the employees not answering this question at all. The reason for not answering this question may be that it is difficult to estimate amount of time due to a type of job where time often is spent outside the primary workspace. The same reason may be relevant for the employees not answering all the questions in the indoor nature contact subscale, here too, the questions are asked in relation to the primary workspace, and is thus not of relevance to employees who spend most of their time outside this space. A large percent of the employees with missing values most likely do not belong in the target group of the study, so missing values is thus likely not a big threat to statistical conclusion validity in this study.

5.2.2 Construct validity

Construct validity of a questionnaire involves making inferences from the sampling particulars to the higher-order construct they represent (Shadich et al. 2002).

The following chapter starts with a brief presentation concerning the construct validity of the scales utilized to measure job stress, subjective health complaints and perceived organizational support. These scales have existed for a long period of time, have frequently been utilized, and have well established norm data (e.g Eriksen et al. 1999, Spielberger & Vagg 1999, Lindström et al. 2000). These facts strengthen the construct validity of these scales.

The norm data for JSS-N is based on a heterogeneous sample of 1025 employees. Compared to the norm group with a mean score of 18.47, our group of employees reported low levels of job stress with a mean score of 11.22 (possible range on the job stress index 0-79.8).

The norm data for SHC is based on a sample of 1240 persons from different professions in Norway. In our sample 81.9 % report having one or more complaints within the subscale of

musculoskeletal pain, and this is almost identical with 80.6 % from the norm group. Compared to the norm group, more employees from the present study reported problems within the subscale of pseudo neurology (76.2 % in the present study, 65.2% in the norm sample). Marginally less employees from the study sample reports gastrointestinal problems (53.6 % compared to 59.8 %), while marginally more employees from the study sample reports problems with allergy (38.5% compared to 33.9 %) (Ihlebak et al. 2004).

The choice of utilizing the QPS-Nordic subscale as a measure of perceived organizational support rather than the more extensive survey by Eisenberg and colleagues (1986) may be a possible threat to the construct validity of perceived organizational support in this study. However, the two scales consist of questions that are closely related, so this choice most likely does not jeopardize the construct validity to a great extent. The norm data for the QPS-Nordic scales is based on results from 2015 respondents from the four different Nordic countries working in various branches (Lindström et al. 2000). Compared to this reference group with a mean score of 2.84, our sample reported higher levels of perceived organizational support with a mean of 3.38 (possible range 1-5). Since the study revealed that perceived organizational support is a mediator between the indoor nature contact variable and the outcomes under study, it would be interesting for further studies to explore these connections further, included utilizing the survey by Eisenberg and colleagues (1986).

A discussion of the construct validity of nature contact in particular now follows. The Nature Contact Questionnaire is a new tool so an evaluation of construct validity is of most importance.

Regarding the Nature Contact Questionnaire (NCQ), construct validity concerns to what degree the questionnaire items are valid measures of nature contact at work. Nature contact can take many forms, and previous studies have operationalized nature contact differently. Studies of benefits of nature contact in indoor work environments have focused on indoor plants alone (Fjeld 2000, Kim & Mattson 2002, Bringslimark et al. 2007, Thomsen et al. 2011), a combination of plants and window view or natural light, comparable to the indoor nature contact measure in this study (Evensen et al. 2013, Chang & Chen 2005, Kaplan 1993), or a combination of both outdoor and indoor nature contact during working hours as in this study (Largo-Wight et. al 2011a). NCQ is the first comprehensive measure of nature contact at work, and every survey item is supported by closely related theory and previous findings within the field (Largo-Wight et al. 2011b). The close link between theory and previous

findings supports that NCQ is a valid measure of nature contact at work, thus construct validity is likely to be strong. Nature contact in workplace settings may vary due to for instance different cultures settings and weather differences. The construct of nature contact in workplace settings is thus subject to variation. NCQ includes several items regarding nature contact in a workplace setting, and recommends excluding items with more than 95 % of the responses in the zero response option. NCQ is thus suitable to measure nature contact in different settings, and is able to capture variations in the construct of nature contact at work, and this strengthens the construct validity of nature contact in NCQ. Different items in the subscales of Nature Contact in the reference study by Largo-Wight and colleagues (2011a), and this study, make it difficult to compare the two studies directly. However, the mean of each item and the subscales of the studies indicate lower levels of exposure to outdoor nature contact, and higher levels of indoor nature contact in our study.

Unfortunately we know little about the shape, size and condition of the plants at the workplaces under study, except at the work places where a firm install and maintain the plants. Plants in bad condition are earlier shown to lack positive impact (Thomsen et al. 2011). If the condition of some of the plants in this study were bad, this potentially may have weakened the positive impact of plants. We do not know if, or to what degree, the employees participate in the care of the plants, maintaining the plants has previously been found to have positive impact upon employees (Thomsen et al. 2011).

Convergent validity is a main aspect of construct validity, and refers to the degree to which a measure is correlated with other measures that it is theoretically predicted to correlate with (Shadich et al. 2002). Since there are no other comprehensive nature contact instruments for comparison, convergent validity is difficult to establish. However, correlations for single items from NCQ with similar items from previous studies are likely since NCQ is partly based on this. The principle component analysis performed by the inventors of NCQ (Largo-Wight et al. 2011b), revealed three distinct factors corresponding to the subscales hypothesized after theory. These findings provided additional support for the proposed comprehensive nature contact construct validity, as well as the hypothesized subscales. Since live plants in the office were of particular interest to the research group, we choose to follow theory and previous research rather than the component analysis when we decided which items to include in the subscales. This act may potentially threaten the construct validity of the subscale of direct indoor nature contact in our study, but can be justified since NCQ

measures objective counts of nature rather than a subjective construct or concept of nature contact.

The construct validity in the present study may be weakened by the fact that all the measures were based on self-reports. This is referred to as monomethod bias, and the result may be that the method itself may influence the results (Shadish et al. 2002). Having more than one operational representation of a construct is preferable, but what unfortunately out of reach in the present study.

Outdoor nature contact is the most direct form of nature contact and with this in mind, it is no surprise that earlier studies (Largo-Wight et al. 2011a) found the strongest beneficial association between outdoor nature contact and outcomes related to stress and health. This study, however, found no significant association between outdoor nature contact and the outcomes at all. According to Shadich and colleagues (2002), one has to be careful not to draw general conclusions about constructs if only some levels of the construct are studied. The result may be confounding of constructs with levels of constructs, and has to do with construct validity. The exposure may be at such low level that no significant association is observed. This may lead to an incorrect characterization of the study as showing that the exposure had no beneficial link at all, while the correct characterization is that exposure at low level has no beneficial link. With this in mind, given a dose-response relationship between exposure and outcome, this might explain the conflicting findings between the two studies in whether outdoor or indoor nature contact is most positively associated with the outcomes under study. Based on this we recommend future research to explore the dose-relationship further.

5.2.3 Internal validity

Internal validity refers to inferences about a causal relationship between the independent variables and the outcomes under study (Shadich et al. 2002). Originally, both perceived organizational support as a predictor variable, and the job stress index as outcome variable, contained elements of social support related to supervisors. In order to strengthen internal validity, we excluded the five items in the job stress index related to both severity and frequency of lack of social support from supervisors from the job stress measure before conducting statistical analysis. The cross sectional design utilized in this study is not suitable

to infer directions of effects or draw direct causal conclusions (Shadich et al. 2002). However, the findings present a clear indication of the beneficial links between nature contact at work and employee well-being.

Systematic errors, or bias, are important to consider since they are a threat to the internal validity. A study can be biased because of the way the subjects have been selected (selection bias), the way the study variables are measured (information bias), or some confounding factor that is not completely controlled (confounding) (Rothman 2002). In the present study selection bias would occur if the association between exposure to nature contact and the outcomes differs from those who participate, and those who do not participate in the study. The respond rate in the study was rather low, and unfortunately we cannot rule out that there are differences between the participants and the nonparticipants. However, in order to diminish selection bias, the participants were told that the purpose of the survey was to study the connection between health promoting factors at the office and health among the employees, and all the questions concerning nature contact was at the end of the survey. This act was performed to avoid that for instance employees without plants at their office should find the study irrelevant to them, and thus not responded to the survey.

Information bias concerns misclassification of a person into an incorrect category (Rothman 2002). An example from this study could be placing a person who had not been absent from work due to doctor assigned sick leave in the yes to doctor assigned sick leave category. Recall bias is a common type of information bias, and typically occurs if participants are asked to report information about exposure and outcomes from the past (Rothman 2002). One could, as an example, imagine that a participant had forgotten a short doctor assigned sick leave, and thus answered no to the question although yes would be correct. Several questions in the present study depend on the participants recalling from the past. However, there are no reasons to expect that misclassifications of either nature contact exposure or the outcomes, depend on a person`s status for the other variable, and the misclassifications, if present, are in so case nondifferential (Rothman 2002). Nondifferential misclassifications between two exposure categories, in general will make the associations for those two categories converge toward one another, and thus the associations without misclassification would be stronger rather than weaker, or not present at all (Rothman 2002). Recall bias is thus not a threat to validity of the associations found in the present study.

Employee-environment relations are complex, and we make no claim to have controlled for all factors that might influence the outcomes under study. Confounding may thus very well be present. Anyway, causal inferences or directions of effects cannot be inferred when using a cross sectional design. We only speak of indications of beneficial links rather than effects, and confounding is thus not of that much importance.

5.2.4 External validity

External validity refers to the extent to which the results of a study can be generalized to other situations and other populations (Shadich et al. 2002). Random sampling from the relevant population would provide the best opportunity for obtaining representative results (Shadich et al. 2002), however, both resource constraints and the need of approval from the workplaces under study limited our possibilities for specifying the relevant population for the study. As compromise we used an as big as possible sample of office workers in workplaces known to be suitable, and with management that approved participation. Unfortunately, the response rate in the study seems rather low (40 %). However, the questionnaire was also sent out to non-office workers, employees that were temporally absent, and persons that had been hired only on short term projects. The response rate among the definite population under study is thus likely to be considerable higher. The final result was a sample of 707 office workers, and compared to similar studies (e.g. Bringslimark et al. 2007, Largo-Wight et al. 2011), this is a large sample (see the article Bjoernstad et al. in prep for details about participants). The sample is most likely to a great extend representative for the population of office workers since it consists of employees of both sexes, at varying ages, from both public and private, small and big companies, from both urban and more rural areas of Norway. However, due to our sample of convenience, generalizability to a population of office workers cannot be guaranteed.

Ecological validity is a type of external validity, and according to Cook and colleagues (1979), it reflects to what degree the behaviors observed in a study reflects the behavior that occurs in natural settings. Since the office workers filled out the questionnaire sitting at their primary workplace during working hours, the ecological validity of the study is likely to be high.

5.3 Benefits of nature contact at work for stress, health and sick leave

The results from this cross sectional questionnaire survey conducted at real offices workplaces indicate that greater amount of nature contact at work, particularly indoor nature contact, is statistically significant attended by less job stress, less subjective health complaints and less days of sick leave. Noteworthy, the associations with job stress and sickness absence is not direct but mediated through elevated perceived organizational support, while the association with subjective health complaints is both direct and mediated through elevated perceived organizational support. These findings will initially be discussed in relation to previous research and theory earlier presented in this paper, with focus on what this study adds to the field. The discussion closes with comments on implications for further research and the relevance to inform practice recommendations regarding design of healthy work places that promotes employee health and well-being.

The present study includes both outdoor and indoor nature contact, and operationalizes indoor nature contact as a combination of diverse plant and window items. Previous studies have operationalized nature contact differently. The associations between outcomes such as stress and general health complaints have been studied against plants alone (Fjeld 2000, Kim & Mattson 2002, Bringslimark et al. 2007, Thomsen et al. 2011), a combination of plants and window view or natural light, comparable to our indoor nature contact measure, (Evensen et al. 2013, Chang & Chen 2005, Kaplan 1993) or a combination of both outdoor and indoor nature contact during working hours like in our study (Largo-Wight et.al 2011a). Several findings in previous studies indicate that it is relevant to combine plants and window as a measure of indoor nature exposure: Firstly, the combination of both nature view and live plants engendered the lowest mean level of stress (Chang & Chen 2005). Further, employees in windowless offices compensate by adding plants and pictures of natural landscapes to their offices (Bringslimark et al 2011). In addition, windows with a view of only built elements, even with no obstruction of natural light, did not foster psychological benefits (Kaplan 1993).

Employees who reported higher exposure to indoor nature contact at work also reported significantly lower prevalence of job stress. An explanation to this might lead from the combination of the Stress Recovery Theory (Ulrich 1983 & 1999, Ulrich et al. 1991) and the Human Environment Interaction Model (Küller 1976); exposure to natural elements reduces stress through lower levels of activation. Previous studies show conflicting results, but the majorities of findings are in line with our study and indicates that nature promotes stress reduction (Chang & Chen 2005, Largo-Wight et al. 2011a, Thomsen et al. 2011). Largo-

Wight and colleagues (2011a) utilized the same NCQ to operationalize nature contact, but their findings were somewhat different from ours. In our study, only indoor nature contact had a reliable association with job stress, while in Largo-Wight and colleagues' study, only outdoor nature contact showed reliable association with stress reduction. The mean of each item and the subscales of the two studies indicate lower levels of exposure to outdoor nature contact, and higher levels of indoor nature contact in our study. There may be cultural variations explaining these differences, for instance in habits of nature contact and whether the management support, or even allow, outdoor breaks and decoration of the office with natural elements. Traditionally the Norwegian lunch break is rather short compared to the American one. Utilizing outdoor areas during the lunch break may due to the limited time be more difficult in Norway. In addition, weather reports from the weeks prior to the Norwegian data collection show rather low temperatures with mostly rainy days and thus the utilizing of outdoor areas is less tempting. Although the months of data collection in the study by Largo-Wight and colleagues is unknown, the weather in Northern Florida more often makes utilizing of outdoor areas tempting. One could speculate that the Norwegian employees compensate the low exposure to outdoor nature contact during working hours by enriching the physical office environment with nature contact through installations of indoor plants and window with view to nature. Cultural variations and weather differences may thus partly explain the differences in exposure to outdoor and indoor nature contact during working hours. Given a dose-response relationship between exposure and outcome, this might explain the conflicting findings between the two studies in whether outdoor or indoor nature contact is most positively associated with job stress. Our indoor nature contact measure was extended with a question regarding what the view from the windows consisted of. Since the content of the view needs to consist of natural elements to foster psychological benefits (Kaplan 1993), this addition, in our opinion, is an advantage of our study. Only items with less than 95 % of the responses in the zero response options are included when calculating the subscales of NCQ. Different items made up the subscales in our study and the one by Largo-Wight and colleagues, and this shows that the NCQ is suitable to capture nature contact in different cultural settings. Different items in the subscales, however, make it difficult to compare the two studies directly.

Bringslimark and colleagues (2007) found no significant association between the presence of plants at the office and general perceived stress at all in a population of moderately stressed office workers. Bringslimark and colleagues used a measure of stress that was not specific to

work related circumstances. Together with plants alone being the nature exposure, this may explain the conflicting results from the findings in this study. It has previously been suggested that persons with higher levels of stress have the greatest effect of green environments (Hartig 1993 in Ulrich 1999). Interestingly, this study found significant associations between job stress and indoor nature contact in a group of fairly low stressed employees. One could only speculate that the association would be stronger with employees suffering from higher levels of job stress. No reliable gender differences in experienced job stress were found in this study, while Kim & Mattson (2002) found that flowering plants promoted stress recovery only amongst highly stressed women.

In line with previous studies (Largo-Wight et al. 2011a, Fjeld 2000, Evensen et al. 2013, Kaplan 1993), we found that more indoor nature contact significantly was attended by less subjective health complaints, and thus this association is strengthened. The study by Largo-Wight and colleagues (2011) found a stronger association between reductions in general health complaints and outdoor nature contact than indoor nature contact. Our study revealed no reliable association between outdoor nature contact and health complaints, again, the relatively low exposure to outdoor nature contact and moderate exposure to indoor nature contact, in our study, might partly explain these differences.

The strongest beneficial association with indoor nature contact has previously been found for neuropsychological symptoms (Fjeld 2000). Findings in this study support this; complaints within the pseudo neurology subscale were the only subscale that independently showed a reliable negative association with indoor nature contact. Higher exposure to indoor nature contact was significantly attended by reduced OR for reporting complaints within this subscale. Fjeld (2000) introduced quite a large amount of plants; altogether 18 plants were introduced into single offices in the intervention study. In the present study, the amount of indoor nature contact was of a more moderate character, but interestingly a significant association still was found.

Subjective health complaint correlates strongly with perceived stress both in this study ($r=0,41$, $p=0.01$), and earlier studies (Wiklund et al. 2012), and is today the most common cause of sick leave in Norway (Anderson 1999, Rikstrygdeverket 2003, Ihlebæk et al. 2004). Subjective health complaints also correlates strongly with days of sick leave in this study ($r=0.36$, $p=0.01$), thus all the outcomes under study are connected. Given these correlations and the fact that employees who reported higher exposure to nature contact at work also

reported less job stress and less subjective health complaints, it is no surprise that indoor nature contact at work had a reliable negative association with days of sick leave in this study. This finding is in line with the findings of a similar study conducted in Norway by Bringslimark and colleagues (2007), who found that the number of indoor plants proximal to a worker`s desk had a small but statistically reliable association with sick leave.

5.4 The mediating role of perceived organizational support

In the present study, employees with higher indoor nature contact at work reported higher perceived organizational support. To our knowledge, this association has not been studied before and is a new adding to the field. Comparable, Thomsen and colleagues (2011) found that plants influenced the social climate and interaction among the employees. Perceived organizational support consists of elements of social support, and is within the same area of psychological and social factors at work, and thus these findings points in the same direction.

The mediated analysis interestingly showed that the associations between indoor nature contact and job stress, and days of sick leave are not direct, but mediated through elevated perceived organizational support. The associations between indoor nature contact and subjective health complaints and the subscale of pseudo neurology are both direct and mediated through elevated perceived organizational support. Environmental modification of the workplace environment with purposeful use of nature contact is thus associated with employees who to a greater extent perceive that their organization cares about their well-being and/or appreciates their contribution. According to the Human Environment Interaction Model, the social climate and the physical environment are connected (Küller 1991), and the results from our study support this. Noteworthy, it seems like the social climate expressed as elevated perceived organizational support, may be a key concept when trying to explain some of the underlying mechanisms or processes induced by including nature contact in the physical environment at work. Our findings indicate that utilization of indoor nature contact at work, through installations of indoor plants and windows with view to nature enhance perceived organizational support, and thus social support and the social climate at the workplace. Purposeful use of nature contact at work may thus be a part of creating a pleasant environment, both physically and social, that helps secure well-being of the employees through less job stress and less subjective health problems, with less sick leaves as an endpoint.

The rationale behind this may be derived from the demand-control-support model (Karasek & Theorell 1990); according to the model, social support from the management is a part of predicting outcomes such as stress and health (e.g. Johnsen & Hall 1988, Karasek & Theorell 1990, Kristensen 1996, Dolard et al. 2000). Findings in this study indicate that indoor nature contact induces higher levels of perceived organizational support. Perceived organizational support refers to the part of social support that refers to overall levels of social interaction at work from supervisors. Changes in the physical office environment that promotes nature contact is thereby associated with an increase in social support in general, or more specific; an increase in the extent to which the employees perceive that their organization cares about their well-being, and thus increased perceived organizational support. Perceived organizational support is a part of perceived available social support rather than actual support received, and is thereby linked to the type of social support that is most highly related to positive outcomes related to stress buffering (Uchino 2004 & 2009). Following the demand-control-support-model, may thus present a possible explanation of how nature contact affects employee well-being; elevated perceived social support leads to improved buffering mechanisms between psychological stressors at work and adverse health outcomes related to stress (Karasek & Theorell 1990).

Further explanation might lead from looking at perceived organizational support in specific. According to Eisenberger and colleagues (1986), perceived organizational support is influenced by statements of praise and approval from the management, or by other rewards that signified the organization's positive evaluations of the employee. One could imagine that elevated nature contact at work is perceived as a reward that signify a positive evaluation of the employee, and thereby increase the extent to which the employees perceive that their organization cares about their well-being. Elevated perceived organizational support follows, and thus a raised effort-outcome expectancy and a positive emotional bond that together increases the employee's efforts to meet organizational goals through raised performance and less absenteeism (Eisenberger et al. 1986). More perceived organizational support correlates with less absenteeism in both earlier studies (Eisenberger et al 2001, Eisenberger et al. 1986, Mills et al. 2013), and this study ($r=-0.18$, $p=0,01$).

5.4 Implications for further research

The present study is conducted at real workplaces and includes a fairly large sample of employees. Earlier studies have showed conflicting results regarding the relation between nature contact at work and perceived job stress among the employees. The utilization of a comprehensive measure related to the experience of nature in the workplace setting and a work specific stress measure has been asked for by previous researchers within the field, and are advantages of this study. The cross sectional design utilized in this study, however, is not suitable to draw direct causal conclusions. Our findings indicate that a moderate level of indoor nature contact is beneficial, while the low levels of outdoor nature contact showed no reliable association with the outcomes at all. Future research should explore the dose-response relationship between both indoor and outdoor nature exposure and the outcomes further, in order to inform precise practice recommendations regarding enhancing nature contact at work as workplace health promotion. Future research should preferably utilize a prospective design that enables causal conclusions.

Findings in this study indicate that the beneficial associations between indoor nature contact at work and the outcomes under study partly may be explained by an improved social climate due to induced perceived organizational support. This connection is new, so exploring this and other aspects of social support and the social climate in relation to nature contact at work should be given priority in future research within the field.

6.0 Conclusions with implications for practice recommendations

Although small, the associations for indoor nature contact show a beneficial direction for all the outcomes under study. More indoor nature contact at work is significantly attended by less job stress, less health complaints, less days of sick leave, and more perceived organizational support. This helps adding power to the knowledge base about benefits of nature contact at work, and thus strengthens the validity of theory and previous studies within the field. Based on this knowledge base, it seems reasonable to inform practice recommendations that include nature contact in the design of healthy office workplaces, in order to promote employee well-being.

Enhancing nature contact at work can be achieved for instance through adding plants to the workplace environment, and open blinds at windows to passively utilize view to nature elements and natural daylight. Purposeful enrichment of the indoor environment with natural elements in order to reduce stress and promote health and well-being for the employees is in line with a salutogenic approach to health promotion. The focus is on positive associations that enable the employees to remain healthy despite adverse circumstances such as stress. Stress and related health consequences are more prevalent today than in the past, and work is attributed as a primary stressor (Horan 2002, Eiken et al. 2008). In order to counteract stress, these facts call the attention towards workplace health promotion.

Enhancing nature contact is easy and cost effective, and should therefore be given priority in cultivating a healthy workplace. Work through employment is a substantial part of the daily lives of the adult population, so utilizing the workplace as an arena for health promotion has great potential for success. All though the topics under study are marginal physical changes to the workplace environments, the ultimate endpoint may be less stress, less health complaints and less days of sick leave. The importance of environments supportive of health in health promotion was highlighted by WHO in the Ottawa Charter for Health Promotion (1986), with promotion of health by maximizing the health values of every day settings, including where people work, as the central theme.

Employee-environment relations are complex. Thus in this study, like most research on occupational health, we make no claim to have controlled for all factors that might influence the outcomes under study. In addition, directions of effects cannot be inferred when using a cross sectional design. Caution should therefore be excised when drawing direct causal

inferences about the effect of nature contact in the working environment on the basis of these results. However, this study presents a clear indication of the beneficial links between indoor nature contact and employee well-being. The small associations between nature contact and the outcomes should not discourage further studies and development of more precise recommendation for practice. Most people spend a large proportion of their life at work, so even small effects may have great practical significance when aggregated over a large number of employees over a life time of employment.

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8.0 The article

Nature contact during working hours; Benefits related to stress reduction, health and sick leave

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Abstract:

BACKGROUND: Occupational health research emphasizes the significance of health promotion. Besides emphasis on improving social support, changes in the physical environments like providing nature contact at work through installation of indoor plants, window view to nature and outdoor breaks can be considered as health promoting initiatives.

OBJECTIVE: To investigate if nature contact at work is associated with less job stress, less subjective health complaints and less sick leave. Further, to study if the possible associations between nature contact and the health outcomes could be explained by the social climate at work, expressed as perceived organizational support.

METHOD: Data were collected through a web based cross sectional questionnaire survey at seven different office workplaces in southern Norway (n=707, 40 % response rate).

RESULTS: Regression analysis reveal that greater amount of indoor nature contact at work is statistically significant associated with less job stress, less subjective health complaints and less sickness absence. Noteworthy, the associations with job stress and sickness absence is mediated through elevated perceived organizational support while the association between indoor nature contact and subjective health complaints is partly mediated through elevated perceived organizational support. Outdoor nature contact showed no reliable association with the outcomes in this population.

CONCLUSIONS: Indoor nature contact at work is positively associated with employee health. The social climate at the work place is an important mediator explaining some of the underlying mechanisms induced by nature contact at work, and this finding is new to the field. This study indicates that extending nature contact in the physical work environment adds to the specter of possible health promoting initiatives in office work places.

Key words: worksite health promotion, perceived organizational support, sick leave, occupational health research, interior plants, window view.

1.0 Introduction

Work through employment is a substantial part of the daily lives of the adult population. Employment promotes employee health, but may also foster negative effects [1]. Stress and related health consequences are more prevalent today than in the past, and work is attributed as a primary stressor [2,3]. Stress, a non-specific response of the body to any demand placed upon it [4], rises when there is imbalance between demands and an individual's available coping resources [5]. Job stress mediates between an aggregate of demands from workplace factors and diverse immediate and long term outcomes. Perceived stress is found to correlate strongly with subjective health complaints [6]. Subjective health complaints, without objective signs or symptoms, are today the most common cause of sick leave in Norway, and it covers more than half of the days lost to sickness absence [7,8,9]. Days of sick leave in Norway steadily rises [10], and the study and promotion of healthy workplaces is thus of most importance.

To counteract possible work related impact on stress, many employers today emphasis on workplace health promotion. Health promoting principles, like enhancing the social climate, have recently become increasingly prevalent in a growing number of workplaces, and a focus on the employee experience has come to the forefront [11]. Another strategy in health promotion is environmental modification, a physical change to the workplace environment [12]. Purposeful use of nature contact at work, like adding an indoor office plant, or providing windows with natural daylight is increasing [12,13]. Nature contact at work has previously been shown beneficial in a few but growing number of empirical studies [14,15,16,17], but more in depth studies are needed to develop recommendations for practice.

2.0 Nature contact at work and health

2.1 Theoretical background

The job strain model, commonly called demand-control-support model [18,19], is the most cited approach in research on psychosocial workplace factors. The model attributes outcomes such as stress and health to the interaction between work demands, the worker's control over the execution of tasks and other aspects of work (decision latitude) and social support from supervisors and co-workers [18,19]. Several studies have found the model to predict diverse health outcomes [e.g. 19,20,21,22].

The Human Environment Interaction Model [23] describes the interaction between the person and the environment more broadly. According to the model, stress can be defined as a generalized response to different environmental factors [4]. The model states that physiological activation at any time is affected by the physical environment, for instance at the workplace, and partly by the social environment and the activities the person engage in. Hence, both work tasks and the physical and social environment at work will contribute to physiological activation, or stress level. Employees with high levels of stress, might, according to Küller [23], suffer from too high levels of activation. High levels of activation might in the long run lead to adverse psychological, social and even medical consequences [23].

Another theory states that the physical environment that we encounter in our direct surroundings can affect our activation level. According to the Stress Recovery Theory developed by Roger Ulrich [24,25,26], exposure to natural environments reduces stress through lower levels of activation. His psychophysiological stress reduction theory explains that nature's particular aesthetic appeal in itself evokes positive affect in people. Positive emotions may block negative affect and hence have a restorative effect in stressful situations.

Following this, adding elements of nature to office workplaces may induce positively valued changes in cognition and emotion, which again have positive impact on stress level, health, and well-being of the employees [27]. The beneficial effects of natural environments are commonly explained with reference to the biophilia-hypothesis which states that humans as a result of the evolution subconsciously seek connections with natural elements [28].

Enhancing the social climate is another way to promote the working environment, and according to the Human Environment Interaction Model [23], the social climate and the physical environment are connected. Social support at work refers to overall levels of helpful social interaction available at work from both co-workers and supervisors [19]. Social relations at work might affect employee well-being through diverse buffering mechanisms between psychological stressors at work and adverse health outcomes related to stress [19].

Perceived organizational support, in particular, refers to the extent to which the employees perceive that their organization cares about their well-being and appreciates their contribution [29], and thereby the part of social support that refers to overall levels of social interaction at work from supervisors. Research shows that the employees' commitment to the workplace is strongly influenced by their perception of the workplace's commitment to them [e.g.29,30]. Together various aspects of an employee's treatment by the organization form an expectancy in the degree of social support the employee would expect of the organizations in a variety of situations. Higher perceived organizational support leads to more satisfied employees and less absenteeism [11,29,30].

Nature contact in office settings may thus promote employee health directly by influencing the employees to help avoid excessive levels of activation and stress [23,24,25,26], as well as indirectly through elevated perceived organizational support and thus elevated social support.

2.2 Previous findings

Previous studies indicate that different types of nature contact at work, is related to less stress and less health complaints. Largo-Wight and colleagues [12] utilized a cross sectional questionnaire survey, on a sample of office workers from Northern Florida, to examine the associations between nature contact experienced at work and employee stress and health. They found a significant negative association between nature contact and stress, and nature contact and general health complaints, indicating that as nature contact during working hours increases, perceived stress and general health complaints decreases. Outdoor nature contact, e.g. taking breaks from work outdoor, was significantly associated with both reductions in stress and general health complaints. Indoor nature contact, e.g. access to window with view to outside, was only significantly associated with reduction in general health complaints, and the associations were weaker than those for outdoor nature contact. Findings in a study by Kaplan [31] indicate that employees with an office window with elements of view to nature felt less frustrated and reported higher overall health. Psychological benefits were not fostered with only window view to built elements, even with no obstruction of natural light. Individuals in windowless offices were found to compensate for the lack of view of nature from their workplace by decorating their offices with indoor plants and pictures of natural landscapes, in a cross sectional questionnaire survey conducted at workplaces in Norway [32]. No significant association between the presence of plants at the office and perceived stress among the employees were found in the same study, however, the participants reported only moderate levels of stress [15]. Field studies have reported reduction in health complaints among office workers after installing foliage plants or both foliage plants and lighting that simulates daylight in their indoor working environments [14,17]. The biggest reduction was obtained for neuropsychological symptoms, e.g. fatigue, feeling heavy headed, dizziness and concentration problems [14]. Experimental studies in laboratories with measurements of

biological responses to different workplace environments (e.g. brain waves, finger skin temperature) have revealed that the combination of nature view and plant engendered the lowest mean level of stress as measured by level of alpha activity [33]. Among highly stressed women watching flowering geraniums promoted faster and more complete stress recovery than watching non-flowering geraniums or no flowers [34]. A study conducted by Hartig [35] suggests that persons with higher levels of stress have the greatest effect of looking at nature settings dominated by vegetation rather than built environment without nature, in terms of positive physiological and emotional changes (blood-pressure recording and emotional self-reports).

To our knowledge, the association between nature contact at work and sick leave is rarely studied. A study by Bringslimark and colleagues [15] utilizing a cross sectional questionnaire survey, found that the number of indoor plants proximal to a worker`s desk had a small but statistically reliable association with sick leave.

We have not been able to find previous studies examining the associations between nature contact at work and the social climate and social support at the workplace. People-plant relationships in office workplaces, however, have been studied with a qualitative, explorative and inductive case study design by Thomsen and colleagues [36]. Findings include that plants influence the social climate and interaction among the employees. Further, employees look at and maintain ornamental plants at the office setting to relax in stressed situations. In relation to individual well-being, plants influenced general- and physical well-being of the employees, and fostered a relaxed feeling. However, poorly maintained plants generally brought about negative comments and lacked positive impact.

2.3 The aim of the study

The lack of consensus in the field in how to measure nature contact has made previous researchers ask whether the different studies are investigating the same phenomenon [e.g. 16,36]. Earlier studies examining relationships between nature elements at work and stress, have also not used stress measures specific to only work related circumstances [12,15]. The purpose of this study is to investigate the associations between nature contact at work at office workplaces, and employee health outcomes related to stress, utilizing a comprehensive measure of the experience of nature in workplace settings, and a work specific stress measure. The research questions are: Is nature contact during work hours related to less job stress, less subjective health complaints and less sick leave among office workers? In addition, we wanted to explore if eventual associations between nature contact and the health outcomes can be explained by the social climate at work, expressed as perceived organizational support. Possible paths for the relationships between nature contact at work and the health outcomes are presented in Figure 1.

Insert Figure 1 here.

3.0 Materials and Methods

3.1 Design

Data were collected through a cross sectional questionnaire survey conducted at a number of office workplaces in Southern Norway. This type of design is relatively time efficient and gives an overview of the associations between the variables under study, in a big population of employees and in a real work place environment. The Regional Committees for Medical and Health Research Ethics evaluated the study, and considered it not to require approval

according to the Norwegian Act on medical and health research since the survey was completely anonymous.

3.2 Participants

An E-mail with a link to an anonymous questionnaire was sent out to 1769 office employees at seven different workplaces in Norway (Table 1). Employees in five different workplaces (N=627) received the link to the questionnaire in April 2012, and the employees (N=1140) in the remaining two workplaces received the link in September 2012. The workplaces were placed in several different areas of Southern Norway with urban areas like the capitol, small semi urban cities and rural villages. Weather statistics from the Norwegian meteorological institute [37] show that the mean temperature in the period prior to answering the survey was similar, and rather low, for all locations and both time periods (mean temperature April 6°C ,September 11°C, both periods predominantly rainy days). In order to secure the presence of plants, two of the work places (N=1026) were chosen because they have a plant firm that install and maintain the plants. The workplaces varied in size with from 31 to 980 employees on the mailing list, and all employees received an invitation to fill in the questionnaire. In each of the workplaces we sought to survey as many employees as possible given the need for statistical power to test associations that previous research and theory have indicated could be small.

Insert Table 1 here

The demographic variables for the different workplaces are presented in Table 1. The questionnaire was filled in by 707 persons giving an overall response rate of 40 %. The bigger workplaces had the lowest response rate. The management at these places did not know all the employees in person, and were unfortunately not able to exclude from the mailing list those

employees not performing typical office work. The E-mail with the link to the questionnaire was also sent out to employees that were temporarily absent from work or only had been hired for short term projects, rather than belonging to the permanent staff. The real response rate is thus higher though unfortunately not possible to calculate. The respondents' age ranged from 17-73 years (mean 48.5). The sample consisted of slightly more men than women (Table 2), and was predominantly longtime employees (mean 7.1 years ranging from a few weeks to 41 years). The physical work environment varied in office type (individual office, shared office, open plan and reception area), proximity to windows and number of indoor plants in the office space. The work places further varied in ways we only to a certain degree were able to cover in the questionnaire. However, a certain standard of physical work environment is secured through the Norwegian work environment regulations that apply to all employees and work places.

3.3 Measures

The questionnaire used in the survey consisted of 197 items totally. Only those used to analysis the present research question are presented below.

3.3.1 Independent variables:

The participants reported demographic variables like gender (coded 0=male, 1=female) and age, type of office (0=any type of shared office; 1=single office/individual office), and the average number of hours per day they spend at their primary office work place. Ten and 46 participants did not report on the office type and average hours at the work place, respectively, and were excluded from further analysis. Since we wanted to investigate possible beneficial links between nature contact at the office workplace and employee health,

we in addition excluded the 87 respondents that spent less than four hours on their primary workplace from further analysis.

Nature contact during working hours was measured by the Nature Contact Questionnaire (NCQ) [38]. We translated NCQ to Norwegian for the purpose of the study. NCQ originally consists of 16 questions that measures actual nature contact experienced at work, and comprises three subscales; outdoor nature contact (4 items), indoor nature contact (6 items), and indirect indoor nature contact (6 items). Largo-Wight and colleagues [38] recommend excluding items with more than 95 % of the responses in the zero response option. Following this, we ended up with three items for outdoor nature contact, and four items for indoor nature contact from NCQ. We further added one new question to the indoor nature contact subscale, increasing the number of items to a total of five. Indirectly indoor nature contact had a mean sum score close to zero, and was thus excluded completely from further analysis.

Outdoor nature contact is defined [38] as contact with natural elements outdoors during working hours, and consists of the sum score of the following three questions: last week (Monday-Friday), how many times did you 1: spend a morning or evening break outside? 2: eat your lunch outside? 3: go outside for work related task such as delivery or errands? Response was given on a six point scale (coded 1=zero times, 6=five and more times). Cronbach's α of the original scale was 0.47 [38] and 0.39 in this study. Test-retest reliability for the original scale was satisfactory ($r=0.75$) [38,39].

Indoor nature contact is defined as contact with natural elements within a building such as live plants, natural light and windows with view outside [38], and consists of the sum score of the following four questions: Last week (Monday-Friday), how many ___ do you have in your primary work space? 1: live plants or flower arrangements, 2: windows (including on doors) that lead directly to the outdoors? In you primary work space last week, Monday-

Friday), what percentage of the time did you___ 3: have sunlight lighting you space? 4: have an unobstructed view outside (blinds open and not drawn)? The fifth added question concerned to what degree the view from the window consisted of natural or built elements. The question was formulated in the following way: on a scale from 1-6 evaluate if you through the window(s) in you primary work space see mainly built area like buildings, road and wall, or mainly natural elements like trees, flower and water? On question one and two, response was given on a six point scale (coded 1=zero, 6=five and more). On questions three and four response was given on a six point scale (coded 1= 0%, 2=1-20% ... 6=81-100%). On question five, response was given on a six point scale and coded to indicate the amount of natural elements (1=0%, 2=20% ... 6=100%). The employees were instructed to answer the questionnaire when sitting at their primary work place. This helps to secure that the amount of contact with natural elements within the building is related to where they spend most of their working hours. Ninety-four respondents did not answer all the questions in the subscale, and were excluded from analysis. Reliability (Cronbach`s α) of the original scale was 0.73 [38], and for this study it was 0.44. Test- retest reliability for the original scale was satisfactory ($r=0.9$) [38,39].

3.3.2 Dependent variables

Job stress was measured by the Norwegian version of the Job Stress Survey (JSS-N) [40,41]. The JSS is developed to assess sources of work-related stress in particular. It assesses 30 job-related stressor events, e.g. assignment of disagreeable duties and inadequate support by supervisor. Response is given on a nine point scale that assesses the perceived severity of the stressor (1=little, 5 =moderate, 9 =severe). In addition, respondents indicate on a ten point scale how often each stressor event has occurred during the last six months (coded 0 days=0, 9+ days=9). The Job Stress Index assesses the overall level of stress based on the combined

severity and frequency rating of all 30 stressor events. The score is made by multiplying severity and frequency of the 30 stressor events, add the sums up and then divide it by 30. The scale has adequate internal consistency (Chronbach's $\alpha=0.95$). The total job stress index measure was utilized to determine the level of job stress in the group of employees under study compared to the norm data. Perceived organizational support consists of elements of social support related to support from supervisors. Subsequently, both perceived organizational support as a predictor variable, and the job stress index as outcome variable, contained elements of social support related to supervisors, and a certain association is thus expected. To be able to rule out this expected association, the five items in the job stress index related to both severity and frequency of lack of social support from supervisors were excluded from the job stress measure before conducting statistical analysis. The items related to lack of social support from coworkers were still included.

Subjective health complaints were measured by the Subjective Health Complaint inventory (SHC) [42]. The SHC consists of 29 items concerning subjective somatic and psychological complaints experienced during the last 30 days. Severity of each complaint is rated on a four-point scale (0=none, 3=severe). A total sum score of all 29 items is calculated, as well as five subscales with sum scores of musculoskeletal pain (8 items), allergy (5 items), gastrointestinal problems (7 items) and pseudo neurology (7 items, e.g. sleep problems, anxiety). The subscale of flu (2 items) was not included in analysis. Internal consistency (α) values were as follows: total $\alpha=0.87$, musculoskeletal pain $\alpha=0.8$, allergy $\alpha=0.56$, gastrointestinal problems $\alpha=0.71$ and pseudo neurology $\alpha=0.77$. Test-retest reliability for the subscales was high for gastrointestinal problems ($r=0.68$), pseudo neurology ($r=0.78$), and allergy ($r=0.85$) and medium high for musculoskeletal pain ($r=0.55$) [43]. The data on all the subscales were skewed with mean scores close to zero. As a result, the answers on the subscales were dichotomized as not having complaints (coded 0), and having complaints (coded 1).

Sick leave was measured with two questions: 1: the last year, have you been absent from work due to doctor assigned sick leave? (coded 0=no, 1=yes), and 2: how many days during the last year have you been absent from work due to your own illness? There were ten response categories (0, 1, .. 8 and 9 and more days). Ferrie and colleagues [44] have found that self-reported sick leave was strongly correlated with recorded number of sickness absence days in a large sample (N=7995) of white collar workers. The two sick leave questions in the present study were strongly positively correlated ($r=0.66$, $p<0.01$).

Perceived organizational support was measured by a sub scale from the QPS-Nordic, a general questionnaire for psychological and social factors at work [45]. The QPS-Nordic scale of perceived organizational support consists of questions within the same area as Eisenberg and colleagues [29] more extensive survey of perceived organizational support, and was chosen to avoid the questionnaire to be too comprehensive. The QPS subscale consists of the mean of the response to the following three questions, 1: At your organizations are you rewarded (money, encouragement) for a job well-done? 2: Are worker well taken care of in your organization? 3: To what extent is the management of your organization interested in the health and well-being of the personnel? Response was given on a five point scale (1= very seldom or never, 5=very often or always). The internal consistency (Chronbach`s α) of the scale was 0.78, whereas the Chronbach`s α of the original scale was 0.83 [45]. Test-retest reliability was 0.8 [45].

3.4 Procedure

An E-mail with the link to the questionnaire was sent out by the management of each workplace, stating that the management supported participation in the research. The participants were told that the purpose of the survey was to study the connection between

health promoting factors at the office and health among the employees, and they were informed that responses to the survey would be fully anonymous. The questionnaire was distributed through Questback, a program for the creation of electronic surveys (www.questback.com). The employees filled out the questionnaire sitting at their primary office work space during working hours. The questionnaire was electronic, and the respondents had only two alternatives for responding: they could use one of the valid response options for any item, or they could choose not to answer the question. In addition a few questions (e.g. age) asked for a number, and the respondents were asked to fill it in themselves. One reminder was sent out after three weeks.

3.5 Statistical analyses

The response data collected by QuestBack were exported to Statistical Package for the Social Sciences (SPSS for Windows, version 21) which was used for data analyses. Data from all workplaces were combined. Following guidelines from Pallant [39], our preliminary analysis assessed normality of the data. The SHC subscales were skewed and were thus dichotomized. The relationship between the variables was investigated using Pearson`s correlation (r) for continuous variables, and Spearman`s Rank Order Correlations (ρ) for non-parametric variables. Multicollinearity was used to identify if the independent variables showed some relationship with the dependent variables, and to check that the correlation between the independent variables was not too high [39]. To investigate the association between Nature Contact at work and the outcomes, job stress, subjective health complaints, perceived organizational support and sick leave, we used multiple regression on the continuous dependent variables, and logistic regression on the dichotomized variables (model I). R^2 on the continuous variables, and Cox and Snell R^2 and Nagelkerke R^2 on the dichotomized variables were used to check how much of the variance in the outcomes that was explained by

the model as a whole. To check whether, and to what degree, the reliable associations between nature contact and the health outcomes was mediated through perceived organizational support, the regressions were repeated when controlling for perceived organizational support (model II). Sobels test was utilized to test whether the indirect effect of nature contact on the health outcomes via the mediator perceived organizational support is significantly different from zero [46]. The exclude cases pairwise option in SPSS was used, meaning that participants were excluded from analysis if the data required for the particular analysis was missing [39]. Extreme multivariate outliers were identified with reference to Mahalanobis distance [47], and this led to excluding of two participants (final sample N= 572). The Omnibus Tests of Model Coefficients and Hosmer and Lemeshow Test were used to indicate how well the models in logistic regressions performed. All analyses were adjusted for sex, age and office type. Precision of the associations (B and odds ratios) were assessed using 95 % confidence intervals.

4.0 Results

The descriptive statistics for the measured variables and their interrelations are presented in Table 2:

Insert Table 2 here.

As indicated by the mean values for the variables, our sample was fairly healthy and satisfied with their job situation. They reported low levels of job stress, moderate levels of subjective health complaints, few days of sick leave and relatively high levels of perceived organizational support. The amount of outdoor nature contact at work was quite low in this population, while the amount of indoor nature contact was moderate.

The Outdoor Nature Contact variable correlates weakly, at most, with the outcomes. Only one correlation involving outdoor nature contact is statistically significant: higher level of outdoor nature contact at work correlates with less days of sick leave. The Indoor Nature Contact variable correlates with several of the outcomes. Employees with higher level of indoor nature contact at work reports statically significant lower scores on the job stress index, lower scores on subjective health complaints total and pseudo neurology, less days of sick leave as well as higher scores of perceived organizational support.

The results of the regression analysis examining the association between nature contact and job stress, nature contact and subjective health complaints with four subscales, nature contact and self-reported sick leave, nature contact and perceived organizational support and the mediated analysis controlling for perceived organizational support, are presented in Table 3:

Insert Table 3 here

No significant association was found between outdoor nature contact and job stress. The indoor nature contact variable has a significant negative association with job stress, indicating that greater amount of indoor nature contact at work is attended by less job stress. Gender, age and office type were not associated with job stress. Model I as a whole explains 1.8% of the variance in job stress.

The outdoor nature contact variable shows no reliable association with either of the subjective health complaints scales. The indoor nature contact variable shows a reliable negative association with subjective health complaints total, indicating that the more indoor nature contact at work, the less subjective health complains. More indoor nature contact at work is significantly attended by reduced OR for reporting complaints within the pseudo neurology subscale of subjective health complaints. Gender has a reliable positive association with subjective health complaints total and the subscales for musculoskeletal pain, pseudo

neurology and gastrointestinal problems, indicating that women report more subjective health complaints than men. Age has a small but significant positive association with allergy. Employees with a private office have a significant greater OR of reporting problems within the subscale of pseudo neurology than employees that share office. Model I as a whole explains 5.7% of the variance in subjective health complaints total and between 6.2% and 9.7% of the variance in the subscale of pseudo neurology.

The indoor nature contact variable has a small, but significant, negative association with days of sick leave, indicating that the greater amount of indoor nature contact at work, the less days of sick leave taken. However, neither of the two nature contact variables shows a reliable association with doctor assigned sick leave. Age has a positive, reliable association with doctor assigned sick leave, while being female is associated with more days of sick leave. Model I as a whole explains 3.1% of the variance in days of sick leave.

No significant association was found between outdoor nature contact and perceived organizational support. Indoor nature contact at work has a significant, positive association with perceived organizational support, indicating the more indoor nature contact at work, the more perceived organizational support. Gender, age and office type were not associated with perceived organizational support. The model as a whole explains 4.6% of the variance in perceived organizational support.

After repeating the regression analysis when controlling for perceived organizational support (model II), the associations between indoor nature contact and job stress (Sobel's test=3.58 $p<0.001$), and indoor nature contact and days of sick leave (Sobel's test=2.86, $p=0.004$) disappears. The connection between nature contact and job stress and sick leave is thus not direct, but mediated through elevated perceived organizational support. The reliable associations between indoor nature contact and subjective health complaints total (Sobel's

test=3.53 $p=0.004$) and the subscale of pseudo neurology (Sobel's test=2.71 $p=0.007$) decreases, but remains significant. The associations between indoor nature contact and subjective health complaints total and the subscale of pseudo neurology are thus both direct and mediated through elevated perceived organizational support. After introducing perceived organizational support in model II, the variance in the outcomes explained by the model as a whole, increases to 8.4% in job stress, 5.7% in days of sick leave, 11.6% in subjective health complaints and between 8.6% and 13.4% in the subscale of pseudo neurology.

5.0 Discussion

The results from this cross sectional questionnaire survey conducted at real offices workplaces indicate that greater amount of nature contact at work, particularly indoor nature contact, is statistically significant attended by less job stress, less subjective health complaints and less days of sick leave. Noteworthy, the associations with job stress and sickness absence is not direct but mediated through elevated perceived organizational support, while the association with subjective health complaints is both direct and mediated through elevated perceived organizational support. The response rate in the study may seem to be rather low (40%), but since the questionnaire also was sent out to non-office workers, employees that were temporally absent and persons that had been hired only on short term projects, the response rate among the definite population under study is likely to be considerable higher. Together with the large final sample ($n=572$), this gives statistical validity to the results.

5.1 Benefits of nature contact at work for stress, health and sick leave

The present study includes both outdoor and indoor nature contact, and operationalizes indoor nature contact as a combination of diverse plant and window items. Previous studies have

operationalized nature contact differently. The associations between outcomes such as stress and general health complaints have been studied against plants alone [14,15,34,36], a combination of plants and window view or natural light, comparable to our indoor nature contact measure [17,31,33], or a combination of both outdoor and indoor nature contact during working hours like in our study [12]. Several findings in previous studies indicate that it is relevant to combine plants and window as a measure of indoor nature exposure: Firstly, the combination of both nature view and live plants engendered the lowest mean level of stress [33]. Further, employees in windowless offices compensate by adding plants and pictures of natural landscapes to their offices [32]. In addition, windows with a view of only built elements, even with no obstruction of natural light, did not foster psychological benefits [31].

Employees who reported higher exposure to indoor nature contact at work also reported significantly lower prevalence of job stress. An explanation to this might lead from the combination the Stress Recovery Theory [24,25,26] and the Human Environment Interaction Model [23]; exposure to natural elements reduces stress through lower levels of activation. Previous studies show conflicting results, but the majorities of findings are in line with our study and indicates that nature promotes stress reduction [12,33,36]. Largo-Wight and colleagues [12] utilized the same NCQ to operationalize nature contact, but their findings were somewhat different from ours. In our study, only indoor nature contact had a reliable association with job stress, while in Largo-Wight and colleagues` study, only outdoor nature contact showed reliable association with stress reduction. The mean of each item and the subscales of the two studies indicate lower levels of exposure to outdoor nature contact, and higher levels of indoor nature contact in our study. There may be cultural variations explaining these differences, for instance in habits of nature contact and whether the management support, or even allow, outdoor breaks and decoration of the office with natural

elements. Traditionally the Norwegian lunch break is rather short compared to the American one. Utilizing outdoor areas during the lunch break may due to the limited time be more difficult in Norway. In addition, weather reports from the weeks prior to the Norwegian data collection show rather low temperatures with mostly rainy days [37], and thus the utilizing of outdoor areas is less tempting. Although the months of data collection in the study by Largo-Wight and colleagues is unknown, the weather in Northern Florida more often makes utilizing of outdoor areas tempting. One could speculate that the Norwegian employees compensate the low exposure to outdoor nature contact during working hours by enriching the physical office environment with nature contact through installations of indoor plants and window with view to nature. Cultural variations and weather differences may thus partly explain the differences in exposure to outdoor and indoor nature contact during working hours. Given a dose-response relationship between exposure and outcome, this might explain the conflicting findings between the two studies, in whether outdoor or indoor nature contact is most positively associated with job stress. Our indoor nature contact measure was extended with a question regarding what the view from the windows consisted of. Since the content of the view needs to consist of natural elements to foster psychological benefits [31], this addition, in our opinion, is an advantage of our study. Only items with less than 95 % of the responses in the zero response options are included when calculating the subscales of NCQ. Different items made up the subscales in our study and the one by Largo-Wight and colleagues [12], and this shows that the NCQ is suitable to capture nature contact in different cultural settings. Different items in the subscales, however, make it difficult to compare the two studies directly.

Bringslimark and colleagues [15] found no significant association between the presence of plants at the office and general perceived stress at all in a population of moderately stressed office workers. Bringslimark and colleagues used a measure of stress that was not specific to

work related circumstances. Together with plants alone being the nature exposure, this may explain the conflicting results from the findings in this study. It has previously been suggested that persons with higher levels of stress have the greatest effect of green environments [35]. Interestingly, this study found significant associations between job stress and indoor nature contact in a group of fairly low stressed employees. One could only speculate that the association would be stronger with employees suffering from higher levels of job stress. No reliable gender differences in experienced job stress were found in this study, while Kim & Mattson [34] found that flowering plants promoted stress recovery only amongst highly stressed women.

In line with previous studies [12,14,17,31], we found that more indoor nature contact significantly was attended by less subjective health complains, and thus this association is strengthened. The study by Largo-Wight and colleagues [12] found a stronger association between reductions in general health complaints and outdoor nature contact than indoor nature contact. Our study revealed no reliable association between outdoor nature contact and health complaints, again, the relatively low exposure to outdoor nature contact and moderate exposure to indoor nature contact, in our study, might partly explain these differences.

The strongest beneficial association with indoor nature contact has previously been found for neuropsychological symptoms [14]. Findings in this study support this; complaints within the pseudo neurology subscale were the only subscale that independently showed a reliable negative association with indoor nature contact. Higher exposure to indoor nature contact was significantly attended by reduced OR for reporting complaints within this subscale. Fjeld [14] introduced quite a large amount of plants; altogether 18 plants were introduced into single offices in the intervention study. In the present study, the amount of indoor nature contact was of a more moderate character, but interestingly a significant association still was found.

Subjective health complaint correlates strongly with perceived stress both in this study ($r=0.41$, $p=0.01$), and earlier studies [16], and is today the most common cause of sick leave in Norway [7,8,9]. Subjective health complaints also correlates strongly with days of sick leave in this study ($r=0.36$, $p=0.01$), thus all the outcomes under study are connected. Given these correlations and the fact that employees who reported higher exposure to nature contact at work also reported less job stress and less subjective health complaints, it is no surprise that indoor nature contact at work had a reliable negative association with days of sick leave in this study. This finding is in line with the findings of a similar study conducted in Norway by Bringslimark and colleagues [15], who found that the number of indoor plants proximal to a worker's desk had a small but statistically reliable association with sick leave.

The Cronbach's α values of both the NCQ subscales are below the standard of $\alpha > 0.7$ [48] on subscales, however, internal consistency may not be a relevant indicator of reliability for the NCQ [38]. Internal consistency reliability (α) is a measure of the similarity of instrument's items to each other as measured by average correlations, and is not an appropriate measure to questionnaires that seek to obtain information about the occurrence of unrelated events or behavior [49]. Thus, the NCQ measures objective counts of different nature contacts and internal consistency may not be a relevant measure. When internal consistency is inappropriate, test retest is the best reliability indicator [49]. Test- retest reliability for the original scales were satisfactory ($r=0.75$, $r=0.9$) [38,39].

5.2 The mediating role of perceived organizational support

In the present study, employees with higher indoor nature contact at work reported higher perceived organizational support. To our knowledge, this association has not been studied before and is a new adding to the field. Comparable, Thomsen and colleagues [36] found that plants influenced the social climate and interaction among the employees. Perceived organizational support consists of elements of social support, and is within the same area of

psychological and social factors at work, and thus these findings points in the same direction. Unfortunately we know little about the shape, size and condition of the plants at the workplaces under study, except at the work places where a firm install and maintain the plants. Plants in bad condition were in the study by Thomsen and colleagues [36] found to lack positive impact. If the condition of some of the plants in this study were bad, this potentially may have weakened the positive impact of plants. We do not know if, or to what degree the employees participate in the care of the plants, maintaining the plants were found by Thomsen and colleagues [36] to have positive impact upon employees.

The mediated analysis interestingly showed that, the associations between indoor nature contact and job stress and days of sick leave are not direct, but mediated through elevated perceived organizational support. The associations between indoor nature contact and subjective health complaints and the subscale of pseudo neurology, are both direct and mediated through elevated perceived organizational support. Environmental modification of the workplace environment with purposeful use of nature contact is thus associated with employees who to a greater extent perceive that their organization cares about their well-being and/or appreciates their contribution. According to the Human Environment Interaction Model, the social climate and the physical environment are connected [23], and the results from our study support this. Noteworthy, it seems like the social climate, expressed as elevated perceived organizational support, may be a key concept when trying to explain some of the underlying mechanisms or processes induced by including nature contact in the physical environment at work. Our findings indicate that utilization of indoor nature contact at work, through installations of indoor plants and windows with view to nature, enhance perceived organizational support, and thus social support and the social climate at the workplace. Purposeful use of nature contact at work may thus be a part of creating a pleasant environment, both physically and social, that helps secure well-being of the employees

through less job stress and less subjective health problems, with less sick leaves as an endpoint. More perceived organizational support correlates with less absenteeism in both earlier studies [11,29,30], and this study ($r=0.18$, $p=0,01$).

The rationale behind this may be derived from the demand-control-support model [19]; according to the model, social support from the management is a part of predicting outcomes such as stress and health [e.g. 19,20,21,22]. Findings in this study indicate that indoor nature contact induces higher levels of perceived organizational support. Perceived organizational support refers to the part of social support that refers to overall levels of social interaction at work from supervisors. Changes in the physical office environment that promotes nature contact is thereby associated with an increase in social support in general or more specific; an increase in the extent to which the employees perceive that their organization cares about their well-being and thus increased perceived organizational support. Following the demand-control-support- model may thus present a possible explanation of how nature contact affects employee well-being; elevated perceived social support leads to improved buffering mechanisms between psychological stressors at work and adverse health outcomes related to stress [19].

5.3 Implications for further research

The present study is conducted at real workplaces and includes a fairly large sample of employees. Earlier studies have showed conflicting results regarding the relation between nature contact at work and perceived job stress among the employees. The utilization of a comprehensive measure related to the experience of nature in the workplace setting and a work specific stress measure has been asked for by previous researchers within the field, and are advantages of this study. The cross sectional design utilized in this study, however, is not

suitable to draw direct causal conclusions. Our findings indicate that a moderate level of indoor nature contact is beneficial, while the low levels of outdoor nature contact showed no reliable association with the outcomes at all. Future research should explore the dose-response relationship between both indoor and outdoor nature exposure and the outcomes further, in order to inform precise practice recommendations regarding enhancing nature contact at work as workplace health promotion. Future research should preferably utilize a prospective design that enables causal conclusions.

Findings in this study indicate that the beneficial associations between indoor nature contact at work and the outcomes under study partly may be explained by an improved social climate due to induced perceived organizational support. This connection is new, so exploring this and other aspects of social support and the social climate in relation to nature contact at work should be given priority in future research within the field.

6.0 Conclusions with implications for practice recommendations

The cross sectional design utilized in this study is not suitable to draw direct causal conclusions. However, the findings present a clear indication that nature contact at work is beneficial for the outcomes under study. Although small, the associations for indoor nature contact show a beneficial direction for all the outcomes under study. More indoor nature contact at work is significantly attended by less job stress, less health complaints, less days of sick leave and more perceived organizational support. This helps adding power to the knowledge base about benefits of nature contact at work and thus strengthens the validity of theory and previous studies within the field. Based on this knowledge base, it seems reasonable to inform practice recommendations that include nature contact in the design of healthy office workplaces, in order to promote employee well-being.

Enhancing nature contact at work can be achieved for instance through adding plants to the workplace environment and open blinds at windows to passively utilize view to nature elements and natural daylight. Purposeful enrichment of the indoor environment with natural elements in order to reduce stress and promote health and well-being for the employees adds to the specter of possible health promoting initiatives in office work places. Enhancing nature contact is easy and cost effective, and should therefore be given priority in cultivating a healthy workplace. Work through employment is a substantial part of the daily lives of the adult population, so utilizing the workplace as an arena for health promotion has great potential for success. All though the topics under study are marginal physical changes to the workplace environments, the ultimate endpoint may be less stress, less health complaints and less days of sick leave.

Employee-environment relations are complex. Thus in this study, like most research on occupational health, we make no claim to have controlled for all factors that might influence the outcomes under study. In addition, directions of effects cannot be inferred when using a cross sectional design. Caution should therefore be excised when drawing direct causal inferences about the effect of nature contact in the working environment on the basis of these results. However, this study presents a clear indication of the beneficial links between indoor nature contact and employee well-being. The small associations between nature contact and the outcomes should not discourage further studies and development of more precise recommendation for practice. Most people spend a large proportion of their life at work, so even small effects may have great practical significance when aggregated over a large number of employees over a life time of employment.

Table 1: Demographic variables at the different workplaces

	Work place						
	1	2	3	4	5	6	7
County	Hedmark	Oppland	Oppland	Hedmark	Hedmark	Rogaland	Oslo
Professional firm							
maintaining indoor plants	no	yes	No	no	no	No	yes
No of employees receiving invitation	260	46	240	50	31	160	980
Response rate (%)	41	67.5	34	54	68	44.5	37.5
Gender							
- Male (%)	37.4	83.9	28	33.3	47.6	42.3	68.8
- Female (%)	62.6	16.1	72	66.7	52.4	57.7	31.2
Age (mean)	47.2	39.3	47.2	51.9	49.5	49.5	49.6
Office type							
- Single (%)	70.1	12.9	74.4	59.3	81	97.2	51.9
- Shared (%)	29.9	87.1	25.6	40.7	19	2.5	48.1

Note: Workplace 1-5 answered the questionnaire in April and workplace 6 and 7 in September.

Table 2: Zero order correlations, means, range and standard deviations for the variables included in the regression analysis of the association between nature contact at work (NCQ outdoor, NCQ indoor) and job stress (JSS), subjective health complaints (SHC), self-reported sick leave and perceived organizational support (POS), including control variables: gender, age and office type.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Gender														
2. Age	-0.13**													
3. Office type	0.09*	0.18**												
4. Job stress	0.01	-0.06	0.02											
5. SHC tot	0.17**	0.05	0.08	0.40**										
6. SHC muscle	0.13**	-0.06	0.08	0.15**	0.38**									
7. SHC pseudo	0.15**	0.04	0.15**	0.29**	0.42**	0.31**								
8. SHC gastro	0.09**	0.05	0.08	0.15**	0.57**	0.20**	0.30**							
9. SHC allergy	0.05	0.10*	0.03	0.17**	0.50**	0.17**	0.19**	0.29**						
10. Sick leave	0.05	0.14**	0.05	0.14**	0.31**	0.10*	0.24**	0.20**	0.11**					
11. Sick leave, days	0.14**	0.02	0.02	0.18**	0.36**	0.16**	0.26**	0.22**	0.17**	0.66**				
12. POS	-0.02	-0.5	-0.04	-0.27**	-0.27**	-0.11**	-0.17**	-0.15**	-0.19**	-0.15**	-0.18**			
13. NCQ outdoor	-0.27**	0.08	-0.03	0.02	-0.05	0.02	-0.01	-0.03	0.01	-0.01	-0.09*	0.05		
14. NCQ indoor	-0.01	0.02	-0.10*	-0.12**	-0.15**	-0.08	-0.14**	-0.09	-0.03	-0.03	-0.09*	0.20**	0.05	
Mean	-	48.41	-	11.22	10.9	4.47	2.98	1.69	0.9	-	3.36	3.38	5.26	17.71
Range	-	17-69	-	0-48.3	0-52	0-21	0-16	0-15	0-10	-	0-9	1-5	3-13	5-30
Standard deviation	-	9.86	-	9.06	9.37	4.32	3.09	2.33	1.61	-	3.27	0.86	2.46	4.88

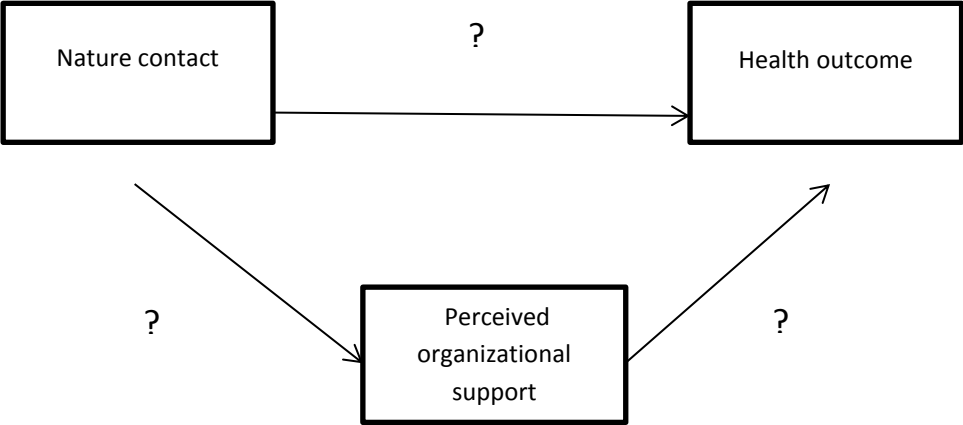
*, ** Significant at $P < 0.05$ or < 0.01 , respectively

Table 3: Regression analysis examining the association between job stress, subjective health complaints (SHC) with four subscales, self-reported sick leave, or perceived organizational support (POS) and contact with outdoor and indoor nature contact at work. Model I include gender, age, office type (control variables) and reported contact with outdoor (NCQ outdoor) and indoor (NCQ indoor) nature. In model II POS is added for mediation analysis.

		Gender	Age	Office type	NCQ outdoor	NCQ indoor	POS (mediation analysis)
Job Stress							
- model I	B (CI)	0.086 (-1.322-1.494)	-0.5 (-0.119-0.02)	0.4 (-1.030-1.83)	0.09 (-0.193-0.373)	-0.18* (-0.318- -0.042)	-
- model II	B (CI)	0,045 (-1.316-1.407)	-0.061 (-0.129-0.006)	0.37 (-1.009-1.757)	0.122 (-0.152-0.396)	-0.098 (-0.234-0.039)	-2.310*** (-3.078- -1.543)
SHC total							
- model I	B (CI)	3.247*** (1.550-4.945)	0.070 (-0.15-0.154)	0.642 (-1.082-2.367)	-0.005 (-0.347-0.336)	-0.278*** (-0.445- -0.112)	-
- model II	B (CI)	3.2*** (1.555-4.846)	0.056 (-0.026-0.138)	0.612 (-1.060-2.284)	0.32 (-0.3-0.363)	-0.182* (-0.347- -0.017)	-2.691*** (-3.619- -1.764)
SHC muscle							
	OR (CI)	2.060** (1.246-3.406)	0.984 (0.961-1.008)	1.503 (0.922-2.449)	1.057 (0.956-1.167)	0.963 (0.918-1.010)	-
SHC pseudo							
- model I	OR (CI)	2.302*** (1.425-3.719)	1.016 (0,993-1.039)	1.719 (1.085-2.724)	1.056 (0.959-1.162)	0.935** (0.893-0.979)	-
- model II	OR (CI)	2.330*** (1.431-3.795)	1.014 (0.992-1.038)	1.694* (1.059-2.710)	0.596*** (0.445-0.799)	0.951* (0.907-0.997)	0.596*** (0.445-0.799)
SHC gastro							
	OR (CI)	1.505* (1.033-2.191)	1.011 (0.993-1.030)	1.243 (0.848-1.820)	0.987 (0.916-1.064)	0.968 (0.932-1.004)	-
SHC allergy							
	OR (CI)	1.247 (0.850-1.830)	1.026** (1.007-1.046)	1.076 (0.727-1.594)	1.009 (0.935-1.089)	0.991 (0.954-1.029)	-
Sick leave							
	OR (CI)	1.343 (0.892-2.023)	1.034** (1.013-1.056)	0.939 (0.617-1.427)	1.008 (0.929-1.093)	0.985 (0.946-1.025)	-
Sick leave days							
- model I	B (CI)	0.841** (0.241-1.441)	0.014 (-0.016-0.044)	-0.101 (-0.711-0.508)	-0.073 (-0.194-0.048)	-0.061* (-0.009- -0.002)	-
- model II	B (CI)	0.083** (0.238-1.423)	0.010 (-0.019-0.040)	-0.108 (-0.710-0.494)	-0.065 (-0.184-0.055)	-0.038 (-0.098-0.021))	-0.621*** (-0.955- -0.287)
POS							
	B (CI)	-0.018 (-0.175-0.140)	-0.005 (-0.013-0.003)	-0.011 (-0.171-0.149)	0.014 (-0.018-0.045)	0.036*** (0.020-0.051)	-

Note: *, **, *** Significant at P<0.05, 0.01 or 0.001, respectively

Figure 1: Mediation model describing the possible paths for the relationship between nature contact, perceived organizational support and the health outcomes.



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9.0 Appendix

9.1 Appendix 1: The questionnaire



Arbeidsmiljøundersøkelse UMB 2012

Når du svarer på spørsmålene er det viktig å huske på at det ikke finnes noen "riktige" eller "gale" svar. Det som er viktig, er at du svarer på alle spørsmålene.

Du avgir svar på spørsmålene ved å merke av i rubrikken ved det svaralternativet som passer best med din oppfatning. Ditt svar vil være helt anonymt.

Lykke til med utfyllingen!

Din identitet vil holdes skjult
Les om retningslinjer for personvern. (Åpnes i nytt vindu)

Først litt bakgrunnsinformasjon

1) * Kjønn

Mann Kvinne

På de neste spørsmålene skriver du inn et tall i rubrikken nedenfor spørsmålet.

2) * Alder i år

3) * Hvor mange år har du vært ansatt i din nåværende stilling?

4) * Hvor mange timer arbeider du vanligvis pr. dag? (Om dette varierer, angi et gjennomsnitt)

Med din faste arbeidsposisjon mener vi det stedet innendørs du tilbringer mesteparten av arbeidsdagen din. Eksempler kan være eget kontor, kontor du deler med andre, åpent kontorlandskap osv.

5) Dersom du har en fast arbeidsposisjon, hvor mange timer arbeider du vanligvis pr. dag fra denne posisjonen? (Om dette varierer, angi et gjennomsnitt)



Fysisk arbeidsmiljø

De neste spørsmålene omhandler din oppfatning av en del fysiske forhold på din arbeidsplass.

6) * Har du i løpet av de siste 4 ukene blitt plaget av noen av de følgende faktorene på din arbeidsplass?

	Aldri	Sjelden	Av og til	Ofte	Svært ofte
Trekk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For høy romtemperatur	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Temperaturvariasjoner over dagen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For lav romtemperatur	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Innestengt/ "dårlig" luft	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tørr luft	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ubehagelig lukt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Statisk elektrisitet eller småstøt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For svak belysning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For skarpt lys	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Støy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Støv og smuss	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Hensikten med de neste spørsmålene er å få din oppfatning av hva som er viktige kilder til stress i din jobb. Du skal vurdere noen utsagn som beskriver jobbrelevante situasjoner. Om du ikke selv har opplevd situasjonen, **forestill deg hvordan du ville ha reagert.**

Tildeling av ubehagelige arbeidsoppgaver vurderes som en gjennomsnittlig stressopplevelse med verdien 5. Din oppgave er å sammenligne hver situasjon med denne standarden. Om situasjonen er mindre stressende enn standarden marker et punkt med verdi lavere enn 5, om situasjonen er mer stressende, marker høyere enn 5.

Start med å markere 5 på den første situasjonen, tildeling av ubehagelige arbeidsoppgaver

7) * Stressende arbeidsrelaterte situasjoner og hendelser - mengde stress

	Lite 1	2	3	4	Moderat 5	6	7	8	Mye 9
Tildeling av ubehagelige arbeidsoppgaver	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overtidsarbeid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Samarbeidsproblemer med overordnet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tildeling av nye eller uvante arbeidsoppgaver	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Arbeidskolleger som ikke gjør jobben sin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mangelfull støtte fra overordnet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Håndtering av krisesituasjoner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mangel på anerkjennelse av godt utført arbeid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Utføre arbeidsoppgaver som ikke står i stillingsinstruks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Arbeidet hemmes av for lite eller dårlig utstyr	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tildeling av økt ansvar	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ubehageligheter fra brukergruppe, rettet mot egen person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanskeligheter med å komme overens med overordnet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Negative holdninger fra utenforstående overfor arbeidsstedet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For få ansatte for å utføre en arbeidsoppgave tilfredsstillende	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



8) * Stressende arbeidsrelaterte situasjoner og hendelser - mengde stress- fortsettelse

	Lite				Moderat				Mye
	1	2	3	4	5	6	7	8	
Ta viktige avgjørelse på stedet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ubehageligheter fra arbeidskollegaer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mangel på deltagelse i beslutninger om regler og retningslinjer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Usikkerhet med hensyn til hvilke oppgaver jeg har ansvaret for	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Konkurranse om forfremmelse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dårlig eller mangelfull ledelse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Motstridende forventninger til arbeidsoppgaver jeg skal ivareta	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hyppige avbrytelser	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hyppige skiftninger fra enkle til krevende arbeidsoppgaver	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For mye papirarbeid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overholde tidsfrister	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mangel på pauser i arbeidstiden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gjøre arbeid for andre ansatte	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lite motiverte arbeidskollegaer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Konflikter med andre avdelinger	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>




For hver av de jobbrelaterte situasjonene listet opp tidligere, skal du nå angi omtrent hvor mange dager i løpet av de siste 6 måneder du personlig har erfart denne situasjonen. Marker "0" om situasjonen ikke har inntruffet de siste 6 månedene.

9) * Stressende arbeidsrelaterte situasjoner og hendelser - antall dager

	0	1	2	3	4	5	6	7	8	9 eller fler
Tildeling av ubehagelige arbeidsoppgaver	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overtidsarbeid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Samarbeidsproblemer med overordnet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tildeling av nye eller uvante arbeidsoppgaver	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Arbeidskolleger som ikke gjør jobben sin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mangelfull støtte fra overordnet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Håndtering av krisesituasjoner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mangel på anerkjennelse av godt utført arbeid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Utføre arbeidsoppgaver som ikke står i stillingsinstruks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Arbeidet hemmes av for lite eller dårlig utstyr	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tildeling av økt ansvar	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ubehageligheter fra brukergruppe, rettet mot egen person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vanskeligheter med å komme overens med overordnet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Negative holdninger fra utenforstående overfor arbeidsstedet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For få ansatte for å utføre en arbeidsoppgave tilfredsstillende	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
										

10) * Stressende arbeidsrelaterte situasjoner og hendelser - antall dager-fortsettelse

	0	1	2	3	4	5	6	7	8	9 eller fler
Ta viktige avgjørelser på stedet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ubehageligheter fra arbeidskollegaer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mangel på deltagelse i beslutninger om regler og retningslinjer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Usikkerhet med hensyn til hvilke oppgaver jeg har ansvaret for	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Konkurranse om forfremmelse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dårlig eller mangelfull ledelse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Motstridende forventninger til arbeidsoppgaver jeg skal ivareta	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hyppige avbrytelser	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hyppige skiftninger fra enkle til krevende arbeidsoppgaver	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For mye papirarbeid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Overholde tidsfrister	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mangel på pauser i arbeidstiden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gjøre arbeid for andre ansatte	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lite motiverende arbeidskollegaer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Konflikter med andre avdelinger	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
										

11) * Mestring av arbeidet

	Meget sjelden eller aldri	Nokså sjelden	Noen ganger	Nokså ofte	Meget ofte eller alltid
Er du fornøyd med kvaliteten på arbeidet som du utfører?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Er du fornøyd med mengden arbeid som du får gjort?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Er du fornøyd med din evne til å løse problemer som dukker opp i arbeidet?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Er du fornøyd med din evne til å ha et godt forhold til dine arbeidskollegaer?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12) * Mestring - fortsettelse

	Meget sjelden eller aldri	Nokså sjelden	Noen ganger	Nokså ofte	Meget ofte eller alltid
Er dine spesialkunnskaper og ferdigheter nyttige i arbeidet ditt?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Er arbeidet ditt utfordrende på en positiv måte?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ser du på arbeidet ditt som meningsfylt?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13) * Ivaretagelse fra ledelsen

	Meget sjelden eller aldri	Nokså sjelden	Noen ganger	Nokså ofte	Meget ofte eller alltid
Får du belønning for velgjort arbeid i din bedrift/virksomhet? (penger, oppmuntring)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Blir de ansatte tatt vare på ved din bedrift/virksomhet?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hvor meget er ledelsen ved din bedrift/virksomhet opptatt av den ansattes helse og velvære?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



På den neste siden nevnes noen vanlige helseplager. Din oppgave er å vurdere hvert enkelt problem, og oppgi i hvilken grad du har vært plaget av dette i løpet av de siste 30 dogn.

14) * Alminnelige helseproblemer siste 30 dogn

	Ikke plaget 0	Litt plaget 1	En del plaget 2	Alvorlig plaget 3
Forkjølelse, influensa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hoste, bronkitt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Astma	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hodepine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nakkesmerter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smerter øverst i ryggen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smerter i korsrygg	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smerter i armer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smerter i skuldre	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Migrene	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hjertebank, ekstraslag	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brystsmerter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pustevansker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smerter i føttene ved anstrengelser	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sure oppstøt, "halsbrann"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sug eller svie i magen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Magekatarr, magesår	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mageknip	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Luftplager"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Løs avføring, diare	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Forstoppelse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eksem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Allergi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hetetokter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Søvnproblemer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tretthet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Svimmelhet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Angst	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nedtrykt, depresjon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15) * Har du vært sykmeldt det siste året?

- ja
- Nei

16) * Hvor mange dager i løpet av det siste året har du vært borte fra jobben grunnet egen sykdom?

- 0 1 2 3 4 5 6 7 8 9 eller flere



Det neste spørsmålet omhandler din bruk av omgivelser utendørs i løpet av arbeidsdagen. Med utendørs mener vi ute i friluft.

17) * Forrige uke (mandag – fredag), hvor mange ganger ...

	0	1	2	3	4	5 eller flere
Tilbragte du en morgen- eller ettermiddagspause fra arbeidet utendørs?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spiste du lunsj utendørs?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trente du utendørs i løpet av arbeidstiden?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gikk du utendørs for oppgaver eller ærender i løpet av arbeidsdagen?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

De siste spørsmålene omhandler innendørs arbeidsmiljø ved din faste arbeidsposisjon. Ikke inkluderer innendørs areal som du av og til besøker i løpet av arbeidsdagen.

18) * Hvordan vil du beskrive din faste arbeidsposisjon?

- Eget kontor (cellekontor)
- Kontor med opptil 3 andre personer
- Åpent kontorlandskap
- Resepsjonsområde
- Har ikke fast arbeidsposisjon
- Annet



Det neste spørsmålet skal du ikke svare på om du krysset av for at du ikke har en fast arbeidsposisjon

19) Forrige uke (mandag-fredag), hvor mange _____ kunne du se fra din faste arbeidsposisjon?

	0	1	2	3	4	5 eller mer
Levende "pottede" planter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Levende avskårne blomster eller blomsterdekorasjoner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kunstige "pottede" planter, avskårne blomster eller blomsterdekorasjoner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vinduer med utsikt direkte ut	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Akvarier med levende fisk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kjæledyr	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Malerier eller tegninger som representerer realistiske naturmotiv eller dyr (ikke mennesker)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personlige eller profesjonelle fotografier av naturmotiv eller dyr (ikke mennesker)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Realistiske utskjæringer eller skulpturer av dyr eller naturelement (ikke mennesker)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Det neste spørsmålet skal du ikke svare på om du krysset av for at du ikke har noen fast arbeidsposisjon, eller om du ikke har vindu ved din faste arbeidsposisjon

20) På en skala fra 1-6 vil du si at du gjennom vinduet/vinduene ved din faste arbeidsposisjon ser hovedsaklig bygde arealer som bygninger, vei og mur (1), eller hovedsaklig naturelement som trær, blomster og vann (6)?

	Bygde arealer, 1	2	3	4	5	Naturelement, 6
Vindusutsikt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Det siste spørsmålet skal du ikke svare på om du ikke har noen fast arbeidsposisjon.

21) Ved din faste arbeidsposisjon siste uke (mandag til fredag), hvor stor del av tiden....

	0%	1-20%	21-40%	41-60%	61-80%	81-100%
Var det naturlig dagslys som belysning?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hadde du fri utsikt ut vinduet? (ingen rullgardin, persienne, gardin eller lignende trukket for)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kunne du høre naturlyder? (fuglesang, vann ol)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Så du på bilder av natur eller dyr på tv eller monitor?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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9.2 Appendix 2: Example of the invitation letter to participate in the questionnaire

Hamar kommune er invitert til å delta i en arbeidsmiljøundersøkelse. Formålet med undersøkelsen er å se på sammenhengen mellom friskfaktorer på en arbeidsplass og helse blant de ansatte. Det tar ca 15 minutter å svare på undersøkelsen, og den er godkjent av Org./personalsjef. Ditt svar vil behandles anonymt. Det vil si at det ikke blir spurt om personidentifiserbar informasjon og verken din leder eller de ansvarlige for undersøkelsen vil kunne identifisere de som svarer. Ditt bidrag til undersøkelsen er viktig for å synliggjøre faktorer som kan bidra til bedre arbeidsmiljø i fremtiden. På forhånd tusen takk!

Ansvarlig for undersøkelsen er tilknyttet master i Folkehelsevitenskap ved Universitetet for Miljø- og biovitenskap:

Siv Bjørnstad, sykepleier, student ved master i Folkehelsevitenskap UMB, e-post: ziw5@hotmail.com, mobil: 99626990

Grete Patil, førsteamanuensis UMB, prosjektansvarlig, e-post: grete.patil@umb.no
kontortelefon: 64 96 56 56

Ruth Kjærsti Raanaas, førsteamanuensis UMB, prosjektmedansvarlig, e-post: ruth.raanaas@umb.no, mobil: 41236314

Du kommer til undersøkelsen ved å klikke på linken nedenfor:

<https://response.questback.com/sivbjrnstad/hamarkommuneumb2012/>

9.3 Appendix 3: Regional Committees for Medical and Health Research Ethics



Region:	Saksbehandler:	Telefon:	Vår dato:	Vår referanse:
REK sør-øst	Jakob Elster	22845530	17.11.2011	2011/2096/REK sør-øst B
			Dens dato:	Dens referanse:
			13.10.2011	

Vår referanse må oppgis ved alle henvendelser

Siv Bjørnstad
Kåtorpgrenda 68

2011/2096 Grønne omgivelser på arbeidsplassen – en helsefremmende faktor?

Vi viser til din forespørsel om fremleggelsesvurdering for prosjektet "Grønne omgivelser på arbeidsplassen – en helsefremmende faktor?", datert 13.10.2011.

Hovedmålet ved studien er å undersøke om ulike grønne omgivelser på arbeidsplassen har innvirkning på arbeidstakerens opplevelse av stress og mestring av jobbhverdagen. Forskningsdeltakerne skal via Questback besvare ulike spørreskjemaer, blant annet om mestring og stress på arbeidsplassen og om subjektive helseplager.

Forespørselen er vurdert på fullmakt av komiteens leder.

Opplysninger om subjektive helseplager og egenmeldt sykefravær, som det skal spørres etter i prosjektet, er å regne som helseopplysninger i helseforskningslovens forstand, og medisinsk og helsefaglig forskning på helseopplysninger er normalt fremleggelsespliktig for REK. Men så fremt opplysningene som skal samles inn er anonyme, det vil si at det ikke er mulig å knytte dem til en enkeltperson, er prosjektet likevel ikke fremleggelsespliktig.

Hvis måten opplysningene samles inn på sikrer reell anonymitet, så det ikke er mulig å knytte opplysningene til en enkeltperson, for eksempel via e-postadresse, vil prosjektet dermed falle utenfor helseforskningslovens virkeområde, jf. helseforskningsloven § 2 (sammenholdt med § 4 d), og ikke være fremleggelsespliktig for REK. Hvis anonymitet ikke kan garanteres, bør en søknad om godkjenning sendes REK.

Med vennlig hilsen,

Stein Opjordsmoen Ilner (sign.)
Professor dr. med
Komiteleder

Jakob Elster
Seniorrådgiver

Besøksadresse: Gulhaug torg 4 A, Nydalen, 0484 Oslo	Telefon: 22845511 E-post: post@helseforskning.etikk.no	All post og e-post som inngår i saksbehandlingen, bes adressert til REK sør-øst og ikke til enkelte personer	Kindly address all mail and e-mails to the Regional Ethics Committee, REK sør-øst, not to individual staff
	Web:		