The influence of the work environment on training transfer

Master thesis

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Abstract

Agencies invest billions in training with the intention to increase knowledge. Characteristics of the learners, the training design and the work environment all influence the increase of knowledge and skills in the workplace (training transfer). This study finds out if training enhances knowledge (generalization) and if this level of knowledge is maintained over time (maintenance). Finally, this study discovers to what extent seven aspects of a supporting work environment facilitate training transfer. A survey that measures the variables in this longitudinal study has been conducted among managers (training group and control group) within a cleaning agency. This research shows that training has an effect on the increase of knowledge (generalization) and maintenance of knowledge over time (maintenance). Beyond expectation, increase of knowledge was also evident in the control group. The participation in training spread over time may explain this increase of knowledge. Moreover, it is shown that young employees share more knowledge of Workplace Safety after this training than older employees do. Interestingly, the work environment only influences the control group, which shows that employees give feedback to several colleagues and have discussions with each other. Research could not be conducted on a number of factors due to validity problems; therefore longitudinal follow-up research with valid scales would be desirable.

Keywords

Training transfer, work environment, latent difference score model, proportional change model and feedback from colleagues

Contents

Introduction

In 2010, companies in the Netherlands invested 44 billion Euros on the enhancement of knowledge (CBS). This money has been spent on computer software, research, and important to note for this research, on the development of the work force and training of employees. Approximately 40 percent of the employees in companies followed a formal training (Tanriseven & Veldhuizen, 2012). There are two main reasons why training is important in companies. First, companies need to stand out in order to keep up with competitors by having more knowledge in their company. Second, employees have to be able to function to the maximum and know their position in the labour market, which will lead to a better circulation of well-trained employees (SER, 2002; Branham, 2005; Michaels, Handfield-Jones & Axelrod, 2001).

Therefore, companies wonder what the effect of training is. The goal of training is the applying of learned knowledge and skills to the workplace. This is called training transfer (Burke & Hutchins, 2007; Blume, Ford, Baldwin, & Huang, 2010). Scientific research on training transfer concludes that in contrast to what the employees acquired during training, their behaviour improved only slightly. These results can vary between 50 and 60 percent improvement and can drop to between 10 and 30 percent a year later (Brown & Reed, 2002; Saks, 2002; Georgenson, 1982; Broad & Newstrom, 1992; Holton & Baldwin, 2003). This indicates that the maintenance of acquired knowledge and skills in the work place therefore asks for support. Research has found three types of factors that support training transfer: learning characteristics, training design and work environment (Baldwin & Ford, 1988; Kessels, 2001; Holton, Bates & Ruona, 2000; Burke & Hutchins, 2007; Blume et al., 2010). Learning characteristics are aspects of the employee, such as intelligence, educational background and also individual influences such as motivation to learn and self-esteem. Training design refers to learning principles, content of training, materials and learning aims of the training that are based on the theory of how employees learn effectively (Holton et al., 2000; Burke & Hutchins, 2007). Besides training design, the work environment influences training transfer. The work environment is the place where employees work and perform (Gielen, 1995; Baldwin & Ford, 1988; Burke & Hutchins, 2007; Blume et al., 2010).

As learning characteristics and the training design are the hardest to influence after implementation, this research focuses on the work environment (Kessels, 2001; Holton, 1996; Burke & Hutchins, 2007). The work environment includes multiple aspects that appear to be effective for the transfer of knowledge: feedback from colleagues, support from colleagues, support of a supervisor, personal outcomes (negative or positive), involvement of the supervisor, degree of openness to change, exchange information with colleagues, opportunities to experiment, experiment with newly learned knowledge and time and resources. Several researchers divide these aspects

into three factors: transfer climate, social support and opportunities to experiment[1] (Burke & Hutchins, 2007; Rouiller & Goldstein, 1993; Tracey, Tannenbaum, & Kavanagh, 1995; Burke & Baldwin, 1999; Baldwin & Ford, 1988; Holton et al., 2000). Moreover, the seven aspects (feedback from colleagues, support from colleagues, involvement of the supervisor, exchange information with colleagues, opportunities to experiment, experiment with newly learned knowledge and time and resources) this research focuses on are important key features of the learning climate in the organization that participates in this research.

In a climate where learning is paramount, the transfer of acquired knowledge and skills to the workplace is possible. Both supervisors and colleagues play a role in this climate. Their stimulation contributes to the transfer of acquired knowledge and skills among employees (Axtell, Maitlis, & Yearta, 1997; Baldwin & Magjuka, 1991; Cromwell & Kolb, 2004; Brinkerhoff & Montesino, 1995; Baldwin & Ford, 1988; Enos, Kehrhahn, & Bell, 2003; Geijsel, Sleegers, Stoel, & Krüger, 2009; Pham, Segers, & Gijselaers, 2012). Besides stimulation, social support also has a positive influence on training transfer. Social support is related to learning in the workplace where sharing information with colleagues stimulates training transfer. Empirical research shows that sharing information with colleagues has a positive effect on training transfer (Van Woerkom, 2003; Van Woerkom, 2004; Cabrera & Cabrera, 2005; Burke & Hutchins, 2007; Dawes, Cresswell, & Pardo, 2009; Spillane, Kim & Frank, 2012). Moreover, optimal transfer requires that an employee should apply newly acquired knowledge and skills in the workplace by experimenting. Research shows that employees with opportunities to experiment have a higher training transfer compared to employees with none of those opportunities (Burke & Hutchins, 2007; Baldwin & Ford, 1988; Rouiller & Goldstein, 1993; Tracey, Tannenbaum, & Kavanagh, 1995; Burke & Baldwin, 1999).

Although all of these issues contribute significantly to training transfer, it is not yet obvious which aspects of the work environment mostly influence training transfer (Tracey et al., 1995; Gaudine & Saks, 2004; Ford & Weissbein, 1997). In addition, the effect of training should crystallize over time. As yet little attention has been paid to this topic in literature and research (Cromwell & Kolb, 2004; Gaudine & Saks, 2004; Saks & Belcourt, 2006; Axtell et al., 1997; Pidd, 2004). Therefore, longitudinal research is necessary. To gain more insight into this study, the influence of seven work environment factors on the transfer of newly acquired knowledge and skills to the workplace has been researched in this study on two occasions, namely one week and two months after the training (Burke & Hutchins, 2007; Baldwin & Ford, 1988; Rouiller & Goldstein, 1993; Tracey et al., 1995; Burke & Baldwin, 1999).

[1] The aspects were not included in our study, because they were not measured as being valid or are non key features of the learning climate in the organization

In Figure 1 the conceptual model of the course of training transfer over time and the influence of the work environment on it is represented. This model is based on earlier models about training transfer and the influence of the work environment (Holton, 1996; Baldwin & Ford, 1988; Nijman, 2004; Axtell et al., 1997).

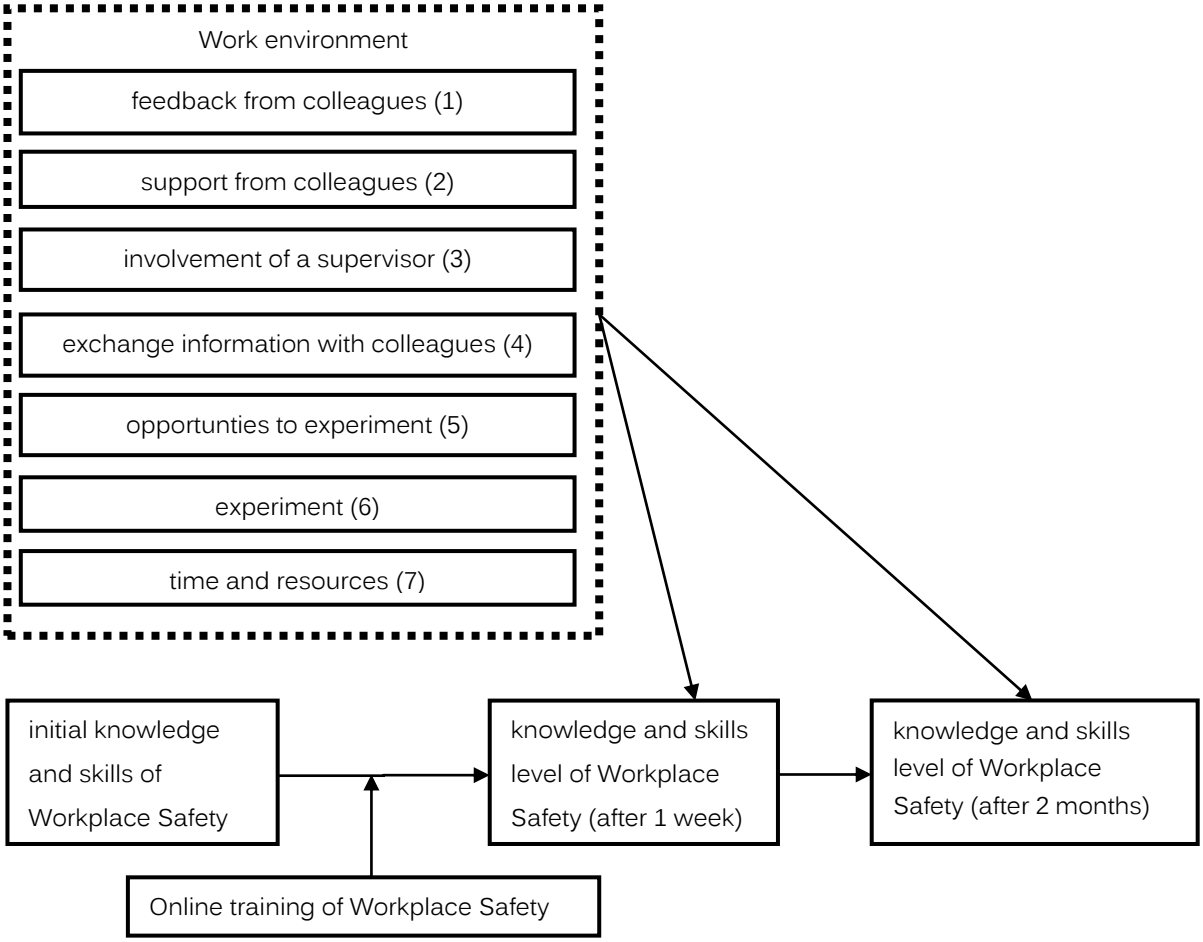

Figure 1. Conceptual framework of the course of training transfer over two months, and the influence of the work environment on it. This study focused on a Workplace Safety training. Initial knowledge and skills are the starting level of an employee. The effect of the training has been measured one week and two months after the training. The work environment influences the knowledge and skills of an employee one week after the training (generalization) and two months after the training (maintenance).

Theoretical background

Training transfer

Training transfer is defined as the application of newly acquired knowledge, skills and attitudes in the workplace, which makes employees change their behaviour over time as the result of training (Baldwin & Ford, 1988; Seyler, Holton, Bates Burnett, & Carvalho, 1998; Rajee, Madan, & Jayarajam, 2009; Blume, Ford, Baldwin, & Huang, 2010; Grossman & Salas, 2011; Weisweiller, Nikitopoulos, Netzel, & Frey, 2013; Mindtools, 2014). Applying these newly acquired knowledge, skills and attitudes is important to companies, because it leads to improving the performance of the employee (Bates & Khasawneh, 2005). In order to fully benefit from training, employees ought to use newly acquired skills and knowledge in different situations (generalization). In addition, employees should be able to maintain the changes in skills and behaviour (maintenance, Cheng & Hampson, 2008).

With generalization, acquired knowledge and skills are applied in the workplace, and extended to new situations. An example of a new situation is conducting a job interview while implementing the communication techniques that were acquired. Maintenance describes the process during which employees keep their acquired knowledge and skills, and go on generalizing. As for generalization and maintenance, besides formal training, informal training is important. By means of informal learning in the workplace, employees discover how acquired knowledge and skills can be applied (Billett, 2001; Watkins & Marsick, 2003; Burke & Hutchins, 2007; Blume et al., 2010).

Although one implicitly expects from training designs that the application of knowledge and skills will remain stable over a long period of time, research shows that training transfer decreases significantly over time (Saks & Belcourt, 2006). Moreover, previous research has shown that maintenance may be reduced if the work environment is negative or non-consistent (Ford & Weissbein, 1997; Merriam & Leahy, 2005; Blume et al., 2010). Research shows that after two weeks the increased knowledge and skills are significant. However, after two months this transfer is not visible anymore, so it appears that maintenance fails (Saks & Belcourt, 2006). This conclusion is confirmed by a review on training transfer, in which it is shown in dozens of studies that training transfer decreases. This decrease indicates that maintenance does not occur. It turns out that the longer the time between the moments of measurement, the greater the probability that a decrease in transfer will be shown (Blume et al., 2010). Research into how training transfer can be perpetuated by the work environment is therefore advisable.

Work environment

The employee's (social) work environment is versatile. Depending on the company and the function, an employee has contacts with colleagues and their supervisor in the workplace and possibly with clients. Different factors, as mentioned before in the introduction, influence training transfer. The level of *support of a supervisor* during the application of acquired knowledge in the workplace contributes to training transfer (Holton et al., 2000; Geijsel et al., 2009). Furthermore, the *degree of openness to change* also adds to this. Finally, the meaning of *personal outcome* is the degree in which an employee experiences a positive or negative outcome when applying knowledge and skills in the workplace (Holton et al., 2000). In this study, we focus on the seven presented factors. Two factors (*feedback from colleagues* and *support form colleagues*) describe a stimulating amicable environment which, according to previous research, leads to higher results in applying acquired knowledge and skills (Cromwell & Kolb, 2004; Baldwin & Ford, 1988; Geijsel et al., 2009; Spitzer, 1986; Montesino, 1995; Pham et al., 2012). Moreover, *involvement of the supervisor* contributes to a higher training transfer (Grossman & Salas, 2011; Rouiller & Goldstein, 1993; Rietdijk, 2009). Besides this stimulating environment, *exchanging substantive information among colleagues* on the training that has been followed also contributes to training transfer. Furthermore, it is shown that when an employee gets the *opportunity to experiment*, and actually does *experiment*, these will positively affect training transfer. Moreover, *time and resources* need to be available in order to apply newly learned skills and knowlegde (Dawes, in Dawes, Cresswell, & Pardo, 2009; Spillane et al., 2012; Van Woerkom, 2003). The factors that are investigated in this study will be clarified in the seven sections below.

Feedback from colleagues

Recent research shows that feedback contributes to an optimal learning climate and therefore may contribute to training transfer (Ashford & Cummings, 1985; Becker & Klimoski, 1989; Smither, London & Reilly, 2005). Three types of feedback may influence the effectiveness of the feedback: the way feedback has been given, the frequency and the source of feedback (Becker & Klimoski, 1989; Edward, 2013). The way in which feedback is given can be positive, moderate or negative, but it is of no importance with regard to effectiveness of the feedback. The most important thing is that feedback is about the performance of work or about the way tasks have been carried out. This type of feedback, together with details about how an employee can improve his performance, is the most effective one. (DeNisi & Kluger, 2000). Frequency is the number of times a trainee receives feedback (Becker & Klimoski, 1989). Increasing feedback may lead to better performance (Russ-Eft, 2002, Schmidt, 1991). Finally, research indicates that feedback from various people positively influences the performance in the workplace (Smither et al., 2005). In addition, (positive) feedback

contributes to an open atmosphere, in which nobody has to feel ashamed when there has not been optimal performance yet (Van Woerkom, 2004; Baldwin & Ford, 1988; Geijsel et al, 2009). In conclusion, an open atmosphere and effective feedback contribute to training transfer (Van Woerkom, 2004; Baldwin & Ford, 1988; Geijsel et al, 2009).

Support from colleagues

Colleagues are supporting the employee's learning process by encouraging and helping one another during the process of applying newly acquired knowledge and skills. Furthermore, paying compliments is a form of stimulation which causes the employees to be more willing to apply newly acquired knowledge and skills (Leahy, 2002; Spitzer, 1986; Montesino, 1995; Cromwell & Kolb, 2004; Baldwin & Ford, 1988; Geijsel et al., 2009). During this learning process it is important that employees should reflect on their performance and that colleagues stimulate each other in this (Geijsel et al., 2009). In conclusion, when encouraging colleagues in their application of acquired knowledge and skills, a positive way of communicating is important (Van Woerkom, 2004).

Involvement of a supervisor

Involvement of the supervisor positively contributes to the application of knowledge and skills that have been acquired earlier. A supervisor can show this involvement by asking questions about learning aims of the training that has been followed (Grossman & Salas, 2011). When an employee fails to apply newly acquired knowledge and skills, a supervisor may consult this person in order to find out the cause (Rouiller & Goldstein, 1993; Rietdijk, 2009). In addition, employees tend to apply newly acquired knowledge and skills more often when they are rewarded or being paid compliments as forms of encouragement (Cromwell & Kolb, 2004; Baldwin & Ford, 1988; Geijsel et al, 2009). Applying leads to increased performance and when rewarded it contributes to training transfer (Rouiller & Goldstein, 1993).

Exchange information with colleagues

Sharing work-related information with colleagues affects training transfer. In essence, sharing information with colleagues is sharing work-related information in order to learn from each other. This information contains sharing solutions to problems in the workplace, sharing new working methods and other relevant substantial information. Sharing and discussing this information are needed to give an insight into the problems colleagues are facing during work (Dawes, in Dawes, Cresswell, & Pardo, 2009; Spillane et al., 2012; Van Woerkom, 2003; Hawley & Barnard, 2005).

The information that is exchanged may include substantive issues in the workplace and questions concerning how to apply newly acquired knowledge and

skills (Noe, Colquitt, Simmering & Alvarez, 2003; Cabrera & Cabrera, 2005; Minnet, 2003). This work-related information contributes to finding methods to work effectively, and ways that contribute to each other's learning efficiency (Van Woerkom, 2003). When exchanging information, it is important that communication goes back and forth. In this way, colleagues learn from each other by communicating.

This communication can take place online or offline, realizing that it is important to deal confidentially with shared information (Spillane et al., 2012; Forsyth, 2001). In addition, confidential communication perpetuates interpersonal relations (Nahapiet & Ghoshal, 1998), which are important in order to take successful actions together (Bolino, Turnley, & Bloodgood, 2002; Leana & Van Buren, 1999). Furthermore, sharing information contributes to the way colleagues learn from each other and their approach to how newly acquired skills should be applied in practice (Van Woerkom, 2003; Cabrera & Cabrera, 2005).

Opportunities to experiment

In this study, the definition of opportunities to experiment is: creating opportunities by the supervisor to allow employees to make errors when applying new knowledge and skills (Leahy, 2002; Spitzer, 1986; Montesino, 1995; Cromwell & Kolb, 2004; Baldwin & Ford, 1988; Geijsel et al., 2009). In addition, it is important to discuss experiences of the training before and during the training with the supervisor, as this demonstrates involvement (Brinkerhoff & Motessino, 1995). A supervisor who encourages the employee to apply new knowledge and skills and gives room to make mistakes can have a positive effect on generalization and maintenance of training transfer (Tracey et al., 1995; Ford et al., 1992; Huczynski & Lewis, 1980).

Experiment

It is important that supervisors should offer opportunities to experiment, but the employee should take his responsibilities as well. He could seize the opportunities to actually experiment in order to embed generalization and maintenance of training transfer (Seyler et al. 1998; Ford et al., 1992; Lim & Johnson, 2002; Geijsel et al., 2009; Runhaar, 2008). The employee should have a creative attitude towards experimenting in the workplace. This creative attitude can be shown when solving work-related problems and presenting new effective working methods (De Jong & Den Hartog, 2010).

Time and resources

Time and resources are important when an employee applies newly acquired knowledge and skills to the workplace. It is impossible to know how to apply these newly acquired skills all at once. Opportunities to practice in the workplace are needed and can be provided by supervisors (Salas, Milham, & Bowers, 2009). Once a

supervisor gives time to experiment with new knowledge and skills, training transfer will be stimulated (Russ-Eft, 2002; Van den Bossche, Segers, & Jansen, 2010; Holton et al., 2000; Gilpin-Jackson & Bushe, 2007). When the supervisor gives time for training transfer it is important to keep the workload of employees low. When an employee experiences too much workload there will be lack of time, energy and mental space to create training transfer (Russ-Eft, 2002; Nijman, 2004). Resources, such as internet and documents that are used during work, are needed when an employee is experimenting with newly acquired knowledge and skills (Russ-Eft, 2002; Rouiller & Goldstein, 1993; Tracey et al., 1995).

Hindrance of the work environment

Researchers show that the work environment can have a positive effect on the application of acquired knowledge and skills in the workplace, but could also be a *hindrance* when this supportive work environment is negative, not stimulating or is lacking. (Tracey et al., 1995, Ford, Quinones, Sego & Sorra, 1992; Huczynski & Lewis, 1980; Leahy, 2002; Spitzer, 1986; Montesino, 1995; Cromwell & Kolb, 2004; Baldwin & Ford, 1988; Geijsel et al., 2009; Clarke, 2002; Daley, 2002; Pham et al., 2012; Baldwin & Magjuka, 1991; Meers, 1997; Ferdinandi, 1995). Moreover, a *lack of* opportunities to experiment negatively influences training transfer. When opportunities are lacking, an employee will not be able to experiment (Lim & Johnson, 2002; Broad & Newstrom, 1992; Ford et al., 1992, Lim, 2000).

Present study

Research questions

Considering the theoretical framework, it is plausible that following a training leads to an increase of knowledge and skills and to the application of this knowledge and new skills in the workplace (generalization). But the question is whether this can be maintained over long periods of time (maintenance). A supportive work environment should have a positive impact on training transfer. These findings lead to the following research questions:

1. Does training enhance knowledge and skills, as has been measured after one week (generalization)?
2. To what extent will the level of knowledge that has been acquired be maintained after two months (maintenance)?
3. To what extent do the seven aspects of a supportive work environment facilitate training transfer?

In order to answer these questions a longitudinal research is needed, because transfer occurs over time, and not in one moment (Gaudine & Saks, 2004; Nesselroade & Baltes, 1979). This type of research can trace the impact of training, and to what extent knowledge and skills may change over time. In addition, stronger claims about the causal connection of environmental conditions and the influence on generalization and maintenance can be made with a longitudinal research. Based on the research questions this research will be working with a Latent Difference Score framework (LDS; see Figure 2; McArdle, 2009; McArdle & Prindle, 2008). The key element of an LDS model is the latent difference factor, which specifies the change scores at any point in time. In a 'full' LDS model latent difference scores are a function of both autoregressions and systematic growth rates (Ferrer & McArdle, 2010; McArdle & Hamagami, 2001; Sbarra & Allen, 2009). However, the expectations in this research are that knowledge and skills will increase only after training, and will remain constant afterwards. This implies that there is no constant change, therefore the latent difference scores will be modelled with autoregressions and estimated intercepts. This indicates that differences in knowledge and skills depend on the level when measured at a previous point in time. This type of method shows the differences between the estimated intercepts on three measuring occasions (McArdle & Prindle, 2008; McArdle, 2009; Eschleman & LaHuis, 2014).

Additionally, increase and maintenance of knowledge after training may be facilitated by work environment factors. Therefore the work environment factors in this research, besides knowledge and skills, will be measured on three occasions as well: before training, one week after training and two months after training (Gaudine & Saks,

2004; Cromwell & Kolb, 2004). Feedback from colleagues, support from colleagues, involvement of a supervisor, exchange information with colleagues, opportunities to experiment, experiment, and time and resources, will be used as predictors of the work environment (Muthén, & Muthén, 2007).

Context

The research was conducted within an organization of more than 10,000 employees who work in the field of cleaning and other related areas. This national agency is based in the Netherlands and has been divided into nine regions. Because of the large numbers of workers, they work in teams that are led by an object manager, who is the manager of about 80 to 100 workers. Approximately 250 object managers work in this agency and they are supervised by branch managers. From now on object managers will be referred to as employees, and branch managers as supervisors. (Schoonmaakbedrijf, 2013).

The employees follow courses in areas that need to be improved. During the trainings a combination of online learning (e-learning) and formal training (meetings with a trainer as leader) takes place. Trainings have been designed on the basis of the principle of blended learning. Blended learning is defined as a combination of formal and informal learning. Thus, the knowledge of the training can be transferred to the employee's workplace (Oliver & Trigwell, 2005; Fransen, 2006; Schoonmaakbedrijf, 2013). In the online environment (this is called 'the Learning House' by the agency) the assignments are central and performed in the workplace. In addition, the training pays attention to different learning strategies (which blended learning endorses; Fransen, 2006) by adding test documents, videos, prezis and images to the training.

The work environment of the employee in this research consists of clients, personnel, colleagues and the supervisor. The employees work on targets that have been presented by the supervisor of that area. In this agency, employees are responsible for the objects they need to clean and for working individually on targets and results (personal communication, J. Brinkhuis, 2 December 2014). In the next paragraph a description will be given of the seven factors of the work environment in this particular agency.

Support of colleagues and exchange information may take place during meetings to discuss progress (approximately once a month), at informal moments when colleagues see each other, or by making use of the chat function in the Learning House. The frequency of contact with colleagues differs per employee, because it happens on their own initiative. The supervisors are responsible for the progress of employees. The supervisors are trained in leadership so they will be able to take charge of the employees in this learning program. Moreover, the supervisor enters into agreements with the employee about when which course will be or could be finalized. After having agreed on the planning with the employee, the supervisor can follow their

progress and possibly send him a message in the Learning House. Besides, the meetings to discuss progress with the supervisor and employees are suitable moments to communicate with employees, but the frequency differs per region. Since supervisors are in charge of the Learning House, they may encourage experimenting with newly acquired skills. Furthermore, the supervisor may find out what the employee needs in order to apply acquired knowledge and skills in the workplace (personal communication, J. Brinkhuis, 2 December 2014).

Contents of the training

For the purpose of this study, the course called Workplace Safety has been selected to measure training transfer. This is based on the fact that this course is required for everyone in the company and that the subject matter is important for workers in order to work safely with machines, tools, equipment, materials and installations. Moreover, safe behaviour, instructions directed at working safely and shared responsibility among workers, employees and employer are important aspects to ensure a safe work environment (Arboportaal, n.d.). These aspects are subject matter during the training. Moreover, working safely is a special point of daily interest. Examples of this are that workers keep an eye on a safe work environment, that materials and resources are tested, that conversations are held with personnel about changes that affect the security and that analysis and plans are executed to ensure safety. Moreover, during the process of hiring new personnel the aspect of working safely is discussed, so that a new employee is also aware of the rules and procedures (personal communication, E. Boonstra, 2 December 2014).

In order to improve and be able to maintain knowledge and skills regarding safety in future, employees receive formal training. The training (based on e-learning only) has been divided into three chapters: Workplace Safety within the cleaning agency, Workplace Safety outside the agency and Workplace Safety in the workplace. The goals of the Workplace Safety training are:

1. Knowing the meaning and function of terms and tools in the field of security, such as the Risk Inventory and Evaluation (RI&E), a plan of action, safety data sheets, safety information sheets, a health and environment Checklist for Contractors (VCA), etc.
2. Knowing the responsibilities with regard to safety for you, your manager and the agency.
3. Updating a Risk Inventory & Evaluation (RI&E), making a plan of action and putting together or updating a book with safety information sheets.
4. Instructing cleaning personnel about working safely (and if it is not safe: do not work at all) and making sure they do so, too.

Method

Design & Sample

In this study a quasi-experimental quantitative longitudinal research design was chosen to test the effects of the work environment on training transfer over time (Field, 2009; McArdle, 2009). The measuring occasions are: before training, one week after training and two months after training.

From the 250 object and project managers[2] 82 (32, 8 %) were willing to participate in this research. Owing to circumstances during this research 22 respondents (26, 8 %) stopped by request. The remaining 60 respondents (24, 0 %) were divided into two groups, 30 respondents per group. Group 1 followed the training Workplace Safety during the research (experimental group) and group 2 did not follow any training during this research (control group).

In this study 62 percent is female and 38 percent male. The percentage of young respondents (18-44) is 48, and older respondents (45-64+) is 52. The educational level has been subdivided into Secondary Vocational Education (70 %) and Higher Vocational Education (30 %). Furthermore, the regions the respondents work in vary as well: region 1 (13,3 %), region 2 (13,3 %), region 3 (21,7 %), region 4 (6,7 %), region 5 (15,0 %), region 6 (15,0 %), region 7 (5,0 %), region 8 (8,3 %) and region 9 (1,7 %). The respondents in this research are a mixed group with regard to their background. Thus the sample is reliable for generalization toward the population (See personal descriptions in Appendix A).

Data collection

Data were collected by using the online questionnaire program called Qualtrics. All employees were familiar with an iPad, which allowed them to participate in this study while being at work. Employees who were willing to participate in this research were informed by e-mail with the purpose, importance, instructions, and the consequences of their participation. To promote this study, the supervisors and the employees were informed about the purpose and importance of this research.

Measures of the variables

The whole questionnaire consists of 42 items. These items are scaled with a 7-point Likert scale (Likert, 1932; 1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = neutral, 5 = slightly agree, 6 = agree, 7 = strongly agree) and have been presented in Appendix B. In addition, respondents were interviewed on the control variables gender, age, educational level and region.

[2] Project managers (20 percent of the sample) and object managers have equal responsibilities with regard to the training Workplace Safety.

The scales are based on previous research. The compilation of the scales to test the knowledge and skills of the training Workplace Safety is based on the learning aims of the training and on a questionnaire about safety previously used in other organisations (18 items; "Vragenlijst: Veiligheidsklimaat," 2012). The construction of feedback from colleagues, support from colleagues and involvement supervisor are based on items in previous research (feedback: 4 items; Van Woerkom, 2004; Smither et al., 2005; Edward, 2013; colleagues: 4 items, Geijsel et al., 2009; Cromwell & Kolb, 2004; Baldwin & Ford, 1988; involvement: 3 items, Rouiller & Goldstein, 1993; Grossman & Salas, 2011; Rietdijk, 2009). Moreover, the scale on exchanging information with colleagues is based on items of different researchers (3 items; Grossman & Salas, 2011; Colquitt, LePine, & Noe, 2000; Hawley & Barnard, 2005). Finally, the three scales on opportunities to experiment are also based on previously examined items (opportunities: 4 items; Grossman & Salas, 2011; Cromwell & Kolb, 2004; Baldwin & Ford, 1988; Geijsel et al., 2009; experiment: 3 items; Geijsel et al., 2009; Runhaar, 2008; De Jong & Den Hartog, 2010; time and resources: 3 items; Clarke, 2002; Gilpin-Jackson & Bushe, 2007; Cromwell & Kolb, 2004; Russ-Eft, 2002; Rouiller & Goldstein, 1993; Tracey et al., 1995). The ten scales, definitions and Cronbach's alpha's are represented in Table 1 (see Appendix B for a total survey of scales, items, residual variance and factor loadings).

Table 1

Ten scales Workplace Safety and work environment

Scale	Definition	Items[3]	Cronbach's alpha		
			T1	T2	T3
Workplace Safety within the cleaning agency	Chapter 1 training	4	.696	-	-
Workplace Safety outside the agency	Chapter2 training	4	.739	.858	.797
Workplace Safety in the workplace	Chapter 3 training	4	-	-	-
Feedback from colleagues	Receiving and asking feedback from colleagues and discussion on performance and improving it	3	.807	.850	.821
Support from colleagues	Colleagues stimulate each other to apply and reflect on newly acquired knowledge and skills in the workplace	3	.972	-	-
Involvement supervisor	The supervisor is involved with the learning process by asking about learning aims, giving compliments or having a conversation on training transfer.	3	.716	-	-
Exchange information with colleagues	Sharing substantive knowledge on the contents of training.	3	.883	-	-
Opportunities to experiment	Supervisor stimulates experimenting with newly acquired knowledge and skills and new, creative ideas by means of encouragement and involvement.	4	.874	-	-
Experiment	Experimenting with newly acquired knowledge, skills and showing creativity.	3	.804	-	-
Time and resources	Time to apply newly acquired knowledge and skills and resources that are needed with it.	3	-	-	-

Note. T1 = measuring occasion 1, T2 = measuring occasion 2, T3 = measuring occasion 3; - indicates invalidity of the scale on that measuring occasion.

Analysis

Because the scales are reconstructed, a number of steps was taken to test whether the scales are valid. First, exploratory Factor Analyses and Confirmative Factor Analyses (EFA's) are performed on data from measuring occasion 1. It is a prerequisite before further use of the items that the (sub-)concepts can be estimated as one factor from these items. Based on the EFA's, items are selected and the factor structure is tested with the Confirmative Factor Analyses (CFAs). Subsequently, these factor loads need to be equal over time (measuring occasion 1, 2 and 3) in order to find out whether items are invariable over time. For that purpose the factor loads from the CFAs are inspected on the basis of three measuring occasions. The factor loads of the same items must be

[3] Scales have been formed from the (most) valid items

reasonably equal (invariant) over the three measuring occasions. In order to test the invariance of the items per factor, CFAs are performed in which the factor loads of items have been fixed to be equal over time. All analyses have been performed on the entire sample and also on separate conditions (training, control). The invariance is essential for longitudinal research (McArdle & Prindle, 2013). When factor loads are not invariant, it means that it cannot be excluded whether the increase or decrease in value of a variable are based on chance (the 'true score' cannot be established). Additionally, it is tested if the autocorrelations are significant. Significant autocorrelations indicate that factors measured on different occasions respond to each other and correlate (McArdle & Prindle, 2013).

After having determined the valid scales, research questions 1 and 2 can be answered by using a univariate proportional change LDS model. In this model the means per measuring occasion are calculated in the formula (1) shown below:

$$Y_t = Y_{t-1} + \mu_{\Delta tY} + \beta Y_t * Y_{t-1} \quad (1)$$

In this formula the Y_t is the mean value on an occasion, Y_{t-1} is the mean value in a previous occasion, $\mu_{\Delta tY}$ is the estimated intercept of the latent difference score, and β_{Yt} is the proportional regression parameter. The initial value can be taken as input for the calculation. For instance, the initial value is the mean of Workplace Safety outside the agency on measuring occasion 1, and has been fixed to be equal for the two groups. This is necessary, because before the training took place the values of the respondents in the two conditions had not been different from each other yet (Ferrer & McArdle, 2010; McArdle, 2009).

By means of this model we tested whether the level of knowledge and skills of Workplace Safety increased one week after training in the training condition (and not in the control condition). In addition, we tested to what extent the knowledge and skills of Workplace Safety appear to be equal after two months (for at least the training condition). Moreover, the effect of training was tested with the t-test (different score).

Thirdly, the control variables are added in order to see if the differences maintain. Control variables are personal characteristics such as gender, age, and educational level (See Appendix A for the questionnaire). Research suggests a negative influence of informal learning and older employees (Borghans, Golsteyn, & De Grip, 2006). Recent research indicates that the gender of the employee does not seem to affect training transfer, but to be certain it has been included in this study (Pam et al., 2013; Fourarge, Schills & De Grip, 2009). Several studies conclude that the lower the educational level, the lower the participation of formal training. This low participation to formal training could in turn influence the opportunities of the employee to acquire new matters. However, recent academic research has not proven that the educational level would influence training transfer (Fourarge et al., 2009).

Fourthly, the bivariate proportional change model is applied on the data to test the impact of the work environment on knowledge and skills of Workplace Safety (and, because it is the nature characteristic of the model, the reversed influence). In this model the associated parameters (and correlations) of the values of feedback from colleagues on Workplace Safety outside the agency were discovered. These and all order analyses have been conducted using Mplus 6.2 (Muthén & Muthén, 1998-2012).

Results

Factor structure and invariance of the variables

The scales were newly constructed and a number of steps were taken to test whether the scales are valid and invariant. In this section results of analyses on the overall sample are reported. However, in order to control if the results of these analyses are equal for both conditions, analyses for the conditions control and training have also been made separately.

First, the results of the Exploratory Factor Analyses (EFA's)[4] on measuring occasion 1 indicate that for the ten scales only a few items form a factor together. Based on the EFA selected items per scale, Confirmative Factor Analyses (CFA's) have been performed on occasion 1. The factor analyses indicate eight valid scales (See Table 2). These tests indicate two scales of Workplace Safety: Workplace Safety within the cleaning agency and Workplace Safety outside the agency. Additionally, six scales of the work environment were found: feedback from colleagues and support from colleagues, involvement supervisor, exchange information with colleagues, opportunities to experiment and experiment with newly learned knowledge.

After having performed the factor analyses (CFAs) on three measuring occasions, only two scales, which are Workplace Safety outside the agency and feedback from colleagues, proved to be invariant. The remaining scales are not invariant, because either the analysis on the separate conditions indicate an unacceptable fit, or the residual variances had been estimated negative. This means that there is no reliable and valid model. The scales, items, factor loads, and residual variances are presented in Appendix B.

Table 2 shows the fit measures of the CFAs of the ten initial scales on occasion 1 or occasions 1, 2 and 3 (CFAs for both conditions) in this research. The fit measures are a reliable and good fit when the value of Chi-square (χ^2(df)) is not significant, the RMSEA (Root Mean Square Error of Approximation) ≤ .06, the CFI (Comparative Fit Index) > .95, and the SRMR (Root Mean Square Residual) ≤ .08 (Hu & Bentler, 1999; Kenny, 2014).

[4] EFA's were > .40, only in the scale of time and resources 1 item was < .40 (Field, 2009),

Table 2

Fit measures CFA (both conditions)

Scale	Chi-square	DF	p	RMSEA	CFI	SRMR
Workplace Safety within the cleaning company (mom 1)	25.737	3	.0000	.000	1.000*	.000*
Workplace Safety outside the agency (mom 1, 2, 3)	73.630	28	.0000	.165	.840†	.084†
Workplace Safety in the workplace	-	-	-	-	-	-
Feedback from colleagues (mom 1, 2 en 3)	55.314	28	.0016	.128	.912†	.072*
Support from colleagues (mom 1)	2.354	2	.3083*	.054*	.999*	.005*
Involvement supervisor (mom 1)	36.182	3	.0000	.000*	1.000*	.000*
Exchange information with colleagues (mom 1)	125.807	3	.0000	.000*	1.000*	.000*
Opportunities to experiment (mom 1)	11.027	2	.0040	.274	.945†	.041*
Experiment (mom 1)	78.443	8	.0000	.000*	1.000*	.000*
Time and resources (mom 1)	-	-	-	-	-	-

Note. df = degree of freedom; mom = measuring occasion; * = good fit, † = marginal fit, - = no valid CFA

Table 2 shows that the fit Workplace Safety in the workplace and time and resources could not be made on the basis of the EFA. In addition, the scales of several models are acceptable or marginally acceptable. First, the fit Workplace Safety outside the agency is marginal. However, this turns out to be the best scale within the items of Workplace Safety. With regard to the CFA of Workplace Safety within the cleaning agency with occasions 1, 2 and 3 fixed to be equal, the fit per condition (training and control) is poor and the residual variance of the control group is not significant. For this reason, this scale will be used in further analyses in order to answer the research questions. The fit measures of the scales exchange information with colleagues, opportunities to experiment and experiment (measuring occasion 1), are acceptable. However, these scales will not be used in further analyses. The fit of the CFA's on three measuring occasions is not acceptable or the residual variances are not significant. This shows that these scales are not invariant over time. Despite a good fit of the scales support from colleagues and involvement supervisor on three measuring occasions, these scales did not prove to be invariant in both conditions separately. In the scale of the training condition support from colleagues a negative residual variance was shown, this indicates that the scale is non-valid. The scale involvement supervisor is not valid either, because the residual variances of the training condition are not significant. The scale of feedback from colleagues does indicate a marginally acceptable fit based on data on three measuring occasions. It should be noticed that this scale, in contrast to other scales, has reasonable fits when this model of the training and control group is tested separately. Moreover, the autocorrelations of the two invariance scales prove to be significant. This means that the variables at occasion

1 have a significant impact on occasions 2 and 3 and that the variables of occasion 2 also influence the values of occasion 3.

Striking is that the RMSEA values of all scales are below standards (> .06) This can be explained because in this study there is a low N and a low degree of freedom (Kenny, 2014). Finally, Cronbach's alphas (α's) of the factors with invariant items were calculated in SPSS (version 20) per measuring occasion. The Cronbach's Alpha indicates the internal consistence of the items. The α's of the scales are higher than .690 (See Table 1 and Appendix B). These values indicate a valid internal consistence of the items (Kines, Lappalainen, Mikkelsen, Olsen, Pousette, Tharaidsen, Tómasson, & Törner, 2011; De Vellis, 2003).

In other words, on the basis of all tests and results, this research will focus on the influence of feedback from colleagues on Workplace Safety outside the agency. In order to test the proportional change LDS models, the degrees of freedom have been reduced due to the low N. This has been done by averaging the items to means per scale.

Subsequently, proportional change LDS models were created in order to answer the research questions. The proportional change LDS model of Workplace Safety outside the agency has reasonably acceptable fit measures: $X^2(4) = 9.401$ ($p = .0518$), RMSEA = .212, CFI = .925, SRMR = .087. Control variables have been added to this model, which resulted in a marginally acceptable fit: $X^2(4) = 8.717$ ($p = .086$), RMSEA = .186, CFI = .948, SRMR = .037. Finally, the scale of feedback from colleagues has been linked to Workplace Safety outside the agency, which resulted in a bivariate proportional change LDS model, with a resonably acceaptable fit: $X^2(17) = 24.020$ ($p = .1189$), RMSEA = .117, CFI = .953, SRMR = .081. The most important details of these three models are presented in the next sections.

Training transfer of Workplace Safety

To answer research questions 1 and 2 the univariate proportional change model has been performed. In this model the latent differ factor between occasions 1 and 2 and occasions 2 and 3 is calculated. This makes it possible to find out if the training had any effect compared to the control group (research question 1) and if the knowledge and skills have maintained after two months (research question 2). In this model the two conditions are compared by splitting the data (See Figure 2).

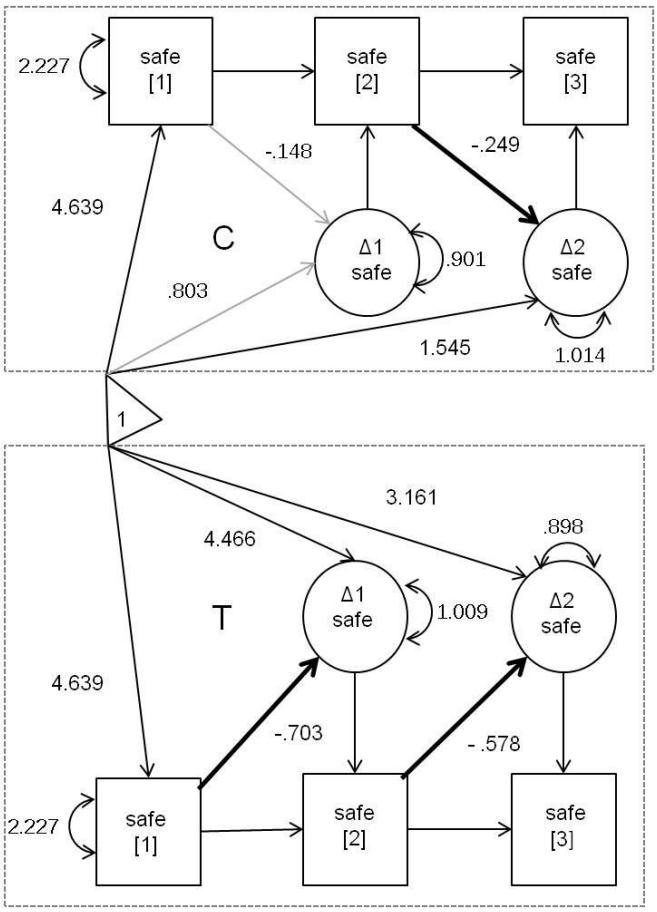

Figure 2. Representation of the univariate proportional change LDS model: Workplace Safety outside the agency

Unstandardized values (C = control group; T = training group), safe[t] represents safe measurement on time t. Δ[#] presents safe's latent difference factor for different measuring occasions. Safe [1] is the initial factor of safe, which is equal for both conditions (4.639).The black arrows (no values) are fixed at 1. The curved lines with double arrows are variances. The black arrows with values are the significant intercepts. The autoregressions (β's) are presented in black bold arrows. The light grey arrows are not significant intercepts or autoregressions

Figure 2 shows the significant autoregressions of the model and indicates that previously acquired knowledge and skills of Workplace Safety outside the agency influence measuring occasions 2 and 3 (training condition). After that, formula 1 has been applied to estimate means on occasions 2 and 3. Subsequently, a t-test has been calculated in this model to illustrate the difference scores between the conditions and within the trainings conditions. Table 3 represents the estimated mean values and difference scores of Workplace Safety outside the agency.

Table 3

Estimated means Working Safety outside the agency and t-test

	Measuring occasion	Mean	t-test
Training	Occasion 1 (safet1)	4.639	
	Occasion 2 (safet2)	5.846	
	Occasion 3 (safet3)	5.626	
Control	Occasion 1 (safet1c)	4.639	
	Occasion 2 (safet2c)	4.756	
	Occasion 3 (safet3c)	5.114	
Different score (Safet2-safet1)			1.207**
Different score (Safet2-safet2c)			1.090**
Different score (Safet2-safet3)			- .220

Note. c = control, ** p < .01, significant

Table 3 shows the estimated means of all measuring occasions in both conditions (training and control). The means of the initial value of Workplace Safety outside the agency have been fixed to be equal for both conditions in order to analyse the differences between these groups. All means are higher than 4.630, which indicates that the starting level of knowledge and skills of Workplace Safety is higher (on average) than the mean of the scale (scale 1-7, mean scale = 4). There are two reasons why the results indicate that training has a significantly positive influence on knowledge and skills of Workplace Safety outside the agency. Firstly, the means of the training condition (one week after training) are significantly higher than the initial values (veiligt2 -veiligt1 = 1.207, p = .000). Secondly, the means of the training condition (one week after training) prove to be significantly higher than the control condition (veiligt2 - veiligt2c = 1.090, p = .000). So the answer to research question 1 is that after training there is increase of knowledge (with 51 % compared to the possible 100 %).

After two months (measuring occasion 3) the knowledge and skills of the training group has not dropped significantly (safet2-safet3 = -.220, p = .285). This indicates maintenance of knowledge and skills in the training group (41, 8 % increase of knowledge compared to the potential increase). In order to get more insight into the course of training transfer multiple values have been estimated. The estimated values (all measuring occasions) have been calculated by means of filling in the formula (1). Then a comparison between the training and control group on occasions 2 and 3 and within the control group (different scores) is calculated. The estimated means, estimated minimal and maximum values) and difference scores (t-test) are represented in Table 4.

Table 4

Estimated means, sd-, sd+, and t-test

		T1	T2	T3	T-test
sd-	Training	3.000	5.386	5.493	
mean	Training	4.667	4.768	5.675	
sd+	Training	6.333	6.259	5.685	
sd-	Control	3.000	3.255	4.241	
mean	Control	4.667	4.768	5.132	
sd+	Control	6.333	6.183	6.234	
Different score (safet3c - safet2c)					.358†
Different score (safet2 - safet2c)					1.090**
Different score (safet3 - safet3c)					.511

Note. safe = Workplace Safety outside the agency, c = control group, T = measuring occasion, actual sd= 1,492, sd- = one sd subtracted from mean, sd+ = one sd added to mean ** p<.01, † marginal. The values on T2 and T3 are estimated based on the factor scores of the initial values (T1). Formula (1) is used with the factor scores on the place of x. The trajectory that best suited the means of Table 3 are presented.

As shown in Table 4, the training has an effect and also within the control group knowledge and skills prove to have increased significantly. Based on the data of Table 4 a graph has been made to explicitly show how training transfer develops within the training group and the control group (See Figure 3).

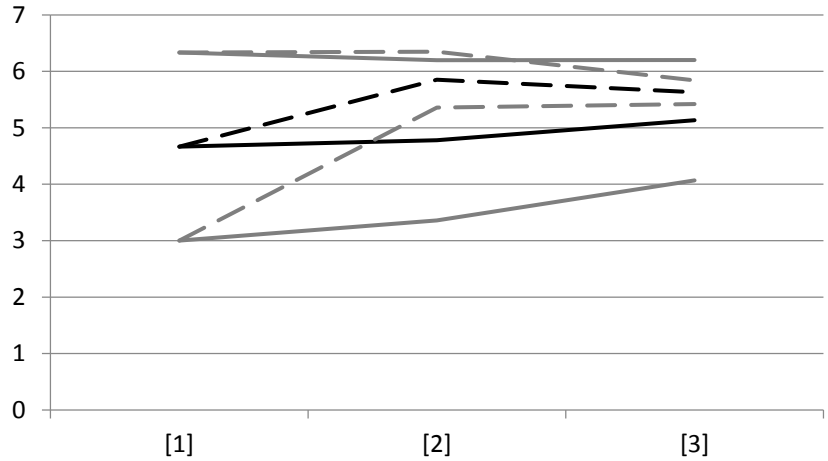

Figure 3. The development of the training group compared to the control group

_____ = control group grey = sd- en sd+

- - - - - - = training group black = estimated expected

On the vertical axis numbers 1 to 7 represent the Likert scale score

On the horizontal axis the time is represented: [1], [2], [3] indicate the actual measuring occasion

Figure 3 illustrates that the estimated mean of training group on occasion 3 compared to occasion 2 remains unchanged. So the answer to research question 2 is that there is maintenance. The striking thing in this graph is that the control group implies a marginally positive difference between measuring occasions 3 and 2. This marginal increase (safet3c – safet2 = .358, p = .064) implies that the control group has developed more knowledge and skills of Workplace Safety outside the agency

between measuring occasions 2 and 3. Finally, the training group did not appear to have any significant differences compared to the control group on occasion 3 (safet3 – safet3c = .551, p = .100). This means that the control group, when compared to the training group after two months, has an equal score. The explanation for these last two striking results will be clarified in the sections below.

Training transfer of Workplace Safety and personal characteristics

The additions of the control values and feedback from colleagues data to the initial model negatively influences the fit of the model. This is due to the low N and therefore the control variables (gender, age and educational level) have been added separately to the existing LDS model of Workplace Safety outside the agency. The standardized values were calculated in order to identify the influence of these variables. In this model the data have been split into control and training results again. Figure 4 represents the effect of the control variables gender, age and educational level on the knowledge and skills of Workplace Safety outside the agency.

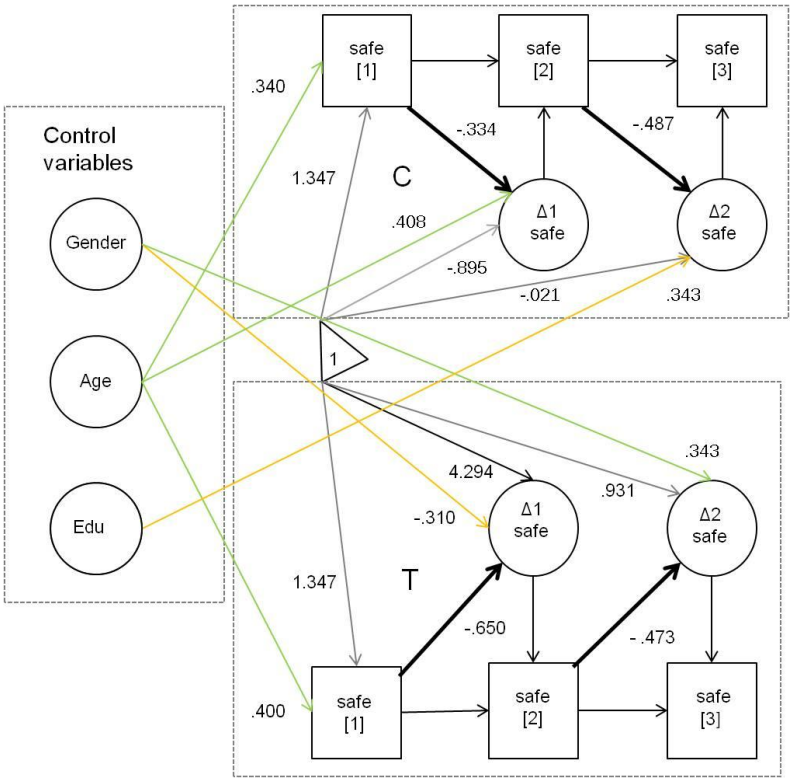

Figure 4. Effect sizes of the control variables on Workplace Safety outside the agency. Standardized values (safe = Workplace Safety outside the agency; C = control group; T = training group; Edu = educational level), Safe[t] represents safe measured on time t. Δ[#] represents safe's latent difference factor for different measuring occasions. Safe [1] is the initial factor of Workplace Safety, which is equal regarding both groups. The black arrows (no values) were fixed on 1. The autoregressions (β's) are represented in black bold arrows. The black arrows with values are the significant intercepts. The light grey arrows with values are non-significant intercepts. The green arrow represents the significant effect size, the orange arrow is the marginal significant effect size.

Figure 4 illustrates that gender and age influence the knowledge and skills of Workplace Safety outside the agency. However, there is no visible influence of the educational level, because the marginal significant influence is only visible in the control group on measuring occasion 3 (p = .071). These results can be neglected. The training group results illustrate that gender negatively influences Workplace Safety outside the agency on measering occasion 2 (effect size = -.310; p = .027) and that it is marginally positive on occasion 3 (effect size = .316; p = .070). The negative influence on measuring occasion 2 indicates that being a man has a greater effect on growth of knowledge of Workplace Safety outside the agency than being a woman. On the other hand, the (marginally) positive influence on measuring occasion 3 indicates that being a woman has a greater effect on the maintenance of knowlegde of Workplace Safety outside the agency than being a man. Furthermore, age also positively influences the initial values of Workplace Safety outside the agency (control group effect size = .340, p = .036; training group = .400, p = .005). In addition, one week after the training (measuring occasion 2; control group) age affects the values positively significantly (effect size = .408; p = .034), but not in the training group (effect size = -.164, p = .225). These results illustrate that the higher the age of the respondent, the more the initial values of Workplace Safety outside the agency in training and control are predicted. This effect is also shown in the control group on measuring occasion 2 (effect size = .408). However, on measuring occasion 3 (control group) and on measuring occasions 2 and 3 (training group) age does not have any effect. Given the low validity, the control variables cannot be included in the following analysis.

Training transfer of working safety and the influence of stimulation (and vice versa)

In order to answer research question 3 a bivariate proportional LDS model has been created (See Appendix C for the input of Mplus). The measured values of feedback from colleagues on measuring occasions 1, 2 and 3 were added to the model of Workplace Safety outside the agency (see Figure 2). This illustrates that the influence of feedback from colleagues (coupling parameters; correlation) on the values of Workplace Safety outside the agency is calculated (research question 3). Figure 5 and 6 represent this model, respectively for the training and control condition. Note that the values in the figures originate from only one analysis, in which the relationship of Workplace Safety outside the agency and stimulation was estimated separately for the two conditions.

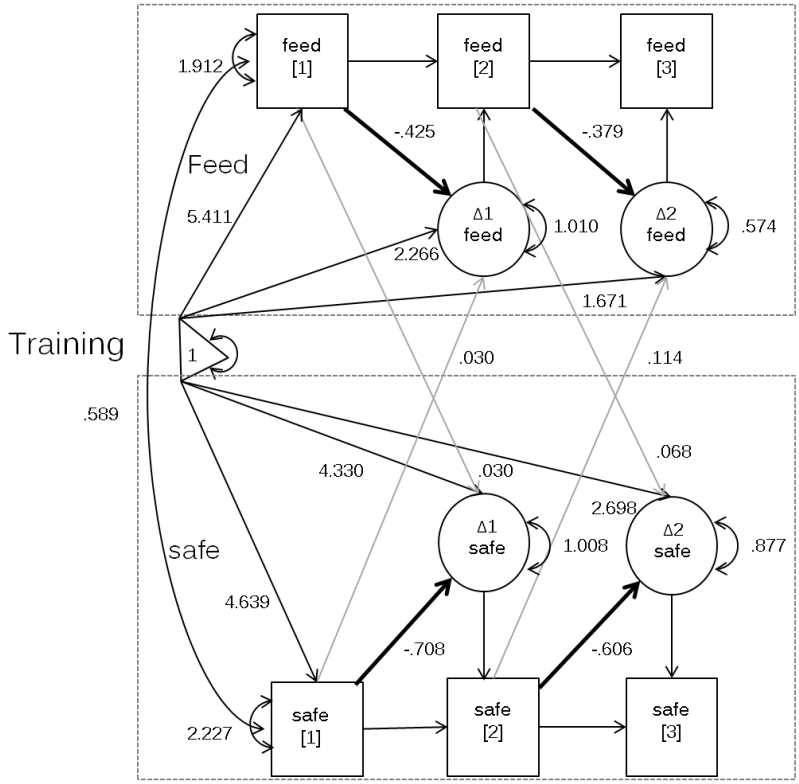

Figure 5. Influence of Workplace Safety on stim and vice versa in the training condition.
Unstandardized values (safe = Workplace Safety outside the agency, stim = feedback from colleagues). Safe[t] represents safe measurement on time t. Δ[#] presents safe's latent difference factor for different measuring occasions. Stim[t] represents stim measurement on time t. Δ[#] presents stim's latent difference factor for different measuring occasions. The black lines with values are the significant intercepts. The black arrows (no values) are fixed at 1. The curved lines with double arrows are variances. The proportional autoregressions (β's) are presented in black bold arrows. The light grey arrows represent the values with the non-significant coupling parameters (y's). Correlation is represented with two-sided black arrows (*p's*).

Figure 5 illustrates that feedback from colleagues has no significant effect on Workplace Safety outside the agency over time after having followed the training (nor vice versa). Thus, the answer to research question 3 is: the work environment (feedback from colleagues) proves not to have any effect on training transfer. In actual fact, the control condition does show a relationship between feedback from colleagues and Workplace Safety outside the agency.

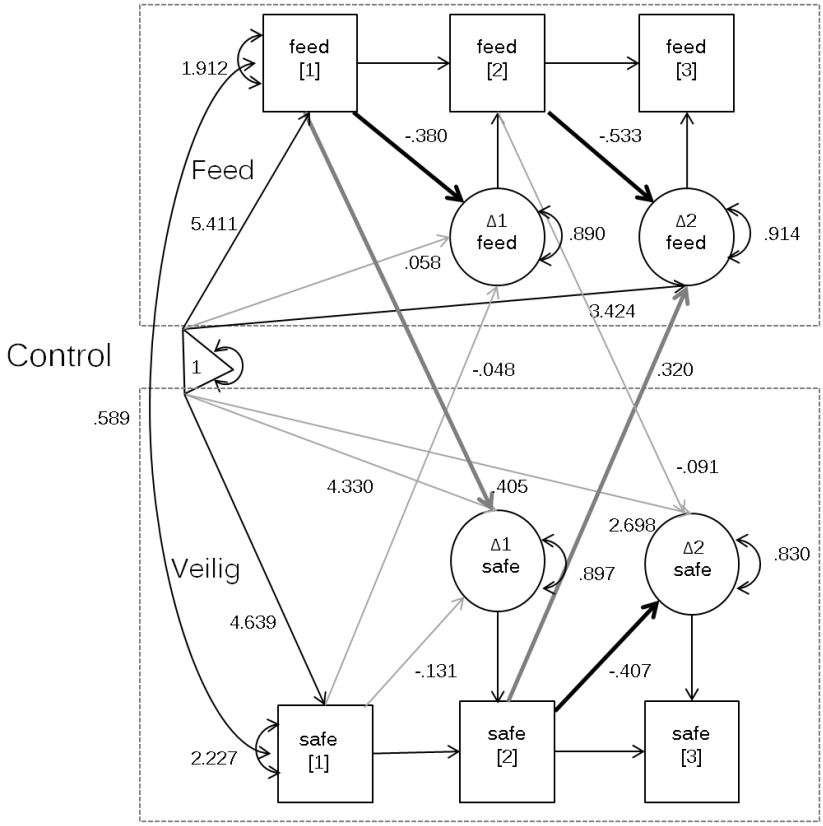

Figure 6. Influence of Workplace Safety on stim and vice versa in the control condition.
Unstandardized values (safe = Workplace Safety outside the agency; feed = feedback from colleagues). Safe[t] represents safe measurement on time t. Δ[#] presents safe's latent difference factor for different measuring occasions. Feed[t] represents feedback from colleagues measurement on time t. Δ[#] presents feed's latent difference factor for different measuring occasions. The black arrows with values are the significant intercepts, the light grey lines taken from the constant are non-significant intercepts. The black arrows (no values) are fixed at 1. The curved lines with double arrows are variances. The proportional autoregressions (β's) are represented in black bold arrows. The invariant coupling parameters of variable feed to variable safe (and vice versa) are dark grey arrows with values (y's). The light grey arrows represent the values with the non-significant coupling parameters (y's). Correlation is represented with two-sided black arrows (*ρ's*).

Figure 6 shows that the initial values of feedback from colleagues and Workplace Safety outside the agency are positively correlated (this applies to both conditions, see also Figure 5; ρ = .589, p = 033). Subsequently, it is striking that Workplace Safety outside the agency and Feedback from colleagues affect each other over time in the control condition. Furthermore, it is shown that the initial value of feedback from colleagues significantly influences the values of Workplace Safety outside the agency on measuring occasion 2 (*γ* =.405, p = .001). The influence of feedback from colleagues on Workplace Safety outside the agency on measuring occasion 2 is not significant. However, the first proportional autoregression of Workplace Safety outside the agency is not significant. This means that the differences in value of Workplace Safety outside the agency on occasion 2 compared to occasion

1 can not so much be attributed to the level of knowledge of Workplace Safety outside the agency as to the degree of feedback from colleagues.

Conversely, the values of Workplace Safety also affect the values of feedback. The influences of the initial values of Workplace Safety outside the agency on Feedback from colleagues on measuring occasion 2 are not significant. However, the data illustrate that Workplace Safety outside the agency on measuring occasion 2 has a significant and positive effect on Feedback from colleagues on measuring occasion 3 ($\gamma = .320$, $p = .010$). These analyses show that more knowledge leads to more feedback and, in addition, more feedback leads to more knowledge.

Discussion

In this longitudinal research it has been tested to what extent the work environment factors facilitate training transfer. The seven supporting work environment factors that have been measured illustrate a stimulating learning climate, an exchange of information with colleagues and opportunities to experiment. On three measuring occasions (pretest, one week after the training, and two months after the training) the perception of the work environment and the knowledge and skills of Workplace Safety was measured. The respondents (N = 60) were divided proportionally in the control group (followed no training) and in the experimental group (followed training). The discussion first concentrates on the extent to which the results correspond to previous studies that are similar to this one and in doing so, the focus is on the knowledge that was gained one week after the training (generalization). Subsequently, the results show that knowledge and skills have been retained two months after the training (maintenance). Then an explanation will be found for the increase of knowledge of the control group during the last measurement. In addition, the control variables gender and age influence the results. Finally, the influence of the work environment is discussed, which, interestingly, has no influence on the training group, but does have an influence on the control group.

Interestingly is that the analyses of the CFAs could only present one moderate valid scale of Workplace Safety and one of the factors of the work environment (applicable for longitudinal research). On moment occasion one eight scales seem valid, however over time the training group responds differ. One explanation for this change in the training group is the way measurements were carried out; the scales might not have been well-reconstructed. Another explanation is that the meaning of the scales changes for respondents. Previous studies show that the interpretation of respondents changed. This altered interpretation can be explained from the conceptual perspective. The meaning of scales can change after training, because an employee has acquired substantive phrases. As a result, an employee interprets and judges the theorems differently (Oort, Visser, & Sprangers, 2009).

Firstly, the online training called Workplace Safety has an effect, as there is an increase of knowledge (training condition). Moreover, this knowledge has also been retained two months after the training. Interestingly enough, the control group also shows an increase of knowledge. In earlier empirical research this increase (in a control group) has not been reported. These results are illustrated in the univariate proportional change model of Workplace Safety outside the agency (see Figure 2). The increase of knowledge (of the training condition) is 51 percent compared to the possible increase and corresponds to previous research. Previous research shows that the increase is about 50 percent. In contrast to previous research, the level of knowledge of the training group is almost equal after two months (41, 8 percent

maintenance of knowledge). Previous research showed a decrease of knowledge (after a year) of 20 percent (on average) compared to previously acquired knowledge and skills (Brown & Reed, 2002; Saks, 2002; Broad & Newstrom, 1992; Holton & Baldwin, 2003). Explanations for this increase of knowledge have been found by adding control variables to the model. Then, it was examined whether the work environment contributes to increase of knowledge in the training and the control conditions.

Secondly, it was found that two control variables influence the training transfer. As was expected, the level of education does not affect training transfer (Fourarge et al., 2009). Previous research shows that gender has no effect on training transfer (Pham et al., 2013). However, this research shows that immediately after the training, being a man contributes more to the value of Workplace Safety outside the agency than being a woman. Conversely, two months after the training it appears that being a woman has a greater influence on the value of Workplace Safety outside the agency than being a man. In conclusion, this shows that both men and women learn from training, but men start learning earlier than women. Moreover, this study shows that all ages learn from training and the initial knowledge is affected by age in both conditions. The higher the age of an employee is, the higher these initial values are. In addition, it appears that the younger the employees are in the control group, the more increase of knowledge occurs. This is consistent with research that indicates that younger employees learn more in an informal way (Borghans et al., 2006). An explanation for the increase of knowledge of the young employees could be that they share information with each other about a training or give feedback to each other in the control group. By analysing the work environment, an explanation has been found for this result and will be clarified below.

Finally, against all expectations, giving feedback to colleagues has no influence on the increase of knowledge after training. However, in the control group feedback of colleagues does appear to have a positive impact on the knowledge of safety outside the agency and vice versa. The bivariate proportional LDS model of feedback from colleagues and safety outside the agency illustrates these results (see Figure 4 and 5). Various studies show that stimulation positively contributes to increase of knowledge after training (generalization) and the preservation of this knowledge (maintenance). The training has an effect and is the only explanation in this setting for increase of knowledge and maintenance of this knowledge in the training group. One reason for this could be that other aspects of the work environment do have influence on it. However, these aspects (because of their low validity) are not included in this research. With regard to the employees that did not participate in training, stimulation by means of giving feedback to colleagues influences the level of knowledge of Workplace Safety outside the agency. Previous research shows that effective feedback of several persons positively contributes to the performance in the workplace (Smither et al., 2005; Becker & Klimoski, 1989). This may explain the observed increase of knowledge. More

knowledge then leads to more feedback to colleagues, which facilitates the maintenance of knowledge. In addition, colleagues may exchange information with each other online (through the Learning House), during consultations at the agency of a particular area, during other trainings or other informal meetings. In the public library of the Learning House all information with regard to the training of Workplace Safety that could be consulted by employees can be found (cleaning company, 2013). Furthermore, the participation of employees in training spread out over time proves to contribute positively to sharing knowledge with colleagues who have not yet participated in the training. Desirable limitations, follow-up of research and implication for theory and practice of this study will be explained in the sections below.

Limitations

A strong point in this research is the comparison between the training condition and the control condition. This is important for a valid interpretation of the increase of knowledge. In addition, only the invariant scales have been included in the analyses. Moreover, the results are valid for the total population of employees, because a mixed group (based on background characteristics) participated in the study.

In this research, the periods of time between the measuring occasions differ per respondent. Within the training group measurements have been carried out before the training, one week and again two months after the training; they differ per respondent. The initial measurement in the control group is equal. The second measurement was carried out after employees in the training group had completed the training and the last measurement was two months later. In addition, the instruments rely in this study on the interpretation of the employees themselves. In this perspective triangulation is desirable. Triangulation is the use of multiple sources and measuring instruments in research (Van Staa & Evers, 2010). As a result, a more valid and reliable picture can be drawn of the work environment and the effect on training transfer. When measuring training transfer, it is advisable to make use of the interpretation of the respondents and their supervisor. Moreover, it is desirable to observe the transfer behaviour on the basis of observation scales (for example, on the basis of the four levels of Kirk Patrick) (MindTools, 2014). However, the presence of an observer affects the results as well. The use of video equipment may prevent this, but this is time-consuming and impractical from an organizational point of view (Phillips & Stone, 2002).

Due to the low response (N = 60), and the considerable amount of parameters to be estimated, it is important that conclusions should be interpreted with caution (Kenny, 2014). This is indicated by the low RMSEA values of the models. Researchers imply that when the number of respondents is higher than 200, a more valid estimation for an LDS model can be carried out. Depending on the expected effect, a lower number of respondents are also possible (Sbarra & Allen, 2009; Eschleman & Lahuis, 2014).

Future research

In this study the univariate proportional change LDS model has been chosen in order to do longitudinal research (McArdle, 2009; McArdle & Prindle, 2008). This model gives a precise interpretation of the differences in means and is a valid research method. However, with a low N this is a risky analysis. Other methods for longitudinal research are: multilevel analysis, growth models and repeated measures (Field, 2009). Multilevel analysis analyses linear regression and random regression. The expectations in this research are that increase or possible decrease of growth is possible, which makes multilevel analysis inappropriate (De Leeuw, & Meijer, 2008). The application of growth models on this study has also been excluded, because there is no scientific unanimity on the progress (decrease, increase or equal after two months) of training transfer (Field, 2009). Another method of longitudinal testing is Repeated Measures. In this method the changes of the variables are tested on the basis of conditions (for example stimulation), but no comparison has been made between an experimental and a control group. These tests are less valid and less capable when times between measuring occasions are unequal (Field, 2009). The most appropriate method for longitudinal comparisons between two conditions and changes of the individual is the univariate proportional change LDS model. This model gives longitudinal insight into how levels of knowledge develop after training and makes it possible to measure the influence of other variables on them (McArdle, 2009; Eschleman & Lahuis, 2014).

In future research, it is important to examine other influences as well, such as characteristics of the learner (McArdle, 2009; Eschleman & LaHuis, 2014). In addition to the work environment, characteristics of the learner and the training design prove to affect training transfer (Baldwin & Ford, 1988; Kessels, 2001; Holton et al., 2000; Burke & Hutchins, 2007; Blume et al., 2010). However, this has not been included in this research. Furthermore, the level of knowledge and skills that were measured two months after training could still drop a year later. In future research maintenance could ideally be measured two months, six months and one year after training. In this way more insight will be gained into how the development of maintenance crystallizes over time. In order to gain insight into the influence of the work environment on training transfer, the work environment could be measured on equal occasions. The work environment may change over time, therefore it is desirable to carry out measurements on several occasions.

In this study de scales are reconstructed, because actual scales do not always measure the work environment. This is the case with the scales of the 'Learning Transfer System Inventory (LTSI)' of Holton et al. (2000), because other factors such as motivation and training design (in addition to work environment), have been measured. When using this scale, it is required to use all scales. Because the focus is only on the work environment, the new scales have been constructed with the aid of example

items of other existing scales. In addition, previously used scales have not consistently been applied in previous research, which shows that it is a problem to find valid scales for longitudinal research when measuring the work environment (Holton et al., 2000). Therefore, the LTSI model or other existing valid scales could be used to measure the work environment (and other factors) in follow-up research. Future research with more power (higher N) and the use of existing scales would contribute to a valid longitudinal research. It is also possible to test self-constructed items in a pilot, as De Jong and Den Hartog (2010) illustrate in previous research. To sum up, in longitudinal research on training transfer it is important that: (1) the selected scales are valid for longitudinal research, (2) the scales are tested in such a way that they are attuned to the interpretation of the respondents.

Implications for theory and practice

Companies put a great deal of money into training. It is important for a company that training contributes to return on investment (Phillips & Stone, 2002; Tanriseven & Veldhuizen, 2012; Percival, Cozzarin, & Formaneck, 2013; Volet, 2013). In this study the cleaning agency and the financier of blended learning have interest in valid future research. This corresponds to a recent review of Weisweiller et al. (2013) who claim that valid longitudinal scales are desirable. Thus, more insight can be gained into training transfer and the influence of the learning characteristics, the training design and the work environment. In addition, follow-up research on feedback and specific scales that concern the way feedback is given, are desirable. In this way, it is clarified which kinds of feedback are effective. Moreover, Volet (2013) notes in an article that adaptive learning can also be linked to the transfer problem. This allows a better understanding of the problems and solutions of training transfer. Finally, it is desirable with blended learning to find out how sharing information takes place with one another and how it contributes to the maintenance of acquired knowledge and skills (Van Woerkom, 2003; Cabrera & Cabrera, 2005).

Companies can facilitate giving feedback and discussions on work-related topics by continuing to arrange and promote meetings with colleagues. As is illustrated in research by DeNisi and Kluger (2000), it is important that several colleagues give feedback. In addition, effective feedback focuses on the work performance or on the tasks. It is important that the feedback provides information on how improvement can be made. Furthermore, because the participation of training is spread over time, colleagues can learn from each other, which positively contributes to training transfer. In order to see to it that maintenance of knowledge and skills that have been acquired will last after a year, repetition of the training content is desirable (Blume et al., 2010). This repetition may take place by stimulating the use of the library in the Learning House. Moreover, attention can be paid to topics that concern training during formal

meetings. When there is a signal in the regions that knowledge and skills of a particular topic decline, an up- to- date revision training is a possibility.

Besides colleagues, supervisors play an important role in training transfer. Because of validity problems this has not been shown. Previous researchers, however, mention a number of factors with regard to the supervisor that can contribute to training transfer: involvement, stimulation of applying acquired skills in the workplace, provide scope to learn and formulation of learning objectives, learning and training (Holton et al., 2000; Russ-Eft, 2002; Van den Bossche et al., 2010; Nijman, 2004; Leahy, 2002; Spitzer, 1986; Montesino, 1995; Cromwell & Kolb, 2004; Baldwin & Ford, 1988; Geijsel et al, 2009). These factors can contribute to training transfer, which is why it is important to motivate supervisors to apply them. Then this can lead to optimized return on investment.

Conclusion

Training has an effect, employees actually learn from the online training called Workplace Safety. Interestingly, the control group also shows increase of knowledge. The control variable age reveals that after training young employees share more knowledge of Workplace Safety than older employees. Moreover, it was shown that employees (in the control group) give feedback to several colleagues and discuss with each other. Furthermore, participation in training spread over time positively contributes to maintenance of knowledge and skills. To sum up, the transfer climate, in which learners apply newly acquired knowledge and skills in the workplace, can contribute to maintenance and the circulation of these acquired knowledge and skills.

References

Arboportaal (n.d.). Veilig werken. [Working safety]. Retrieved from http://www.arboportaal.nl/onderwerpen/veilig-werken

Ashford, S., & Cummings, L. (1985). Proactive feedback seeking: the instrumental use of the information environment. *Journal of Occupational Psychology, 58*(1), 67–79.

Axtell, C. M., Maitlis, S., & Yearta, S. K. (1997). Predicting immediate and longer term transfer of training. *Personnel Review*, *26*(3), 201–213. doi: 10.1108/00483489710161413

Baldwin, T. T., & Ford, J. K. (1988). Transfer of training: A review and directions for future research. *Personnel Psychology, 41,* 63–105. doi:10.1111/j.1744-6570.1988.tb00632.x

Baldwin, T. T., & Magjuka, R. J. (1991). Organisational training and signals of importance: Linking pretraining perceptions to intentions to transfer. *Human Resource Development Quarterly, 2,* 25-36. doi: 10.1002/hrdq.3920020106

Bates, R., & Khasawneh, S. (2005). Organizational learning culture, learning transfer climate and perceived innovation in Jordanian organizations. *International Journal of Training and Development,* 9(2), 96-109. doi:10.1111/j.1468-2419.2005.00224.x

Becker, T. E., & Klimoski, R. J. (1989). A field study of the relationship between the organizational feedback environment and performance. *Personnel Psychology,* 42, 343–58. doi:10.1111/j.1744-6570.1989.tb00662.x

Billett, S. (2001). *Learning in the workplace: Strategies for effective practice*. Sydney: Allen and Unwin. ISBN: 186508-364-X

Blume, B. D., Ford, J. K., Baldwin, T. T., & Huang, J. L. (2010). Transfer of Training: A Meta Analytic Review. *Journal of Management 36(4),* 1065-1105. doi:10.1177/0149206309352880

Bolino, M. C, Turnley, W.H., & Bloodgood, J.M. (2002). Citizenship Behaviour and the Creationof Social Capital in Organizalions. *Academy of Management Review,* 27(4), 505-22.

Borghans, L., Golsteyn, B., & De Grip, A. (2006). *Meer werken is meer leren. Determinanten van Kennisontwikkeling [More working is more learning. Determinants of knowledge development].* 's-Hertogenbosch: CINOP.

Branham, L. (2005). *The seven hidden reasons employees leave.* New York: AMACOM.

Broad, M. L., & Newstrom, J. W. (1992). *Transfer of training: Action packed strategies to ensure high payoff from training investments.* Reading, MA: Addison-Wesley.

Brown, R. E., & Reed, C. S. (2002). An integral approach to evaluating outcome evaluation training. *American journal of Evaluation, 23* (1), 1-17. doi:10.1177/109821400202300102

Burke, L. A., & Baldwin, T. T. (1999). Workforce training transfer: A study of the effect of relapse prevention training and transfer. *Human Resource Management*, *38*(3), 227–243. doi:10.1002/(SICI)1099-050X(199923)38:3<227::AID-HRM5>3.0.CO;2-M

Burke, L. A., & Hutchins, H. M. (2007). Training Transfer: An Integrative Literature Review. *Sage,* 3, 263-296. doi:10.1177/1534484307303035

Cabrera, E. F., & Cabrera, A. (2005). Fostering knowledge sharing through people management practices. *International Journal of Human Resource Management, 16(5),* 720-735. doi:10.1080/09585190500083020

Cheng, E. W. L., & Hampson, I. (2008). Transfer of training: A review and new insights. *International Journal of Management Reviews.* doi:10.1111/j.1468-23 70.2007.00230.x

Clarke, N. (2002). Job/work environment factors influencing training effectiveness within a human service agency: Some indicative support for Baldwin and Fords' transfer climate construct. *International Journal of Training and Development*, *6*(3), 146-162. doi:10.1111/1468-2419.00156

Colquitt, J.A., LePine, J.A., & Noe, R.A. (2000). Toward an integrative theory of training motivation: A meta-analytic path analysis of 20 years of research. *Journal of Applied Psychology, 85,* 678–707.

Cromwell, S. E., & Kolb, J. A. (2004). An Examination of Work-Environment Support Factors Affecting Transfer of Supervisory Skills Training to the Workplace. *Human Resource Development Quarterly, 15*(4), 449-471. doi:10.1002/hrdq.1115

Currie, K., Tolson, D. & Booth, J. (2007). Helping or hindering: the role of nurse managers in the transfer of practice development learning. *Journal of Nursing Management, 15*, 585–594. doi:10.1111/j.1365-2834.2007.00804.x

Dawes, S. S., Cresswell, A. M., & Pardo, T. A. (2009). From "Need to Know" to "Need to Share": Tangled Problems, Information Boundaries, and the Building of Public Sector Knowledge Networks. *Public Administration Review,* 392-404. doi:10.11 11/j.1540-6210.2009.01987_2.x

De Jong, J. & Den Hartog, D. (2010). Measuring Innovative Work Behaviour. *Blackwell Q Publishing Ltd, 19*(1), 23-36. doi:10.1111/j.1467-8691.2010.00547.x

De Leeuw, J., & Meijer, E. (2008). Handbook of multilevel analysis. Springer Science+Business Media, USA. ISBN: 978-0-387-73183-4. 1-498.

De Vellis, R. F. (2003). *Scale development: theory and applications: theory and application*. Thousand Okas, CA: Sage.

DeNisi, A., & Kluger, A. (2000). Feedback effectiveness: can 360-degree feedback appraisals be improved? *Academy of Management Executive, 14*(1), 129–39. doi:10.5465/AME.2000.2909845

Edward, J. S. (2013). Factors affecting training transfer in supervisors and hourly employees in a manufacturing organisation (PhD Theses, Southern Cross University NSW, Australia. Retrieved from http://epubs.scu.edu.au/theses/326/

Enos, M. D., Kehrhahn, M. T., & Bell, A. (2003). Informal Learning and the Transfer of Learning: How Managers Develop Proficiency. *Human resource development quarterly, 4*(4), 369-387. doi:10.1002/hrdq.1074

Eschleman, K. J., & LaHuis, D. (2014). Advancing occupational stress and health research and interventions using latent difference score modeling. *International Journal of Stress Management, 21*(1), 112-136. doi:10.1037/a0033099

Ferdinandi, V. M. (1995). An analysis of transfer of training in a business setting. *Dissertation Abstracts International, 56*(09), 3481A.

Ferrer, E., & McArdle, J. J. (2010). Longitudinal modeling of developmental changes in psychological research. *Current Directions in Psychological Science, 19(3),* 149-154.

Field, A. (2009). *Discovering statistics using SPSS (pp. 1-856)*. London: Sage. ISBN: 9781847879073

Ford, J. K., & Weissbein, D. A. (1997). Transfer of training: an updated review and analysis. *Performance Improvement Quarterly, 10(2)*, 22-41. *doi*:10.1111/j.1937-8327.1997.tb00047.x

Ford, J. K., Quinones, M., Sego, D., & Sorra, J. (1992). Factors affecting the opportunity to perform trained tasks on the job. *Personnel Psychology*, 45, 511-27.

Fourarge, D., De Grip, A., & Nelen, A. (2009). *Leren en werken [Learn and work]*. Researchcentrum voor Onderwijs en Arbeidsmarkt. ISBN: 978-90-5321-474-9.

Fransen, J. (2006). Blended Learning. *1-6.* Retrieved from www.scienceguide.nl*/pdf/20060704.pdf*

Gaudine, A. P., & Saks, A. M. (2004). A longitudinal quasi-experiment on the effects of post training transfer interventions. *Human Resource Development Quarterly*, *15*(1), 57–76.

Geijsel, F. P., Sleegers, J. C., Stoel, R. D., & Krüger, M. L. (2009). The Effect of Teacher Psychological and School Organisational and Leadership Factors on Teachers' Professional Learning in Dutch Schools. *The Elementary School Journal, 109* (4), 406-427. doi:10.1086/593940

Georgenson, D. L. (1982). The problem of transfer calls for partnership. *Training and Development Journal, 6*(10), 75-78.

Gielen, E. W. M. (1995). *Transfer of training binnen bedrijfsopleidingen (dissertatie) [Transfer van training in a corporate setting (dissertation)].* Enschede: Universiteit Twente.

Gilpin-Jackson, Y., & Bushe, G. R. (2007). Leadership development training transfer: a case study of post-training determinants. *Journal of Management Development, 6* (10), 980 - 1004. doi:10.1108/02621710710833423

Grossman, R., & Salas, E. (2011). The transfer of training: what really matters. *International Journal of Training and Development 15*(2), ISSN 1360-3736. 103-120.

Holton, E. F. (1996). The Flawed Four-Level Evaluation Model. *Human Resource Development Quarterly, 7*(1), 5-21. doi:10.1002/hrdq.3920070103

Holton, E. F. (2004). Holton's Evaluation Model: New Evidence and Construct Elaborations. *Advances in Developing Human Resource, 7*(1), 37-54. doi:10.1177/1523422304272080

Holton, E. F., Bates, R., & Ruona, W. E. A. (2000). Development of a generalized learning transfer system inventory. *Human Resource Development Quarterly, 11*(4), 333–360.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55. doi:10.1080/10705519909540118

Huczynski, A. & Lewis, J. (1980). An empirical study into the learning transfer process in management training. *Journal of Management Studies, 17*, 227-40. doi:10.1111/j.1467-6486.1980.tb00086.x

Kenny, D. A. (6 October, 2014). *Measuring Model Fit* . Retrieved on 12 January 2014 on http://davidakenny.net/cm/fit.htm

Kessels, J. W. M. (2001). *Verleiden tot kennisproductiviteit [Tempted to knowledge productivity].* Rede. Universiteit Twente. 1-26. Retrieved from kessels-smits.com

Kines, P., Lappalainen, J., Mikkelsen, K. L., Olsen, E., Pousette, A., Tharaidsen, J., Tómasson, K., & Törner, M. (2011). Nordic Safety Climate Questionnaire (NOSACQ-50): A new tool for diagnosing occupational safety climate. *International Journal of Industrial Ergonomics, 41*(6). 634-646. doi:10.1016/j.ergon.2011.08.004.

Kontoghiorghes, C. (2001). Factors affecting training effectiveness in the context of the introduction of new technology—a US case study. *International Journal of Training and Development*. ISSN 1360-3736. 248-260.

Leahy, B. (2002). *The transfer of learning process: From outdoor, adventure-based programs to the practice setting*. Unpublished doctoral dissertation. The University of Georgia, Atens, GA.

Leana, C. R., & Van Buren, H. J. (1999). Organizational Social Capital and Employment Practices. *Academy of Management Review.* 24(3), 538-55. doi:10.5 465/AMR.1999.2202136

Likert, R. (1932). A Technique for the Measurement of Attitudes. *Archives of Psychologoly, 140*, 1-55.

Lim, D. H. (2000). Training design factors influencing transfer of training to the workplace within an international context. *Journal of Vocational Education and Training, 52* (2), 243–257.

Lim, D. H. & Johnson, S. D. (2002). Trainee perceptions of factors that influence learning transfer. *International Journal of Training and Development, 6*(1), ISSN 1360-3736. 36-48.

McArdle, J. J. (2009). Latent Variable Modeling of Differences and Changes with Longitudinal Data. *Annual Review of Psychology, 60*, 577–605. doi:10.1146/annurev.psych.60.110707.163612

McArdle, J. J., & Prindle, J. J. (2008). A latent change score analysis of a randomized clinical trial in reasoning training. *Psychology and Aging, 23(4),* 702.

Meers, K. A. (1997). Contextual barriers to transfer of training [Abstract]. *Dissertation Abstracts International, 59*(01), 54A.

Merriam, S. B., & Leahy, B. (2005). Learning Transfer: A review of the research in adult education and training. *PAACE Journal of Lifelong Learning, 14,* 1-24.

(Mindtools, 2014). Kirkpatrick's Four-Level Training Evaluation Model. Retrieved from http://www.mindtools.com/pages/article/kirkpatrick.htm

Minnet, A. M. (2003). Collaboration and shared reflections in the classroom. *Teachers and Teaching: Theory and Practice*, *9* (3), 279-285. doi:10.1080/13540600309382

Michaels, E., Handfield-Jones, H., & Axelrod, B. (2001). *The war for talent*. Boston: Harvard Business School Press.

Montesino, M. U. (1995). A study of support for transfer and the alignment of the training with the strategic direction of the organization. *Dissertation Abstracts International, 56(05),* 1632A.

Muthén, L. K., & Muthén, B. O. (1998-2012). *Mplus User's Guide. Seventh Edition*. Los Angeles, CA: Muthén & Muthén.

Nahapiet, J., & Ghoshal, S. (1998). Social Capital. Intellectual Capital, and the Organizational Advantage. *Academy of Management Review, 23*(2), 242-66.

Nijman, D. J. M. (2004). *Supporting Transfer of Training: Effects of the Supervisor* (Proefschrift, Universiteit Twente, Nederland). ISBN 90-365-2120-3. 1-269.

Nesselroade, J. R., & Baltes, P. B. (1979). *Longitudinal Research in the Study of Behavior and Development*. New York: Academic.

Noe, R. A., Colquitt. J. A., Simmering, M. J., & Alvarez, S. A. (2003). 'Knowledge Management; Developing Intellectual and Social Capital'. In Jackson, S. E. Hitt, M. A. and Denisi, A. S. (eds). *Managing Knowledge for Sustained Competitive Advantage.* San Francisco, CA: Jossey-Bass.

Oliver, M. & Trigwell, K. (2005). Can 'Blended Learning' Be Redeemed? *E-Learning and Digital Media, 2*(1), 17-26. Retrieved from http://dx.doi.org/10.2304/elea.2005.2.1.17

Oort, F. J., Visser, M. R. M., & Sprangers, A. G. (2009). Formal definitions of measurement bias and explanation bias clarify measurement and conceptual perspectives on response shift. *Journal of Clinical Epidemiology, 62*, 1126-1137.

Percival, J. C., Cozzarin, B. P., & Formaneck, S. D. (2013). Return on investment for workplace training: the Canadian experience. *International Journal of Training and Development, 17*(1), 20–32. doi:10.1111/ijtd.12002

Pham, N. T. P., Segers, M. S. R., & Gijselaers, W. H. (2012). Effects of work environment on transfer of training: empirical evidence from Master of Business Administration programs in Vietnam. *International Journal of Training and Development, 17*(1), 1-19. doi:10.1111/j.1468-2419.2012.00417.x

Phillips, J. J., & R. D. Stone (2002). *How to measure training results. A practical guide to tracking the six key indicators.* New York: McGraw-Hill.

Pidd, K. (2004). The impact of workplace support and identity on training transfer: a case study of drug and alcohol safety training in Australia. *International Journal of Training and Development, 8*(4), ISSN 1360-3736. 274-288.

Rajee, P., Madan, M. S., & Jayarajam, K. (2009). Revisiting Kirkpatrick's model –an evaluation of an academic training course. *Current Science, 9*(2), 272-276.

Rietdijk, M. M. (2009). *Organisaties conditioneren: De invloed van beloning en straf op werkprestaties [Organisations conditioning the influence of reward and punishment on work performance]* (Proefschrift, Vrije Universiteit, Nederland). ISBN 97890-8659-355-2. 1-335.

Rouiller, J. Z., & Goldstein, I. L. (1993). The relationship between organisational transfer climate and positive transfer of training. *Human Resource Development Quarterly, 4*(4), 377-390. doi:10.1002/hrdq.3920040408

Runhaar, P. R. (2008). *Promoting Teachers' Professional Development* (Doctoral dissertation, Universiteit Twente, Nederland). Retrieved from http://doc.utwente.nl/60129/1/the-sis_Runhaar,_P.pdf

Russ-Eft, D. (2002). A Typology of Training Design and Work Environment Factors Affecting Workplace Learning and Transfer. *Human Resource Development Review, 1*(1), 45-65. doi:10.1177/1534484302011003

Saks, A. M. (2002). So what is a good transfer of training estimate? A reply to Fitzpatrick. *The Industrial-Organizational Psychologist*, *39*, 29–30.

Saks, A. M., & Belcourt, M. (2006). An investigation of training activities and transfer of training in organisations. *Human Resource Management, 45*(4), 629-648. doi:10.1002/hrm.20135

Sbarra, D. A., & Allen, J. J. B. (2009). Decomposing depression: On the prospective and reciprocal dynamics of mood and sleep disturbances. J*ournal of Abnormal Psychology, Vol 118*(1), 171-182. doi:10.1037/a0014375

Schoonmaakbedrijf (2013). Interne training veilig werken. [Internal training Workplace Safety]. Retrieved from https://mijnleerhuis.asito.nl/auth/saml/login.php

SER (2002). *Het nieuwe leren. Advies over een leven lang leren in de kenniseconomie* [*The new learning. Advice about livelong learning in a knowledge economy]*, Advies 02-10, Den Haag.

Seyler, D. L., Holton, E. F. III, Bates, R. A., Burnett, M. F., & Carvalho, M. A. (1998). Factors Affecting Motivation to Transfer Training, *International Journal of Training and Development*, 2(1), 2–16. doi:10.1111/1468-2419.00031

Schmidt, R. A. (1991). 'Frequent Augmented Feedback Can Degrade Learning: Evidence and Interpretations', in G. E. Stelmach and J. Requin (Eds). *Tutorials in Motor Neuroscience* (Dordrecht: Kluwer Academic). pp. 59–75.

Smither, J. W., London, M., & Reilly, R. R. (2005). Does performance improve following multisource feedback? A theoretical model, meta-analysis, and review of empirical findings. *Personnel Psychology, 58*(1), 33–66. doi:10.1111/j.1744-6570.2005.514_1.x

Spillane, J. P., Kim, C. M., & Frank, K. A. (2012). Instructional Advice and Information Providing and Receiving Behavior in Elementary Schools: Exploring Tie Formation as a Building Block in Social Capital Development. *American Education Research Association*, *29*(6), 4445-4478. doi:10.3102/0002831212459339

Spitzer, D. R. (1986). Improving individual performance. Englewood Cliffs, NJ: Educatinal Technology Publication. 1-144.

Tanriseven, M. & Veldhuizen, E. (2012). Kennisinvesteringen bedrijfsleven niet toegenomen [Knowledge investment in business has not increased]. Webmagazine, thursday 1th of March 2012. Retrieved from http://www.cbs.nl/nlNL/menu/themas/macroeconomie/publicaties-/artikelen/archief/2012/2012-3573-wm.htm

Tracey, J. B., Tannenbaum, S. I., & Kavanagh, M. J. (1995). Applying trained skills on the job: The importance of the work environment. *Journal of Applied Psychology, 80*(2), 239-252. doi:10.1037/0021-9010.80.2.239

Van den Bossche, P., Segers, M., & Jansen, N. (2010). Transfer of training: the role of feedback in supportive social networks. *International Journal of Training and Development, 14*(2). 81-94. doi:10.1111/j.1468-2419.2010.00343.x

Van Staa, A. L., & Evers, J. (2010). 'Thick analysis': strategie om de kwaliteit van kwalitatieve data-analyse te verhogen. *KWALON. Tijdschrift voor Kwalitatief Onderzoek in Nederland*, *43*(1), 5–12. Retrieved from http://hdl.handle.net/1765/23133

Van Woerkom, M. (2003). *Critical reflection at work: Bridging individual and organisational learning.* Unpublished doctoral dissertation, University of Twente, Nederland.

Van Woerkom, M. (2004). The concept of critical reflection and its implications for human resource development. *Advances in Developing Human Resources*, *6*(2), 178-192. doi:10.1177/1523422304263328

Volet, S. (2013). Extending, broadening and rethinking existing research on transfer of training. *Educational Research Review, 8*, 90-95. doi:10.1016/j.edurev.2012.11.005

Vragenlijst: Veiligheidsklimaat op de werkvloer [Questionnaire: Safety climate on the workplace]. (2012). Retrieved from http://www.arbejdsmiljoforskning.dk/~/me-

dia/Spoerges-kemaer/Nosacq-50/Language-versions/NOSACQ-50---Belgian-Dutch-2012.pdf

Watkins, K. E., & Marsick, V. J. (Eds.). (2003). Make learning count! Diagnosing the learning culture in organisations. *Advances in Developing Human Resources, 5*(2). ISBN:9780761930051

Weisweiller, S., Nikitopoulos, A., Netzel, J., & Frey, D. (2013). Gaining insight to transfer of training through the lens of social psychology. *Educational Research Review, 8*, 14-27. doi:10.1016/j.edurev.2012.05.006

Appendix A - Personal descriptions

Education level		
	Frequency	Percent
Secondary Vocational Education	42	70,0
Higher Vocational Education	18	30,0
Total	60	100,0

Region		
	Frequency	Percent
Region 1	8	13,3
Region 2	8	13,3
Region 3	13	21,7
Region 4	4	6,7
Region 5	9	15,0
Region 6	9	15,0
Region 7	3	5,0
Region 8	5	8,3
Region 9	1	1,7
Total	60	100,0

Age		
	Frequency	Percent
18-25	5	8,3
26-34	10	16,7
35-44	14	23,3
45-54	20	33,3
55-64	11	18,3
Total	60	100,0

Gender		
	Frequency	Percent
Woman	37	61,7
Man	23	38,3
Total	60	100,0

Appendix B - Scales

Scales	Residual variances			Factor loads	Reference
	T1	T2	T3		
Working Safety within the cleaning agency					
I know what the cleaning agency means by working safety.	-	-	-	-	based on the learning aims of the training
I tell my cleaning staff that they can't work by unsafe situations.	-	-	-	-	"Vragenlijst: Veiligheidsklimaat" (2012)
I give new cleaning staff safety instructions. These safety instructions are about working safety with cleaning products, safety risks and personal protective equipment.	-	-	-	-	"Vragenlijst: Veiligheidsklimaat" (2012)
Safety Data Sheets in my objects are up to date.	1.238	-	-	1.000	"Vragenlijst: Veiligheidsklimaat" (2012)
I know that I have to inspect all electric machines, stairs and ladders periodically and I do that. I keep my inspection up to date.	1.258	-	-	1.065	"Vragenlijst: Veiligheidsklimaat" (2012)
I explain the Last Minute Risk Analysis (LMRA) to my cleaning staff and control them doing it.	1.138	-	-	0.958	"Vragenlijst: Veiligheidsklimaat" (2012)
If there is a meeting/consultation on security, I involve my staff in this activity.	1.551	-	-	1.226	based on the learning aims of the training
I execute the procedures for internal and external inspections of work equipment and I know who is responsible.	-	-	-	-	based on the learning aims of the training
Working Safety outside the agency					
When implementing the Risk Inventory and Evaluation (RI&E) and plan of action I know what I must look out for.	-	-	-	-	"Vragenlijst: Veiligheidsklimaat" (2012)
I check whether the RI&E are expired and make a new RI&E every four years.	2.113	0.857	1.176	1.000	"Vragenlijst: Veiligheidsklimaat" (2012)
I know the content of the VCA (Safety, health and environment checklist for contractors).	-	-	-	-	"Vragenlijst: Veiligheidsklimaat" (2012)
I know the content of VCA-VOL (Safety for operational managers).	2.006	1.210	1.344	.848	"Vragenlijst: Veiligheidsklimaat" (2012)

If I am going to use other resources or machines in my building, I will adjust the RI&E and the plan of action.	-	-	-	-	"Vragenlijst: Veiligheidsklimaat" (2012)
If there RI&E is created or adapted, I will discuss this with my staff.	1.257	0.727	0.493	1.030	based on the learning aims of the training
Workplace Safety in the workplace					
I make sure that the workplaces are safe for the cleaning staff.	-	-	-	-	based on the learning aims of the training
Where possible I will remove the source of danger, protect every member of staff from the danger, shielding the danger from individual cleaning staff and otherwise use personal protective equipment.	-	-	-	-	based on the learning aims of the training
When something is wrong with safety, my cleaning staff and I know what to do.	-	-	-	-	based on the learning aims of the training
If there has been a dangerous situation or an accident in my building, I will report this to head office.	-	-	-	-	based on the learning aims of the training
Feedback from colleagues					
I ask my colleagues for feedback.	.610	.566	.334	1.000	Van Woerkom (2004)
When I do my job incorrectly, I discuss this with my colleagues.	1.060	.839	.616	.925	Van Woerkom (2004)
I receive feedback about my performance from more than three different people.	1.450	1.206	.990	1.299	Smither et al. (2005)
The feedback I received from my colleagues is helpful.	-	-	-	-	Edward (2013)
Support from colleagues					
My colleagues stimulate me to reflect on my own performance.	.222	-	-	1.000	Geijsel et al. (2009)
My colleagues encourage me to experiment with new learned knowledge and skills.	-	-	-	-	Geijsel et al. (2009)
I feel that my colleagues stimulate me to apply new skills and knowledge during my work.	.112	-	-	1.055	Cromwell & Kolb (2004); Baldwin & Ford (1988)
My colleagues encourage my to try new things in line with their own interests	.173	-	-	1.026	Geijsel et al. (2009)
Involvement supervisor					
My supervisor asks about the learning goals of training I attended. [a]	1.155	-	-	1.000	Grossman & Salas (2011)
If I don't apply my new learned knowledge and skills, my supervisor will ask me for a meeting.	1.051	-	-	.726	Rouiller & Goldstein (1993); Rietdijk (2009)

When my performance is improving based on training I will receive a reward or compliment.	1.478	-	-	.887	Rouiller & Goldstein (1993); Rietdijk (2009)
Exchange information with colleagues					
I regularly talk with my colleagues about training content.	.589	-	-	1.000	Hawley & Barnard (2005)
My colleagues and I discuss the learning goals of the training.	.009	-	-	1.434	Colquitt, LePine, & Noe (2000)
I regularly share meaningful information with my colleagues.	.631	-	-	1.383	Grossman & Salas (2011)
Opportunities to experiment					
My supervisor asks about the learning goals of training I attended. [a]	1.531	-	-	1.000	Grossman & Salas (2011)
I feel that my supervisor stimulates me to apply new skills and knowledge during my work.	.262	-	-	1.039	Cromwell & Kolb (2004); Baldwin & Ford (1988)
My supervisor encourages me to experiment with new learned knowledge and skills.	.162	-	-	1.025	Geijsel et al. (2009)
My supervisor encourages employees to try new things in line with their own interests.	.497	-	-	0.960	Geijsel et al. (2009)
Experiment					
During my daily work, I experiment with new learned knowledge and skills.	.549	-	-	1.000	Geijsel et al. (2009); Runhaar (2008)
I come with creative solutions for problems.	.121	-	-	1.131	De Jong & Den Hartog (2010)
I show creativity in my work when I have the opportunity.	.097	-	-	.917	De Jong & Den Hartog (2010)
Time and resources					
I feel that there is time to apply new learned knowledge and skills.	-	-	-	-	Clarke (2002) Gilpin-Jackson & Bushe (2007); Cromwell & Kolb (2004)
I feel that my work pressure is high. [b]	-	-	-	-	Clarke (2002)
I feel that that there are sufficient resources to apply new knowledge and skills.	-	-	-	-	Russ-Eft (2002); Rouiller & Goldstein (1993); Tracey et al. (1995)

Note. T1 = measure occasion 1, T2 = measure occasion 2, T3 = measure occasion 3

- indicates no valid values of factor loading and residual variance.

[a] two of the same items, fit both scales

[b] item is recoded.

Values presented at the residual variance indicate invariance at T1, T2 en T3 (set equal on T1, T2 and T3), when the residual variance is only presented at T1, the factor loading from T1 is presented. Cronbach's alpha's for the factor loadings: Working safety within the cleaning company at: t1 = .696; Working safety by

the client at: t1 = .739; t2 = .858; t3 = .797; Feedback from colleagues at: t1 = .807; t2 = .850; t3= .821; Support from colleagues at: t1 = .972; Exchange information with colleagues at: t1 = .883; Opportunities to experiment at: t1 = .874; Experiment at: t1 = .804

Appendix C - Mplus

Mplus code model feedback (stimulation) and safe

```
Data:
FILE = D:\_Doc\Data\Data LDS Mplus.csv;

Variable:
NAMES ARE
PPnr1 Team1 ! person and group membership identity (first and second level identity)
working safety
SafeA11 SafeA21 SafeA31 safeA41 safeA51 safeA61
safeO11 safeO21 safeO31 safeO41 safeO51 safeO61
safeV11 safeV21 safeV31 safeV41 safeV51 safeV61
work environment1
CFC11 CFC21 CFC31 CFC41
CFS11 CFS21 CFS31
CCON11 CCON21 CCON31 CCON41
CAU11 CAU21 CAU31 CAU41
STLV11 STLV21 STLV31
STLS11 STLS21 STLS31
SCC11 SCC21 SCC31
SCST11 SCST21 SCST31 SCST41
SCIN11 SCIN21 SCIN31
OPEX11 OPEX21 OPEX31
OPGO11 OPGO21 OPGO31
OPTM11 OPTM21 OPTM31
control variables
Gen1
Age1
Edu1
working safety 2
SafeA12 SafeA22 SafeA32 safeA42 safeA52 safeA62
safeO12 safeO22 safeO32 safeO42 safeO52 safeO62
safeV12 safeV22 safeV32 safeV42 safeV52 safeV62
work environoment2
CFC12 CFC22 CFC32 CFC42
CFS12 CFS22 CFS32
CCON12 CCON22 CCON32 CCON42
CAU12 CAU22 CAU32 CAU42
STLV12 STLV22 STLV32
STLS12 STLS22 STLS32
SCC12 SCC22 SCC32
SCST12 SCST22 SCST32 SCST42
SCIN12 SCIN22 SCIN32
OPEX12 OPEX22 OPEX32
OPGO12 OPGO22 OPGO32
OPTM12 OPTM22 OPTM32
working safety 3
```

```
SafeA13 SafeA23 SafeA33 safeA43 safeA53 safeA63
safeO13 safeO23 safeO33 safeO43 safeO53 safeO63
safeV13 safeV23 safeV33 safeV43 safeV53 safeV63
work enviromet3
CFC13 CFC23 CFC33 CFC43
CFS13 CFS23 CFS33
CCON13 CCON23 CCON33 CCON43
CAU13 CAU23 CAU33 CAU43
STLV13 STLV23 STLV33
STLS13 STLS23 STLS33
SCC13 SCC23 SCC33
SCST13 SCST23 SCST33 SCST43
SCIN13 SCIN23 SCIN33
OPEX13 OPEX23 OPEX33
OPGO13 OPGO23 OPGO33
OPTM13 OPTM23 OPTM33
;

MISSING ARE ALL ( 9999 ) ;

!USEOBSERVATIONS ARE RESP1 EQ 1 ; ! use control condition only
!USEOBSERVATIONS ARE RESP1 EQ 2 ; ! use training condition only
grouping = resp1 ( 1 = control, 2 = training) ;

USEVARIABLES
safe1 safe2 safe3
stim1 stim2 stim3
;

Define:
safe1 = mean (safeO21 safeO41 safeO61);
safe2 = mean (safeO22 safeO42 safeO62);
safe3 = mean (safeO23 safeO43 safeO63);
stim1 = mean (CFC21 CFC31 CFC41);
stim2 = mean (CFC22 CFC32 CFC42);
stim3 = mean (CFC23 CFC33 CFC43);

!------------------------------------------------------------------------------
Model:
!fixed model
safe2 @0;
[safe2 @0];
safe3 @0;
[safe3 @0];
safe2 ON safe1 @1;
safe3 ON safe2 @1;
dsafe2 BY safe2 @1 ;
dsafe3 BY safe3 @1 ;
dsafe2 WITH dsafe3 @0;
```

```
safe1 WITH dsafe2 @0;
safe1 WITH dsafe3 @0;
!variances:
safe1 (vsafe1);
!means:
[safe1] (msafe1);

!correction of work environment, stim = feedback from colleagues:
safe1 WITH stim1 (rstim1);

!-------------------------------------------------------------------------------
stim2 @0;
[stim2 @0];
stim3 @0;
[stim3 @0];
stim2 ON stim1 @1;
stim3 ON stim2 @1;
dstim2 BY stim2 @1 ;
dstim3 BY stim3 @1 ;
stim1 WITH dstim2 @0;
stim1 WITH dstim3 @0;
dstim2 WITH dstim3 @0;
stim1 (vstim1);
[stim1] (mstim1);

safe1 WITH stim1 @0;
!safe1 WITH stim2 @0;
!safe1 WITH stim3 @0;
safe1 WITH dstim2 @0;
safe1 WITH dstim3 @0;
dsafe2 WITH stim1 @0;
!dsafe2 WITH stim2 @0;
!dsafe2 WITH stim3 @0;
dsafe2 WITH dstim2 @0;
dsafe2 WITH dstim3 @0;
dsafe3 WITH stim1 @0;
!dsafe3 WITH stim2 @0;
!dsafe3 WITH stim3 @0;
dsafe3 WITH dstim2 @0;
dsafe3 WITH dstim3 @0;

!-------------------------------------------------------------------------------
!-------------------------------------------------------------------------------
Model Control:
!autoregression:
dsafe2 ON safe1 (bsafe1c);
dsafe3 ON safe2 (bsafe2c);
!variances:
dsafe2 (vdsafe2c);
```

```
dsafe3 (vdsafe3c);
!means:
[dsafe2] (mdsafe2c);
[dsafe3] (mdsafe3c);

!----------------------------------------------------------------------------
dstim2 ON stim1 (bstim1c);
dstim2 (vdstim2c);
[dstim2] (mdstim2c);
dstim3 ON stim2 (bstim2c);
dstim3 (vdstim3c);
[dstim3] (mdstim3c);

!----------------------------------------------------------------------------
!effect of work environment:
dsafe2 ON stim1 (gst1ds2c);
dsafe3 ON stim2 (gst1ds3c);

dstim2 ON safe1 (gsa1ds2c);
dstim3 ON safe2 (gsa1ds3c);

!----------------------------------------------------------------------------
!----------------------------------------------------------------------------
Model Training:
!autoregression:
dsafe2 ON safe1 (bsafe1t);
dsafe3 ON safe2 (bsafe2t);
!variances:
dsafe2 (vdsafe2t);
dsafe3 (vdsafe3t);
!means:
[dsafe2] (mdsafe2t);
[dsafe3] (mdsafe3t);

!----------------------------------------------------------------------------
dstim2 ON stim1 (bstim1t);
dstim2 (vdstim2t);
[dstim2] (mdstim2t);
dstim3 ON stim2 (bstim2t);
dstim3 (vdstim3t);
[dstim3] (mdstim3t);

!----------------------------------------------------------------------------
!effect of work environment:
dsafe2 ON stim1 (gst1ds2t);
dsafe3 ON stim2 (gst1ds3t);

dstim2 ON safe1 (gsa1ds2t);
dstim3 ON safe2 (gsa1ds3t);
```

```
!-------------------------------------------------------------------------------
Model Constraint:
NEW (mean2t) ;
mean2t = msafe1 + msafe1*bsafe1t + mdsafe2t ;
NEW (mean3t) ;
mean3t = mean2t + mean2t*bsafe2t + mdsafe3t ;
NEW (mean2c) ;
mean2c = msafe1 + msafe1*bsafe1c + mdsafe2c ;
NEW (mean3c) ;
mean3c = mean2c + mean2c*bsafe2c + mdsafe3c ;

!does working safety increase after training?:
NEW (t12diff);
t12diff = mean2t - msafe1;
!does training have an effect?:
NEW (ct2diff) ;
ct2diff = mean2t - mean2c ;
!is there maintenance (no sign decline)?:
NEW (t23diff) ;
t23diff = mean3t - mean2t ;
!does control increase?:
NEW (c23diff) ;
c23diff = mean3c - mean2c ;
!does control catch up with training?:
NEW (ct3diff) ;
ct3diff = mean3t - mean3c ;

!-------------------------------------------------------------------------------
Output:
!standardized ( stdyx ) ;
savedata:
file IS safestimout.csv ;
save = fscores ; !the factor scores make estimated values possible and can be used in formula (1)
```