

Safety Training Park Northern Finland – A Multi-stakeholder Approach to Improve Occupational Safety and Health

Abstract

Accident and injury rates are high in the construction industry, and there are no significant signs of occupational safety and health (OSH) development. The OSH interests, skills and knowledge of both employees and managers should be improved to gain long-lasting improvements. The Finnish construction industry has introduced a new safety training concept called Safety Training Park (STP) to meet these challenges. STPs consist of real-world training points and use new and innovative safety training methods aimed at stimulating both individual behaviour change and quality change in overall conditions that ultimately aims to lead to improved safety performance at both the construction site and organisational levels. The trainings are based on multimodal information sharing and participation with the ultimate aim of provoking discussion on experiences and beliefs among the members of the trainee group. This study focuses on the Safety Training Park in northern Finland (STPNF). STPNF has been designed, constructed and financed during a collaboration process that includes more than 80 organisations. In order to contribute to the discussion regarding sustainable work reaching from the employee level to the organisational level and beyond, STPNF is discussed both from microergonomic and macroergonomic perspectives.

Introduction

The construction industry is amongst the most challenging industries worldwide regarding occupational safety and health (OSH). Accident figures are high, and no significant signs of OSH development have been identified (Lander, Nielsen & Lauritsen, 2016; Ringen, Duivenbooden & Melius, 2010). In addition to risks for different types of accidents, construction work contains several other factors that have been identified as causing adverse health effects to personnel at construction sites. Construction work is associated with various psychosocial discomfort and stress factors related to job characteristics and organisational and social aspects (Sobeih, Salem, Daraiseh, Genaidy & Shell, 2006; Sobeih, Salem, Genaidy, Abdelhamid & Shell, 2009). Work tasks at construction sites also include physical discomforts and hazards such as difficult and repetitive working positions and manual lifting and transfers. In addition, changing weather conditions and exposure to industrial hygiene

risk factors such as chemical substances, whole-body and hand-arm vibration, noise and dust are common in the construction industry (Boschman, van der Molen, Sluiter & Frings-Dresen, 2012; Guo, Yiu & Gonzalez, 2016; Rwamamara, Lagerqvist, Olofsson, Johansson & Kaminskas, 2010).

From an organisational perspective, construction sites are highly complex. Construction sites and work environments are in a constant change due to the nature of construction work. Almost all construction sites, and certainly large sites, can be considered shared workplaces because employees from several different employers are working on their specific area of expertise (Häkkinen & Niemelä, 2015; Ismail, Doostdar & Harun, 2012). Such multi-employer worksites are most often ran by a principal employer (or principal contractor) whilst a variety of different tasks may be outsourced to other service providers. Electrical installation, heating, plumbing, ventilation and sanitation engineering work can be considered as typical examples of such tasks.

Employers working at a shared workplace all have their own perspectives and interests at hand. Further, they might value OSH differently (Loushine, Hoonakker, Carayon & Smith, 2006). OSH at a shared workplace is however ultimately dependent on principal employer's OSH management practices and processes. Managing this kind of a multi-organisational complexity is a challenge. When this complexity is inadequately managed, different kinds of problems and risks occur at the construction site level. Typically, these are realised in practice as ineffective processes, such as quality errors, schedule delays, litigation costs and non-productive time, but they also represent an increased level of different types of risks and hazards.

The employees that comprise the workforce at construction sites are often less-educated males representing different nationalities (Demirkesen & Arditi, 2015; Wilkins, 2011). On the front lines, these employees face these complex challenges in practice at sites (Loushine et al., 2006). Based on above references highlighting the complexity of a construction site as a work environment, we point out that OSH management is often forced to rely on employees having adequate skills, knowledge and competence to cope with these challenges. OSH trainings, in their various forms, are commonly used to improve the OSH skills, knowledge and capability of personnel (Demirkesen & Arditi, 2015; Ricci, Chiesi, Bisio, Panari & Pelosi, 2016).

Traditionally, the common culture at construction sites has at least indirectly acknowledged accidents as a 'natural part of the work' (Loushine et al., 2006). However, some signs of a cultural change have been recognised and a vision of zero accidents (e.g. Zwetsloot et al., 2013) has taken root in the Finnish construction industry. Larger construction companies in Finland can be considered forerunners and signposts as they have publicly shared their visions on zero accidents (e.g. Zwetsloot et al., 2013). Within the OSH literature, this cultural change is paralleled by newer approaches to OSH management that focus on quality, corporate social responsibility (CSR), corporate sustainability (CS), business ethics and providing and securing safe operations and safe processes in all kinds of circumstances, instead of accepting the occurrence of risks for accidents and injuries at sites (Loushine et al., 2006; Zwetsloot et al., 2017).

Recent OSH literature calls for increasing the knowledge on these OSH training approaches and their effects at different levels (Ricci et al., 2016; van der Molen et al., 2018). A novel approach to OSH trainings has been created in Finland by introducing the Safety Training Park (STP) concept (Reiman et al., 2017). The STP concept has risen from the Finnish construction industry's need to improve OSH performance at construction sites. STPs are based on an underlying assumption that OSH performance is improved when OSH skills and knowledge are increased at the personal level and, ultimately, at the team, worksite and organisational levels. The STP concept has sparked interest outside Finland as well; for instance, in Sweden and Denmark, different stakeholder groups representing construction have shared their visions on creating STPs for their purposes. We see STPs as a part of a historical development towards a more proactive and human-centred approach to OSH in the Finnish construction industry. Further, as STPs have been developed, designed, constructed and financed largely by commercial stakeholders representing mainly construction industry, we see that as a concrete sign of both CSR and CS (see van Marrewijk, 2003; Zink & Fischer, 2013). We see STPs as constructs that foster stakeholder dialogue between the construction companies, but also between construction industry and other stakeholders. Further, as OSH can be associated to value creation at various levels and human capital development and management at large, we see STPs have the potential to influence CS more broadly.

Based on the references above, we conclude that the focus of OSH should be aimed towards organisational and proactive actions, instead of focusing merely on the occurrence of

accidents and injuries. One such proactive action is safety training (Vredenburg, 2002). In this chapter, we focus on the STP in northern Finland (hereafter, STPNF). Objectives of this qualitative and interpretative chapter are twofold. In the first phase, the STPNF concept is presented and discussed as an ergonomic construct with channels for influence by both microergonomics and macroergonomics. In the second phase, to facilitate more in-depth discussion, empirical interview material reaching from the trainee group level to top management is analysed to highlight the effects that the STPNF trainings can have at the personal and organisational levels.

Methodology

This study is based on case study premises. Case studies can be used to develop new understandings of social phenomena in different contexts through analytical generalisations from empirical and theoretical material (Yin, 1994). Multiple methods can be used in case studies, but often qualitative methods are given preference. Hence, the goal of a case study is detailed descriptions and explanations of social phenomena in its context and not statistical generalisation.

Case description

STPNF can be considered a complex interorganisational construct with the potential to affect various levels. From the macroergonomics perspective, the emphasis in this study is on describing the STPNF as an output of multi-organisational collaboration. From the microergonomics perspective, the emphasis is on individual learning potential; that is determining the most effective kinds of training in STPNF and the changes the trainings have initiated. Thus, in this article, we discuss STPNF both as a microergonomics and macroergonomics construct.

The STP concept and STPNF, in particular, are presented in detail by Reiman, Airaksinen, Väyrynen and Aaltonen (2015) and Reiman et al. (2017). Here we just provide a short description of STPNF to facilitate and deepen our case study analysis. The STP concept is a unique Finnish-born safety training innovation. STPs are physical learning environments. The trainings in STPs are based on training points that include simulated work environments mainly from the construction industry. All three Finnish STPs share a similar structure with several different training points all representing typical work environments in the construction industry. The major differences between the three STPs in Finland are based on

their ownership and consortium arrangements. The first STP, Rudus STP, is owned by a single company, whereas STPNF was designed, constructed and financed in a multi-stakeholder cooperation of more than 80 organisations and is managed by the STPNF Association. The structure of the third STP, located in eastern Finland (STPEF) is close to the STPNF. However, STPEF is operated by and located inside the national Emergency Services College. The coverage of the Finnish STP network can be considered somewhat exhaustive, as all major cities in Finland are located within a maximum of 200 kilometres from the nearest STP.

The 21 STPNF training points are described in detail by Reiman et al. (2015, 2017). In the STPNF design phase, each one of the training points was nominated by a master organisation (or organisations) from the consortium members. In fact, the master organisations led the design and construction process of each training point; however, the STPNF Association controlled the overall process as an entity. Master organisations covered the expenses related to the design and construction of the training points. Expenses related to the STPNF training environment as a whole, including infrastructure and surface construction, electricity works and cleaning and maintenance, are covered by the STPNF Association. A more profound description of the expenses is provided by Reiman et al. (2017).

Methods

The first phase of our case study is based on the STPNF document analysis and interviews. The documents analysed cover written training point descriptions and a trainer's training material. The second phase analyses stakeholders' perspectives on STPNF in general and on the effects of the trainings. This part of the analysis is based on interview material.

Both individual and focus group interviews are used in this study. The focus group interviews focus on one trainee group from a local unit (~400 employees) in a large multi-national service company providing services to the construction industry and other branches. The company's main services concerning the construction industry are related to construction site cleaning and sanitation. Thus, the work tasks their personnel provide at construction sites can be considered physically demanding. The company has had all of its regional personnel trained in the STPNF. The trainee group visited the STPNF in June 2015. The first focus group interview was arranged one month after the training session, and the second interview occurred one year after the training. Seven interviewees (three female, four male representing

four employees and three foremen) participated in the first session, and four interviewees (one female, three male representing two employees and two foremen) took part in the second session. In addition, the regional director and the managing director were interviewed separately after the focus group sessions. Along with the company-specific interviews, a focus group interview was arranged for three experts (all male) representing the STPNF Association. The interviews lasted from 48 to 92 minutes, and all interviews were recorded and transcribed. To enliven the analyses direct quotations from the interviews (translated from Finnish to English and proof checked by a native English speaking professional) are used in this article. In addition to the interviews, annual loss-time injury frequency rates (LTA1: injuries leading to one or more days of absence from work per million working hours) concerning the local unit were collected.

Results

STPNF as a microergonomics and macroergonomics construct

In the first phase of our analysis, we discuss STPNF as a construct, resulting from stakeholder collaboration. The approach to using STPNF may vary from one organisation to another. However, from the construction company point of view, the main objective for STPNF is to serve as an environment in which the company can train its own personnel. The trainings can cover all the training points, or they can be tailored to fit the needs of the trainee group. This adaptability was recognised as one cornerstone of the trainings towards larger, long-lasting improvements in OSH performance. A top management representative pointed out that when planning STPNF trainings, the organisation must have settled goals for how they deal with the visit to STPNF: *“We are willing to have a push forward and that you must take each employee into consideration and start leading them towards the common targets”*.

Besides organisation-specific objectives to train their own personnel, STPNF was also seen as a forum through which the STPNF consortium members can publicly share their willingness to affect society at large. STPNF membership can even be seen as part of the CSR as emphasised by a top management representative: *“This [STPNF] is some kind of a sign of social responsibility to participate on safety development action. If you invent something, you will give it to me, and if I invent something, I’ll give it reciprocally to you. . . We will compete [with] each other with something else, quality for instance”*.

The STPNF creation process as a whole can be discussed as a multi-stakeholder collaboration phenomenon starting from the early design phases. As a means to engage organisations in the STPNF process, organisations voluntarily selected the topics that they were willing to have training on in the STPNF. Link to the introductions where barriers for such a corporation are mentioned. To avoid overlapping topics, the STPNF Association coordinated the topic selection process, nominated master organisations and steered those with similar interests to collaborate. The importance of this collaboration steered by the Association is emphasised by an expert interview quotation: *“It was like when the common topic was found, it simultaneously created commitment to construct the training point. A common understanding was found that this kind of ‘voluntary work’ is not such a kind that you will be doing something that someone else has planned. Instead, you are actively thinking what are the issues that you are willing to have trained in that training point”*. A vast majority of the training points were designed and constructed in such collaboration processes between the stakeholder organisations.

The participatory design and construction process just described aimed to have the most important aspects related to OSH at construction sites covered at the STPNF training points. Figure 1 shows an aerial photograph of STPNF training points related to construction site logistics, road construction work and excavation protection. In addition, dummies representing good and bad solutions are shown.

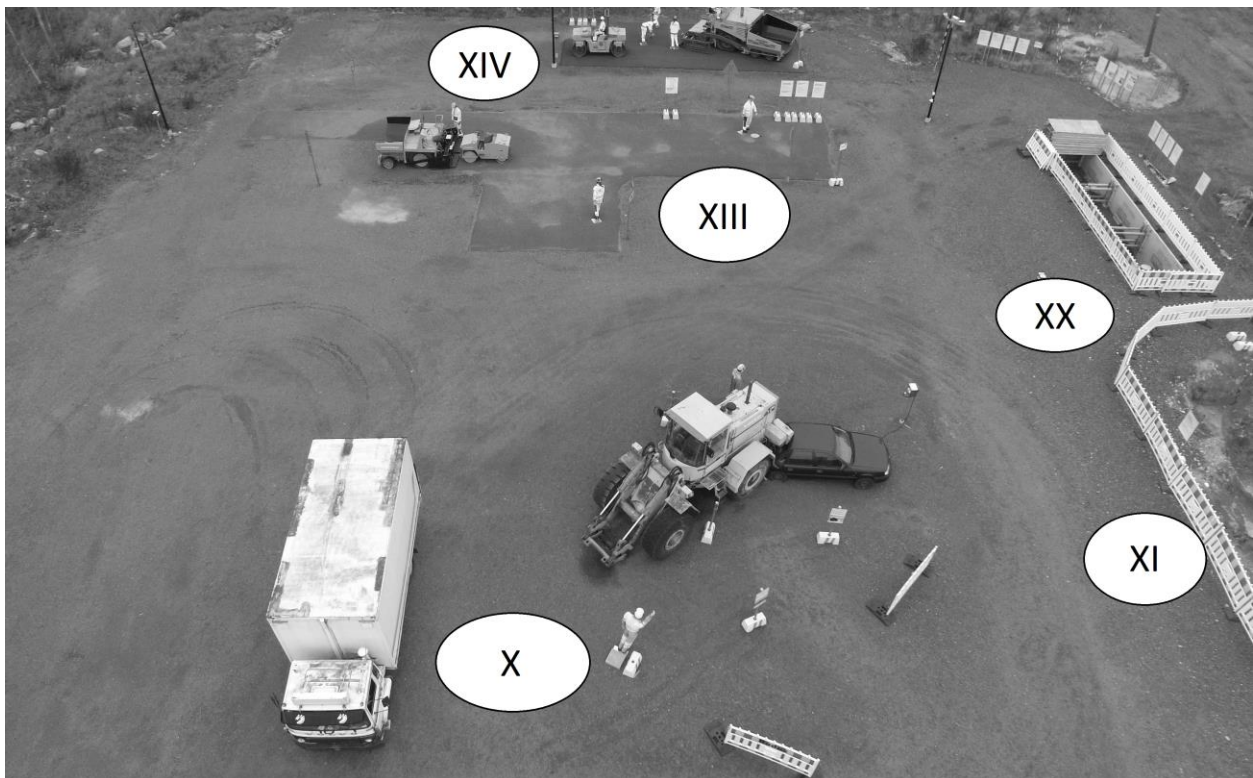


Figure 1. Training points X, XI, XIII, XIV and XX. See Table 1 for further information on the training points.

The master organizations provided written descriptions of the training points, which included intended training approaches and expected learning outcomes. Our analysis for the training point documents revealed both microergonomics and macroergonomics aspects. To contribute to holistic OSH management, macroergonomics at the organisation level and interorganisational practices were identified in the documents. A majority of these organisational training aspects were related to construction design and planning processes aiming to work safely at shared workplaces. Thus, a majority of the training points include training aspects in which construction site planning and collaboration are discussed. Depending on the trainee group, the training point discussions may cover different stakeholders' duties and responsibilities, as well as good practices related to early phase design processes at construction projects. However, the trainee group may also deepen their discussion into concrete microergonomics aspects. For example, the training point discussions may contain hazard identification exercises followed by discussions on good risk management practices reaching all the way to the selection of proper personal protective equipment (PPE) at certain work phases. Table 1 presents the analysis results concerning the intended training point contents from microergonomics and macroergonomics aspects.

Table 1. Training points and their intended microergonomics and macroergonomics training aspects.

Training point	Macroergonomics training aspects	Microergonomics training aspects
I. Safety management, responsibilities and safety planning	<ul style="list-style-type: none"> - Different stakeholders' duties and responsibilities - Structure of the safety organisation 	<ul style="list-style-type: none"> - Personal OSH responsibilities at work - Accident consequences
II. Access control and grey economy	<ul style="list-style-type: none"> - Contractor's obligations and liability 	<ul style="list-style-type: none"> - Personal requirements and permissions
III. Construction work for foundations and framework	<ul style="list-style-type: none"> - Orientation to work at shared workplaces - Concrete element storage arrangements - Construction site fencing 	<ul style="list-style-type: none"> - Fall arrest systems, routes and scaffoldings at high-rise buildings - Concrete pumping - Vault moulding
IV. Construction work for house technology	<ul style="list-style-type: none"> - Timetable planning 	<ul style="list-style-type: none"> - Workplace cleanliness - Lifting ergonomics
V. Construction work inside houses	<ul style="list-style-type: none"> - Dust control at construction sites 	<ul style="list-style-type: none"> - Floor casting and chipping - Grinding of walls and ceilings - Construction site lighting
VI. Lifting and hoisting safety	<ul style="list-style-type: none"> - Planning of lifting and hoisting at construction sites 	<ul style="list-style-type: none"> - Assisting devices and tools - Signs and signals
VII. Tools, working levels, and personal passenger hoists	<ul style="list-style-type: none"> - Arrangements for working at heights 	<ul style="list-style-type: none"> - Using handheld tools - Working at levels and hoists
VIII. Reconstruction work	<ul style="list-style-type: none"> - Exposure management at sites - Development of damp housing 	<ul style="list-style-type: none"> - Weather guards for roof work - Scaffolding solutions - Roof work practices - Occupational exposures
IX. Property maintenance	<ul style="list-style-type: none"> - Chemical safety arrangements - Arrangements for situations while working alone 	<ul style="list-style-type: none"> - Ventilation installation maintenance - Electricity works
X. Transits and transportation at sites	<ul style="list-style-type: none"> - Construction site logistics arrangements 	<ul style="list-style-type: none"> - Ascending and descending the cab - Shadow areas of heavy machinery

			- Pressurisation of tires at site
XI.	Dangers in excavation work	- Excavation protection planning	- Excavation protection solutions
XII.	Dangers of overhead lines	- Planning of working with overhead lines	- Typical hazards - Working with overhead lines
XIII.	Traffic control in roadwork	- Traffic control planning at roadwork sites	- Commonly used control systems - Typical hazards
XIV.	Asphalt work	- Planning of asphalt construction sites	- Commonly used machinery - Typical hazards
XV.	Construction within industrial processes	- OSH requirements and permission to work at industrial sites	- Zero-energy state for the machinery - Welding OSH and ergonomics
XVI.	Single-family house construction work	- OSH requirements and duties related to constructing single-family houses	- Fall arrest protection systems at single-family house construction sites
XVII.	PPE exhibition	- Guidance on PPE selection - Chemical safety and storage at sites	- Commonly used PPEs
XVIII.	Industrial services	- Risk management planning for employees working alone	- Typical hazards related to working at industrial sites
XIX.	Fire safety training	- Fire safety planning	- Fire safety training - Commonly used hand extinguishers
XX.	Excavation protection	- Excavation protection planning	- Protection solutions - Different pipes and cables
XXI.	Slips and falls	- Expenses related to slipping accidents - Slip safety campaigns	- Sand spreader solutions - Slip-resistance solutions

The major idea for learning in the STPNF is that while OSH information is shared via different channels (visual, auditory, texts, videos, kinaesthetic learning) simultaneously, the trainers aim to provoke discussion on experiences and beliefs among the members of the trainee group. Thus, the trainings include an important peer learning element. To enliven the information sharing and the learning experience, simulated work environments are used that represent real-life working situations. Figures 2a and 2b illustrate the arrangements at training points IV (Construction work for house technology) and XIII (Reconstruction work). In Figure 2a, the dummy and the simulated work environment represent good practices related to asbestos removal processes. From the microergonomics perspective, the training includes aspects related to asbestos as an exposure and the selection of proper PPEs, for instance. As a

macroergonomics aspect, the training point discussion may be extended to asbestos legislation, permissions to work with asbestos and to the isolation of the work environment where asbestos work is performed. Figure 2b represents macroergonomics problems related to bad planning; that is overlapping with different tasks. However, the discussion may be – once again – reaching to various microergonomics aspects, such as identifying different risks, discussion of risk management practices and communication skills.



Figure 2 (a) a visualised example of a training point representing good practices related to asbestos work and related to (b) bad timetable planning.

Stakeholder perspectives on the trainings

As mentioned, the employees within the construction industry vary greatly regarding their OSH interests, skills and knowledge. Good OSH performance is highly dependent on the compliance of the workers to the common laws, rules and practices. A positive attitude towards OSH is a prerequisite. STPNF training aims to provide a positive learning experience that has long-term effects and facilitates changes in individual behaviour. Long-term effects include not only safe performance at construction sites but also increased understanding of the broad consequences of bad OSH reaching from the individual level to the family level and beyond. Understanding the variety of different consequences of their own actions is an

important first step towards employees making changes in their behaviours. One employee emphasised this point: “. . . *From that you figure out, that if a severe occupational accident occurs, it touches not only the injured person and his or her fellow workers, but that there are mothers, fathers, wives and children back at home waiting. It makes you think about your actions*”.

Demonstrated bad working environments stirred thoughts on possible consequences. One interviewee raised the following issue: *It [Excavation protection training point] was a frightening demonstration. Really . . . very thought-provoking to consider that such excavation pits can be seen everywhere. You don't think, when you are digging that the ground may fall over you.*” Another emphasised how it was a surprise *“how the visibility from a big bucket loader can be such a bad, that you actually can run over a car without even noticing it”*.

STP was seen as a forum through which participants could show their willingness to cause change at various different levels. Concerning the training experiences, both the interviewed trainee group and the top management interviewees identified the most effective elements from the STPNF trainings as demonstrations of good and bad working environments and solutions complemented with group discussions. Discussion of examples of good solutions was strongly concentrated on working at heights and the use of PPE and other tools and devices. A top management representative put it this way: *“those concrete examples on fall arrest systems and PPEs, so that you see what kinds of solutions are available . . . the discussions on good practices and perceived hazards. It can be seen as preventative measure”*.

When discussing PPEs and other devices, the training brought an understanding of the variety of existing choices. This was emphasised by a foreman: *“there were a variety of different PPEs that you were able to touch and test”*. This started a discussion related to procurement, as emphasised by another interviewee: *“That there are [a] variety of alternatives available. Now you know where to ask”*. Some of the interviewees were also able to identify practical changes on some working practices after the trainings. One interviewee pointed out that *“It was a new thing to me, that you should – every time you pick up a personal hoist – have a written permission where the users are named”*, and another emphasised behavioural changes at a personal level by saying how important it is *“to act as an example when communicating*

OSH to your employees”.

The above-mentioned examples illustrate the level and quality of the experiences one month after the training. The interview was repeated one year later for the same interviewee group in order to facilitate discussion on more permanent changes. Similar to the earlier interview, demonstrations of good and bad examples were emphasised. The interviewees interlinked some of the good practices to certain changes at their workplaces. For example, one interviewee emphasised how he has begun to think about safety when using ladders: *“that you consider how high you can go, how many footsteps there can be and what kinds of equipment you should have”*. Another participant had noticed a change in the safety observation level, but also noted the difficulties related to having long-lasting effects: *“right after the training, there was a bit more safety observations than normally it would have been”*. However, the interviewees also pointed out that *“maybe one month later, the situation concerning the safety observations was normal and that the trainees were enthusiastic about that for about one month, but now it seems to be left behind. Thus, you should have such (trainings) more constantly”*. This statement highlights well that the singular trainings, regardless of the training environment and approach, are not enough but must be tailored to organisation’s continuous development processes. Table 2 summarises the above-mentioned elements of the STPNF trainings that supported long-term learning at a personal level and provides possibilities and initiatives to the larger work community level. In addition, the table lists the identified concrete changes in behaviour.

Table 2. Training elements supporting learning and identified concrete outputs one month after the training.

Training element	Concrete outputs
Demonstrated good solutions, especially on <ul style="list-style-type: none"> - Working at heights - Fall protection - PPE 	Led to concrete discussion regarding whether the good solutions are available and possible to put into use Some identified changes at personal/team level: <ul style="list-style-type: none"> - On how to use personal hoists - On using PPE - On communicating OSH to others
Demonstrated bad working environments and videos demonstrating different hazards at construction sites	Thought-provoking examples that led to the following: <ul style="list-style-type: none"> - Considering the consequences of bad OSH by the demonstrated accidents - Considering that similar kinds of bad working environments can be identified also at home and leisure time, for instance when performing normal maintenance

	and repair issues at home or when walking by excavation areas on public streets
Group discussions and sharing of experiences	<p>Concretise discussion on accident consequences:</p> <ul style="list-style-type: none"> - Accidents affect many people other than the injured person - Thought-provoking discussion that has lived on still after one month of the training

Discussion

Considerations on organisational level influences

Based on a comprehensive review, Hale et al. (2010) emphasize the importance of organizational procedures and commitment to OSH as well as constructive dialogue between the employees and management. Modern vision zero thinking supplements and deepens that by steering and encouraging OSH processes and interventions to go deep into the personal level. That requires understanding of human factors and their management. The variation of human activities in uncertain and changing situations is emphasised in construction work. Traditionally much of the OSH responsibilities have in practice been placed at the construction sites and/or the individual employee. Thus, OSH is strongly dependent on personnel skills, knowledge and competence. However, very little scientific proof has been shown on the effectiveness of the current OSH training practices (see, e.g. van der Molen et al., 2018).

This study provides a descriptive analysis of the Finnish STP concept. STPs aim to increase OSH at the personal level by providing new kinds of OSH trainings. An assumption is that increased OSH skills and knowledge at a personal level leads to increased OSH performance at the construction site and organisation levels. However, measuring and analysing such progress is very complicated because various other aspects and actions may affect this complex OSH entity. Therefore, it is important to learn to understand factors that are connected to individual and organisational learning. New training solutions and activities should strengthen and support long-lasting learning. In addition, organisations' processes should provide adequate support for their personnel to apply new skills and knowledge in practice. This may require organisation and construction site level development processes.

Our analysis highlights that simulated work environments – containing both good and bad work practices and supplemented with peer discussions – are the most effective training

elements in STPNF. The changes in behaviour that were identified in the interview one year after the training indicate long-term learning potential for the STPNF trainings. However, the material is very limited, preventing any generalisation of these findings. Further, it must be noted that our interview material was not punctual from individuals representing the construction industry, as personnel from a service company were interviewed. However, interviewees worked at continuously changing worksites (including construction sites), and their work contained similarities with construction work (e.g. physical work and working at heights), so the STPNF training environment fit well with their training purposes.

As supplementary material complementing our analysis, we collected accident statistics from the observation unit – the service company’s northern Finnish personnel (n ~ 400). Loss-time injury frequency decreased from 40.1 in 2014 to 14.9 in 2015. As the company had all of its regional employees trained in the STPNF in 2015, there is a temporal connection between the performance improvement and STPNF trainings. However, due to various changes in organisational structures, there are no comparable data before 2014, and from 2016, and later. Before 2014, the company was divided in branch-specific sectors. Since 2014, the company has had an organisational structure that is based on regional sectors. However, in 2016 the division of the regional sectors changed. From a strict scientific standpoint, such changes are problematic and unwanted, as they interfere with interpreting causality (Pedersen et al. 2012). On the other hand, these changes are very common in dynamic real world organizational interventions – especially in the construction sector. Based on the unofficial estimations concerning the observation unit by the top management interviews, the LTA1 frequency level has remained at a lower level, thus indicating that long-term OSH improvements, human capital development and value creation have been achieved. Even though this quantitative examination of the OSH figures was limited and speculative, we see this as an initiative for future research.

Considerations on influences at the societal level

STPNF is an innovative OSH training approach that is based on participatory ergonomics premises. A broad collaboration of 80 stakeholder organisations enabled the learning environment, which would not have been possible for any of the organisations to do alone. In addition to having expectations at the individual and organisational levels, the STPNF is also focused on broader societal level effects. For example, the STPNF has made a decision contributing to social sustainability that all schools and universities get access to a free

membership to use the STPNF learning environment. With expectations for having a long-term influence, this has also been identified as a sustainable solution supporting CSR and CS to increase the OSH skills and knowledge of the future workforce. Groups from preschool children to university students have been trained in the STPNF (see Reiman et al., 2018), and STPNF trainings have been included in the curriculums of local educational organisations for construction employees and engineers.

The question arises regarding how effectively STPs in their current form reach young people. Out of the microergonomic view, expectations have been stated that STPs should be developed to include even more activating training. Kinaesthetic learning, virtual reality (VR) and other digital learning platforms and games could also be tested and utilised in the STP environment. In addition, the STPs could take a stronger stand on holistic safety, covering not only OSH at working hours but also reaching outside that by influencing safety behaviour at home and during leisure time. Consequently, for one's part, this would be a small step towards promoting understanding about holistic well-being (see e.g. Fostervold et al. 2018; Reiman and Väyrynen, 2018). The present learning approach in STPs is based on provoking individual thinking. This idea of affecting personal behaviour could extend to holistic safety thinking and health and well-being in general by having training points that discuss home and leisure time as well as urging trainers to steer discussions at the training points to cover issues that occur outside of working hours. For example, while training on roof work safety, the discussion could easily be steered to more general information about safe actions at heights. Similarly, instance ergonomics and PPEs could be discussed outside work environments with minor changes in the training points.

As another future research initiative beyond the STPs and concerning the STPNF stakeholder consortium, we propose to continue future collaboration approaches. As mentioned, STPNF contributes to individuals, organisations and beyond. We see that the STPNF consortium has proven its capability to collaborate, which is essential for sustainable changes in the construction sector. We call for new initiatives to continue and in-depth that collaboration. We raise the question as a future research and development challenge whether and how STPNF consortium could contribute to stakeholder management at construction sites. As an example, we bring out how Finnish process industry collaboration has led to common procedures and tools related to supply chain management, focusing especially on identifying problems and deviation sources related to supplying companies' health, safety, environment

and quality performance at industrial sites. For instance, Väyrynen et al. (2016) have discussed this long-term collaboration more in-depth. We propose to the STPNF consortium as a future research and development action to seek and develop similar approaches for construction site management.

The consortium should seek OSH approaches that reach from the principal employer to all subcontractors inside the value chain. This could mean for instance common OSH trainings and following development discussions in the STPNF. For its part, to raise more interest in the top management level STPNF could expand and serve as a forum in which not only OSH but also the typical environmental and quality errors and problems faced at construction sites are concretised and supplemented with conclusive information on existing solutions. As the adaptability of the trainings already is a basic characteristic, these issues could be supplemented within reasonable development resources. Even though OSH is recognized as a keen element of CSR (see European Agency for Safety and Health at Work, 2004), such a development process would increase further the possibilities to discuss STPNF as a concrete proof of multi-stakeholder collaboration on CSR.

In this chapter, we have highlighted the potential that STPs have in improving OSH and well-being in the construction sector. Whilst STPs have gained large interest in Finland, we see that the concept has also international potential. The STP concept as a training environment itself is rather simple. However, the complexity comes from the collaboration aspects. We see that this kind of a broad collaboration requires commonly shared vision and goals. Further, we highlight the participatory design and development aspects of STPNF. As a future research challenge, we raise up a question whether the concept would be accepted outside Finland as it is, or whether the concept would evolve to something else.

Conclusion

This chapter introduces a unique OSH training approach, namely Safety Training Park, by the Finnish construction industry and identifies key learning aspects related to the STP trainings. STP trainings aim to provoke positive changes of behaviour at the individual level, leading further to improved OSH performance at the construction site and organisation levels. Special attention is paid to the STP in northern Finland (STPNF), which is an output of a multi-organisational collaboration. STPNF is discussed as an ergonomics construct that has

expectations for a broad influence all the way to the societal level, but especially at the individual level. As a joint construct by the construction industry stakeholders, STPNF can be considered a concrete sign of CSR and CS aiming to foster stakeholder dialogue and promote not only current employees' OSH and well-being but also affecting future workforces' skills, competences and knowledge.

This study documents the STPNF as a macroergonomics construct and discusses the effects at the microergonomics level by highlighting the simulated work environments and representing good and bad solutions as the training elements with the most potential for long-term learning. The STP concept has gained broad interest in Finland inside the construction industry but also from the stakeholders representing other industries. STPs are concrete learning environments and thus not removable. However, the STP concept could be adopted into use outside Finland. Concrete actions towards STPs have been made in other Nordic countries. Future research and development actions should be aimed at deepening the collaboration processes inside the consortium in Finland and on studying the transferability of the concept outside Finland.

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