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## RESEARCH ARTICLE OPEN ACCESS

# Strengthening Trainers' Transfer Knowledge: An Intervention Study

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## ABSTRACT

Although continuous vocational education and training (CVET) trainers are relevant stakeholders who can initiate and support transfer, they have received little attention in the context of transfer research, especially with respect to their transfer knowledge. In this study, we investigated the extent to which the transfer knowledge of CVET trainers can be increased through an intervention. Based on our conceptualization of transfer knowledge, which is a three-dimensional construct that includes knowledge about learner characteristics, training design and the work environment, we implemented a 5-week digital training programme (intervention) for CVET trainers. We employed a nonrandomized pretest–posttest design to investigate  $N = 81$  trainers and examined the effects of the training programme on trainers' transfer knowledge. While 47 trainers participated in the training programme (experimental group), 34 trainers were included in the control group and received no intervention. As hypothesized, we found a significant interaction effect on the development of trainers' transfer knowledge ( $\eta_p^2 = 0.386$ ). Furthermore, we found significant interaction effects pertaining to all three dimensions of transfer knowledge: learner characteristics ( $\eta_p^2 = 0.196$ ), training design ( $\eta_p^2 = 0.246$ ) and the work environment ( $\eta_p^2 = 0.279$ ). Thus, the experimental group exhibited a significant increase in transfer knowledge. No such development was observed among the control group during the intervention period. Hence, the findings of this research provide initial indications that transfer knowledge is learnable and can be increased through an intervention. Further studies are necessary to evaluate whether trainers also transfer training content to their own training courses.

## 1 | Introduction

In the contemporary fast-paced work environment, an organization's success is largely dependent on the speed with which employees can acquire and transfer new knowledge and skills (Baldwin et al. 2017). To remain competitive in the labour market, working professionals must rely on continuous professional development (Quesada-Pallarès et al. 2022), which can be achieved through continuous vocational education and

training (CVET, Lischewski et al. 2020). To promote lifelong learning, individuals and organizations engage in CVET to acquire the knowledge, skills or attitudes necessary to overcome current or future professional challenges (Cerasoli et al. 2018). One important goal of such training measures is transfer, which means that learners apply what they have learned in a successful and sustainable way in the workplace (Baldwin and Ford 1988). Both practitioners and scholars have agreed that transfer must be promoted in the context of training;

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accordingly, this topic requires additional detailed investigation (Baldwin et al. 2017; Wisshak and Hochholdinger 2018).

Transfer research has typically distinguished among the three input factors identified by Baldwin and Ford (1988), which directly or indirectly impact the transfer of training: *learner characteristics, training design and the work environment*. These input factors have been extensively studied for many years through meta-analyses, original empirical studies and literature reviews, which have aimed to identify the determinants and factors that influence transfer (Wisshak 2022). However, to further enhance comprehension of transfer processes, Baldwin et al. (2017, 18) proposed a ‘new agenda for transfer research’. This agenda emphasizes the importance of taking into account relevant stakeholders in the transfer process, including trainers. Trainers are the individuals who plan and organize training sessions for adult learners (Wisshak and Hochholdinger 2018). Studies have indicated that trainers can influence transfer success among learners (e.g., Creon and Schermuly 2022; P. Donovan and Darcy 2011; Russ-Eft et al. 2010). Broad and Newstrom (1992) even suggested that trainers play the role of the ‘manager of transfer of training’ (p. 30). This paper builds on the premise that trainers need appropriate professional knowledge to promote transfer in the context of CVET.

The purpose of this study was to investigate the effect of a training programme (intervention) for CVET trainers on their transfer knowledge. Therefore, this paper addresses the following question: To what extent can the transfer knowledge of CVET trainers be increased through this intervention? To answer this question, we first characterize CVET trainers. We then elaborate on the theoretical and empirical considerations pertaining to our conceptualization of transfer knowledge, and we present and discuss the results of a quasi-experimental field study that involved  $N = 81$  trainers.

## 2 | CVET Trainers

Effective CVET can offer competitive advantages to organizations (Yoo et al. 2021), especially in economically uncertain times (Kim and Ployhart 2014). On the other hand, poor training quality can not only cause economic damage but also cost lives in the worst cases, such as in the health, transportation or military sectors (Kopp 2006; Salas et al. 2012).

Scholars have suggested that trainers can promote transfer before, during and after training (Burke and Hutchins 2008) and that they should be held accountable for the success or failure of such training (Burke and Saks 2009; Kopp 2006).

In various survey studies, practitioners have emphasized trainers’ relevance to the question of training effectiveness. A survey study conducted by Brotherton and Evans (2010) in the United Kingdom suggested that companies that delegate their CVET to external training providers expect trainers to be professional and knowledgeable; they also expect learners’ work performance to improve after training (i.e., they expect transfer to occur). The 65 respondents in that research rated these aspects as more important than, for example, the price of the

training or the certificates received by the trainees. Burke and Hutchins (2008) asked training practitioners in the United States about best practices regarding the transfer of training. The responses of 92 practitioners were analysed qualitatively, and the transfer-promoting categories thus identified included the trainers’ characteristics, particularly their knowledge of the subject matter, professional experience and knowledge of teaching principles (such as adult learning strategies). Burke and Hutchins (2008) therefore included trainer characteristics in their model of training transfer. Relatedly, in the survey study conducted by P. Donovan and Darcy (2011), 314 human resource development (HRD) practitioners in Ireland identified trainers’ effectiveness as the most important transfer requirement among 21 potential factors. These HRD practitioners even identified trainer effectiveness as more important than the perceived relevance of the training or organizational and peer support—factors that have previously been proven to be key antecedents of transfer in meta-analyses (Blume et al. 2010; Colquitt et al. 2000; Reinhold et al. 2018). However, studies that have emphasized the importance of trainers have mostly been survey studies featuring relatively small sample sizes. To our knowledge, no meta-analyses have investigated trainers’ influence on transfer, which could provide stronger empirical evidence in this regard. Nevertheless, such studies have been conducted in the school context, suggesting that teachers substantially influence student outcomes (Hattie 2009). Furthermore, Wisshak (2022) conducted a systematic literature review that included 19 transfer-related meta-analyses. In her synthesis, she noted that many of the antecedents of transfer identified in the literature can—and should—be promoted by trainers.

Despite their presumably strong influence on training quality and transfer, CVET trainers have rarely been investigated. This research gap might be because trainers are a heterogeneous professional group that is difficult to grasp. In Germany, for example, the title of *trainer* is not legally protected, and access to a career as a CVET trainer is not regulated by the state or chambers (e.g., the German Chamber of Commerce and Industry [DIHK]; Wisshak et al. 2020). This situation distinguishes CVET trainers from trainers in the initial dual VET system, who must pass a standardized examination. CVET trainers must be further distinguished from teachers in the vocational schools included in the VET system, who, in Germany, must complete a state-regulated teacher education degree (Deissinger 2015). However, such contextual factors vary across countries. For example, the roles of CVET trainers and VET trainers may be blurred in countries in which VET is less strictly regulated and more heterogeneous, such as the United Kingdom (Deissinger 2002). For these reasons, among others, CVET trainers are difficult to investigate, particularly with respect to international comparisons.

However, these circumstances should not prevent *the science of training* (Salas and Cannon-Bowers 2001) from focusing on the role and professional knowledge of trainers. Like other scholars, we critique the fact that trainers have been omitted from investigations of transfer (Baldwin et al. 2017; Burke and Hutchins 2008; Burke and Saks 2009; Creon and Schermuly 2022; Glerum et al. 2021; Kopp 2006). Based on previous research that has emphasized the importance of

teachers' and trainers' professional competence with respect to learning outcomes and transfer (Burke and Hutchins 2008; P. Donovan and Darcy 2011; Hattie 2009; Kunter et al. 2013), we further argue that trainers need knowledge about transfer to be able to promote transfer (Hutchins and Burke 2007). In particular, in light of the increasing demand for evidence-based training (Baldwin et al. 2017; Holton 2004), it is important for trainers to possess the necessary professional knowledge about the various determinants that can affect transfer and how trainers themselves can promote this outcome. Previous research has suggested that although trainers, trainees and HRD practitioners believe that trainers need such transfer knowledge (Wisshak and Hochholdingner 2018), trainers rarely incorporate research findings into their everyday work (Hutchins et al. 2010). Hutchins et al. (2010, 606) referred to this situation as the 'research-practice gap', which indicates that evidence-based transfer knowledge does not reach trainers. Our study attempts to investigate and foster trainers' transfer knowledge and to address the gap between research and practice in this context (Hutchins and Burke 2007; Hutchins et al. 2010).

### 3 | Definition and Conceptualization of Trainers' Transfer Knowledge

To explain our conceptualization of transfer knowledge, we must first define transfer in the context of training. For this definition of transfer, we refer to Baldwin and Ford (1988, 63), who defined transfer 'as the degree to which trainees effectively apply the knowledge, skills, and attitudes gained in a training context to the job'. To achieve this goal, learners must generalize what they have learned in the training context to their work and maintain it for a specific period of time (Baldwin and Ford 1988). Based on this definition of transfer, we define transfer knowledge as evidence-based knowledge regarding the determinants and facilitators of transfer (Koch et al. 2022).

Our conceptualization of trainers' transfer knowledge is based on the transfer models developed by Baldwin and Ford (1988) and Burke and Hutchins (2007) as well as the findings of a systematic literature review on how trainers can promote transfer (Koch et al. 2022; Wisshak 2022). First, trainers should possess knowledge of the transfer determinants among the three transfer input factors: *learner characteristics*, *training design* and the *work environment* (Baldwin and Ford 1988). Additionally, they should be familiar with relevant stakeholders in the transfer process, such as peers, trainers, trainees, supervisors and the organization (Burke and Hutchins 2008). Finally, trainers should be aware of the importance of promoting transfer during all phases of training, including before, during and after training (Burke and Hutchins 2008). Accordingly, pronounced transfer knowledge consists of both declarative knowledge about the empirically proven determinants of transfer and procedural knowledge on how to facilitate these determinants through appropriate measures (Koch et al. 2022). For example, declarative knowledge about the transfer of training refers to which aspects of the learners, the training design and the work environment are generally related to transfer, such as the learners' motivation, application

possibilities during training and the support of colleagues. Procedural knowledge about the transfer of training incorporates knowledge on how transfer can be promoted in certain situations. For example, if application situations differ strongly from the learning context (i.e., if far transfer is required), trainers can adopt explorative learning situations during training instead of providing rigid instructions.

With respect to *learner characteristics*, trainers should know that motivation and self-efficacy significantly impact transfer. In transfer research, motivation has been divided into learning motivation and transfer motivation. Learning motivation refers to the learner's desire to acquire training content (Colquitt et al. 2000; Gegenfurtner and Vauras 2012). Research has shown that higher levels of motivation to learn among trainees increase the likelihood of transfer (Colquitt et al. 2000). Transfer motivation refers to the desire to apply knowledge and skills that one has acquired during training in the workplace (Reinhold et al. 2018). To increase motivation, trainers could emphasize the relevance of the training content (Salas et al. 2012). Self-efficacy refers to an individual's belief in their ability to overcome challenges (Bandura 1977). Research has indicated that the more self-efficacy trainees exhibit before and after training, the more likely they are to transfer their skills successfully (Colquitt et al. 2000; Gegenfurtner et al. 2013). To increase self-efficacy, trainers should implement application options and convince learners that transfer is possible (Wisshak 2022).

Since trainers are responsible for planning and implementing training courses, it is important that they are aware of how to promote transfer in the context of *training design* and that they are able to implement appropriate measures. Trainers should be familiar with transfer-promoting training methods, such as *error management training (EMT)* and *behaviour modelling training (BMT)*, as well as their suitability for achieving training objectives. For example, encouraging learners to explore training content and to make errors during training can promote far transfer (Keith and Frese 2008). BMT has been shown to be effective with respect to enhancing communication and collaboration within teams (Taylor et al. 2005). Relatedly, trainers with extensive transfer knowledge are aware of the fact that the incorporation of exercise scenarios drawn from the participants' daily work and the presentation of both positive and negative examples can promote transfer (Taylor et al. 2005). Additionally, such trainers possess knowledge of training design principles that can promote transfer; for example, they offer practice opportunities and provide feedback to trainees (Burke and Hutchins 2007; Lacerenza et al. 2017). Furthermore, trainers should know and emphasize the benefits of providing multiple training sessions rather than a single long session, as research has indicated that the former approach can enhance transfer (J. J. Donovan and Radosevich 1999; Lacerenza et al. 2017). They should also be aware of how to support transfer after training, including through coaching or follow-up measures (Reinhold et al. 2018; Salas et al. 2012). Additionally, trainers should know that instead of evaluating affective reactions, it is more appropriate to focus on assessing the perceived benefits of the training and the actual transfer of skills (Alliger et al. 1997).

Furthermore, trainers with extensive transfer knowledge can provide transfer-related guidance even if they are no longer involved in the transfer process in the context of the *learner's work environment* (Wisshak 2022). However, trainers should not only inform their clients but also incorporate appropriate measures into their training programmes at an early stage. They should know that social support in the learner environment is crucial for successful transfer (Grossman and Salas 2011). As studies have demonstrated that supervisor and peer support are important in the transfer process (e.g., Blume et al. 2010; Colquitt et al. 2000; Reinhold et al. 2018), trainers can encourage supervisors to participate in training or introduce learning tandems during training. They can also encourage peers to provide feedback on transfer attempts after training and to continue supporting each other throughout the application process (Wisshak 2022). Trainers should be aware that applying the content one has learned promptly after training is essential, as it may otherwise be forgotten (Arthur et al. 1998). Organizations should be informed that a positive transfer climate in the learner's workplace is necessary. Learners should be provided with sufficient time and opportunities to apply what they have learned (Blume et al. 2010).

## 4 | Research Question

Previous chapters have highlighted the importance of trainers with respect to the transfer of training and its outcomes. Furthermore, in line with the suggestions of Hutchins and Burke (2007), we argued that to promote transfer, trainers are required to have appropriate transfer knowledge. Against this background, we developed an intervention (training programme) to enhance trainers' transfer knowledge. The objective of this study is to investigate whether trainers' transfer knowledge can be increased through an intervention. Therefore, the following research question is posed: To what extent can the transfer knowledge of CVET trainers be increased through this intervention? We hypothesize that trainers in the experimental group will exhibit greater transfer knowledge at the second measurement (posttest) but that trainers in the control group will not exhibit such an increase.

**Hypothesis 1.** *Trainers who have attended the training programme (experimental group) will exhibit significantly greater transfer knowledge at time T2 (posttest) than at time T1 (pretest). In contrast, transfer knowledge should not change for trainers who have not attended the training programme (control group).*

In addition, we conceptualized transfer knowledge as a three-dimensional construct that includes knowledge about learner characteristics, training design and the work environment (Naumann and Wisshak 2024), which is in line with the transfer model of Baldwin and Ford (1988). As this intervention also addresses these three dimensions in terms of content, we hypothesize that trainers in the experimental group will exhibit significantly greater transfer knowledge at the second measurement time with regard to all three dimensions. No such changes are anticipated for trainers in the control group.

**Hypothesis 2.** *Trainers who have attended the training programme (experimental group) will exhibit significantly greater transfer knowledge at time T2 (posttest) than at time T1 (pretest) with respect to all three dimensions of transfer knowledge. In contrast, transfer knowledge with regard to all three dimensions should not change for trainers who have not attended the training programme (control group).*

## 5 | Methodology

### 5.1 | Research Design

A quasi-experimental field study featuring a pretest–posttest design and experimental and control groups was used to answer the research question. The train-the-trainer programme (intervention) was implemented by a commercial training provider. The authors were responsible for the training content, scientific monitoring and evaluation of the programme. The design of the train-the-trainer programme was developed by both the authors and the training provider. The participants were CVET trainers. Since trainers often work independently and adjust their schedules to meet their client's requirements, we offered the training programme four times. The allocation to the experimental and control groups was nonrandomized. Trainers who enrolled in the training within the first 17 months were assigned to the experimental group, while those who joined the study at a later point were assigned to the control group.

Trainers in the experimental and control groups were recruited via their homepages or via career networks and were asked to participate in the study. The commercial training provider also shared the training programme via their network. Participation in this study was voluntary for both groups. At the beginning of the study, trainers were informed of the research objective and that the training programme would be scientifically monitored and evaluated. The participants subsequently provided their consent to participate in the study and for data processing. The data were collected anonymously via the online platform SoSci Survey (Leiner 2020). To protect the privacy of the participants, they generated their own personal codes to link the pretests with the posttests. After the posttest, the trainers in the control group received access to the online learning materials of the training programme. Thus, they also had the opportunity to strengthen their transfer knowledge through self-study. Additionally, they received the opportunity to win one of 40 Amazon vouchers worth 20 euros each.

Trainers in the experimental group completed the pretest (transfer knowledge test T1) during the first session of the 5-week programme and the posttest (transfer knowledge test T2) during their final training session. Trainers in the control group completed the pretest, and 5 weeks later, the posttest. During this 5-week period, the control group did not receive any learning materials or training pertaining to transfer; however, they were aware of the fact that they would subsequently be asked to complete another questionnaire.



## 5.2 | Sample

To determine the optimal sample size, we conducted an a priori power analysis via G\*Power version 3.1.9.7 (Faul et al. 2007). The expected medium effect size ( $f = 0.25$ ) was derived from meta-analyses examining the effectiveness of training on learning outcomes, which identified a medium effect size (Arthur et al. 2003; Lacerenza et al. 2017). The power analysis for a repeated-measures analysis of variance (ANOVA) (within-between interaction) indicated that a total sample size of  $N = 54$  would be needed, given an error limit of 0.05, a power level of 0.95 and an assessed medium effect size of Cohen's  $f = 0.25$  (Cohen 1988).

The achieved sample consisted of  $N = 81$  ( $n_{EG} = 47$ ;  $n_{CG} = 34$ ) CVET trainers. On average, the trainers in the experimental group (29 females, 18 males) were 45.13 years old ( $SD = 10.59$ ) and had 12.31 years of work experience ( $SD = 8.09$ ). A total of 83% of these trainers held a university degree (e.g., in Economics or Psychology), whereas only 24.4% held a pedagogical degree (e.g., in Educational Science). A total of 55.3% of these trainers had a trainer certificate. On average, these trainers reported providing 52.89 days of training per year ( $SD = 48.71$ ). The majority of participants (85.1%) provided training in Germany.

On average, the 34 trainers in the control group (17 females, 17 males) were 51.41 years old ( $SD = 10.26$ ) and had 18.35 years of work experience ( $SD = 10.25$ ). The majority (91.2%) of these trainers held a university degree, whereas only 15.6% held a pedagogical degree. A total of 91.2% of these trainers held a trainer certificate. On average, these trainers reported providing 64.97 days of training per year ( $SD = 45.24$ ), and the majority of participants (94.1%) provided training primarily in Germany.

## 5.3 | The Train-the-Trainer Programme (Intervention)

The main objective of the web-based training programme was to equip trainers with the evidence-based knowledge and skills necessary to effectively promote the transfer of training. Accordingly, the trainers acquired knowledge about ways of facilitating transfer while receiving the best possible support for their own transfer from the programme to their individual work contexts. The programme lasted for 5 weeks and required approximately 17–20 h to complete (Koch and Wisshak 2024). The intervention consisted of self-study phases, which included application exercises (three 180 min phases) and joint online meetings (five 120 min sessions). The self-study phases were divided into three modules based on the transfer input factors defined in our conceptualization, which is in line with the work of Baldwin and Ford (1988): learner characteristics (module 1), training design (module 2) and the work environment (module 3). The modules were completed on a weekly basis via a learning platform. In each module, trainers learned from brief audio files pertaining to factors that influence

transfer and received practical recommendations for the implementation of this knowledge. To guarantee that the content was directly applicable to trainers' practical work, 3 weekly accompanying tasks were integrated into the programme. These tasks included (1) the optimization of an existing or new training concept by directly integrating transfer-promoting measures, (2) the recording of these measures in a checklist to ensure results and (3) exchange within the learning tandem concerning obstacles to transfer and possible solutions (Koch and Wisshak 2024). Following each self-study phase, the training provider hosted a joint video meeting that involved presentations regarding the current status of the optimized training concept, discussions and feedback from both the training provider and peers. Additionally, a follow-up session was conducted 6 months after the training programme to discuss and assess the trainers' success.

## 5.4 | Instrument

The instruments used for the pretest and posttest were identical, except those items pertaining to demographic information, which was collected only during the pretest. To operationalize transfer knowledge, we developed an instrument featuring 31 test items based on our conceptualization of transfer knowledge (Koch et al. 2022; Naumann and Wisshak 2024). The instrument was scaled based on the item-response-theory (IRT). The initial findings suggested that the instrument was reliable, that the results could be validly interpreted and that the construct of transfer knowledge exhibited a three-dimensional structure, including knowledge about learner characteristics (10 items), knowledge about training design (13 items) and knowledge about the learners' work environment (8 items; Naumann and Wisshak 2024). The instrument exhibited acceptable EAP reliabilities, with values of 0.64 for the dimension of knowledge about learner characteristics, 0.74 for the dimension of knowledge about training design and 0.75 for the dimension of knowledge about learners' work environment. The items pertained to both declarative knowledge of the determinants that can promote transfer and procedural knowledge of the ways in which transfer can be promoted. The instrument contained three item formats, including open questions (3), dichotomous forced-choice items (6) and partial-credit multiple-response items (22). Please see Figure 1 for example items. With respect to the open questions, trainers were asked to name evidence-based strategies that could be used to enhance transfer in light of learner characteristics, training design and work environment. The open questions were coded via qualitative content analysis (Mayring 2015). Therefore, we developed a detailed coding scheme (Koch et al. 2022). When answering the forced-choice items, the trainers were required to choose the option that best answered the question from a set of 4 options. When answering the multiple-choice items, trainers were asked to rate each of 3–7 possible answers to an item as either correct or incorrect. In total, the trainers could receive a maximum test score of 56 points.

(1) OQ: The following questions feature an open format. Here, we want to learn from you which factors have been scientifically proven to influence transfer. Please write your answers to each of the three questions in the blankfield.

**Various individual characteristics and trainee attributes can be relevant to transfer. Please list the most important participant characteristics that have been proven empirically to influence transfer.**

(2) FC: Please tick only one answer option here, namely, the one that best answers the question. The other answers do not necessarily have to be wrong but are less important with regard to the transfer of training. If you do not know the correct answer, please check the „do not know“ box and do not guess.

**After training, learners are expected to transfer the training content they have acquired to various different work situations that may differ significantly from the training situation. How would you proceed?**

- ☐ I allow learners to use video tutorials to acquire the training content.
- ☐ I give step-by-step instructions to the learners.
- ☐ *I let learners explore the new content on their own.*
- ☐ I elaborate the content for the learners by asking specific questions.
- ☐ Do not know

(3) MR: Here, please tick each of the statements based on whether it is true or false. Please note that more than one statement can be correct and that in some cases, all statements can be either incorrect or correct. You also have the option to check the box „do not know“.

**To what extent should you consider the trainees' immediate work colleagues in the company?**

Not at all. Trainees should focus on the newly acquired skills.

- ☐ True
- ☐ False
- ☐ Do not know

*I should encourage the trainees to exchange information about the training contents with their colleagues.*

- ☐ True
- ☐ False
- ☐ Do not know

*I should consider these work colleagues only if they have also participated in the training.*

- ☐ True
- ☐ False
- ☐ Do not know

*I should encourage trainees to seek feedback from their work colleagues concerning the newly acquired skills.*

- ☐ True
- ☐ False
- ☐ Do not know

Work colleagues are less important with regard to the transfer process than the supervisor, so I should only consider them if the trainees do not have a direct supervisor.

- ☐ True
- ☐ False
- ☐ Do not know

**FIGURE 1** | Example items pertaining to the three domains of transfer knowledge distinguishing between declarative and procedural knowledge. *Note:* (1) Open question, dimension learner characteristics, testing declarative knowledge; (2) forced-choice item, dimension training design, testing procedural knowledge; (3) multiple-response item, dimension work environment, testing procedural knowledge. The item stems are formatted in bold. The correct answer options are formatted in italics.

## 5.5 | Data Analysis

We used SPSS software (version 29) to conduct the data analysis. To test both of our hypotheses, we conducted a mixed ANOVA, which combined an analysis of dependent within-subjects factors (repeated-measured variables, i.e., trainers' transfer knowledge at two points in time) with an analysis of independent between-subjects factors (i.e., experimental group vs. control group). This design enabled us to distinguish between group effects (differences between the experimental and control groups), time-related effects (development over time) and interaction effects (time  $\times$  group; Findeisen et al. 2021; Piwovar et al. 2013). The analyses focused on both the overall scale (transfer knowledge) and the three dimensions (learner characteristics, training design and work environment). If the trainers' development of transfer knowledge differed between the experimental group and the control group, such findings would indicate an interaction effect. Levene's test was used to test the assumption of homogeneity of variance. For the work environment dimension at the posttest, the variances were significantly different in the two groups ( $F_{(1, 79)} = 6.11$ ;  $p = 0.016$ ). Given the relatively small differences in the sample sizes, it was anticipated that the ANOVA would be robust. We used partial eta-squared ( $\eta_p^2$ ) as an indicator of effect size (Richardson 2011), which is considered small at 0.01, medium at 0.06 and large at 0.14 (Cohen 1988). The  $\alpha$  level was set at  $p < 0.05$  for all the statistical analyses.

## 6 | Results

Table 1 presents the mean values and standard deviations pertaining to the pretest (T1) and posttest (T2) scores as well as the results of the mixed ANOVA with regard to the three dimensions of transfer knowledge and the test scores obtained by both the experimental and control groups.

The control group initially exhibited a slightly higher level of transfer knowledge with respect to all dimensions as well as overall test scores on the pretest ( $M = 33.03$ ;  $SD = 5.37$ ) than did the experimental group ( $M = 31.43$ ;  $SD = 6.86$ ). On the posttest, the experimental group exhibited notably higher scores on the overall test ( $M = 39.66$ ;  $SD = 6.50$ ) as well as on all three dimensions. The control group obtained nearly equal mean scores on the pretest and posttest with respect to all dimensions and on the overall test ( $M = 32.44$ ;  $SD = 7.22$ ). In the pretest, the overall test scores of both groups ranged from min = 6 points to max = 46 points, and in the posttest, these scores ranged from min = 13 points to max = 50 points. Figure 2 illustrates the test performance over time (pretest to posttest) exhibited by trainers in both groups.

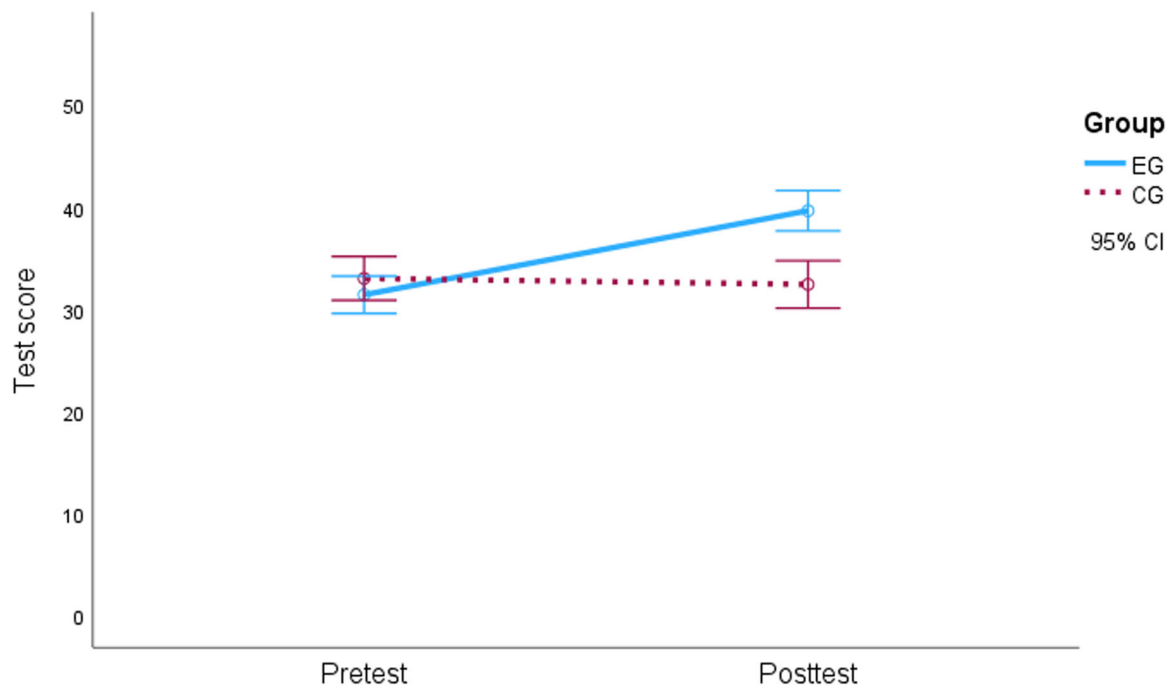
The findings of the mixed ANOVA indicate a significant change over time for all trainers with regard to the overall test score ( $F_{(1, 79)} = 37.36$ ;  $p \leq 0.001$ ;  $\eta_p^2 = 0.321$ ) as well as the three dimensions of learner characteristics ( $F_{(1, 79)} = 15.45$ ;  $p \leq 0.001$ ;  $\eta_p^2 = 0.164$ ), training design ( $F_{(1, 79)} = 23.80$ ;  $p < 0.001$ ;  $\eta_p^2 = 0.231$ ) and the work environment ( $F_{(1, 79)} = 17.22$ ;  $p \leq 0.001$ ;  $\eta_p^2 = 0.179$ ).

**TABLE 1** | Pretest means, posttest means, standard deviations and mixed ANOVA statistics for the transfer knowledge dimensions.

Dimension	Pretest (T1) M (SD)	Posttest (T2) M (SD)	Main effects						Interaction		
			Group (G)			Time (T)			G × T		
			F (1, 79)	p	$\eta_p^2$	F (1, 79)	p	$\eta_p^2$	F (1, 79)	p	$\eta_p^2$
Learner characteristics			1.97	0.165	0.024	15.45	< 0.001	0.164	19.28	< 0.001	0.196
EG	9.28 (2.75)	11.94 (2.99)									
CG	9.94 (2.47)	9.79 (2.60)									
Training design			5.86	0.018	0.069	23.80	< 0.001	0.231	25.81	< 0.001	0.246
EG	11.64 (2.88)	14.53 (2.67)									
CG	11.85 (2.08)	11.79 (2.81)									
Work environment			2.84	0.096	0.035	17.22	< 0.001	0.179	30.58	< 0.001	0.279
EG	10.51 (2.68)	13.19 (1.90)									
CG	11.24 (2.15)	10.85 (3.05)									
Overall test score			4.42	0.039	0.053	37.36	< 0.001	0.321	49.74	< 0.001	0.386
EG	31.43 (6.86)	39.66 (6.50)									
CG	33.03 (5.37)	32.44 (7.22)									

*Note:* N = 81. Range of the scale for learner characteristics: 0 points (min) to 18 points (max); range of the scale for training design: 0 points (min) to 22 points (max); range of the scale for work environment: 0 points (min) to 16 points (max); range of the scale for possible test scores: 0 points (min) to 56 points (max).  
Abbreviations: CG = control group; EG = experimental group.





**FIGURE 2** | Overall test scores for transfer knowledge both before (pretest) and after (posttest) the intervention. [Color figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]

Concerning the factor *group*, we found statistically significant effects on the overall test score ( $F_{(1, 79)} = 4.42$ ;  $p = 0.039$ ;  $\eta_p^2 = 0.053$ ) and the dimension of training design ( $F_{(1, 79)} = 5.86$ ;  $p = 0.018$ ;  $\eta_p^2 = 0.069$ ). No significant group effects were observed with respect to the dimensions of learner characteristics and work environment. Nevertheless, large significant *interaction effects* (time  $\times$  group) were observed for the overall test score ( $F_{(1, 79)} = 49.74$ ;  $p < 0.001$ ;  $\eta_p^2 = 0.386$ ) and all three dimensions, that is, learner characteristics ( $F_{(1, 79)} = 19.28$ ;  $p \leq 0.001$ ;  $\eta_p^2 = 0.196$ ), training design ( $F_{(1, 79)} = 25.81$ ;  $p \leq 0.001$ ;  $\eta_p^2 = 0.246$ ) and work environment<sup>1</sup> ( $F_{(1, 79)} = 30.58$ ;  $p < 0.001$ ;  $\eta_p^2 = 0.279$ ). These findings indicate a greater increase in transfer knowledge from the pretest to posttest with regard to overall test scores and all the dimensions in the experimental group than in the control group. In other words, group membership had a significant impact on the development of transfer knowledge.

## 7 | Discussion

With a focus on CVET trainers, this paper responds to the call for research on the relevant stakeholders involved in the transfer process (Baldwin et al. 2017). The aim of this study was to investigate the extent to which trainers' transfer knowledge can be increased through an intervention. Therefore, a web-based train-the-trainer programme for CVET trainers was implemented (Koch and Wisshak 2024). We used a quasi-experimental pretest–posttest design featuring an experimental and a control group. To compare the pretest and posttest scores between the two groups, we used an instrument that was developed to assess transfer knowledge (Koch et al. 2022).

We first hypothesized that trainers' transfer knowledge would increase after they participated in the training programme. The

findings of the mixed ANOVA indicated a large significant interaction effect of time  $\times$  group on the trainers' transfer knowledge ( $\eta_p^2 = 0.386$ ;  $p < 0.001$ ). As hypothesized, trainers who participated in the training programme (experimental group) had significantly more transfer knowledge after the intervention than before the intervention. In contrast, the knowledge of trainers in the control group changed only marginally. Therefore, Hypothesis 1 was supported.

We further hypothesized that trainers in the experimental group would exhibit significantly increased transfer knowledge with regard to all three dimensions (learner characteristics, training design and work environment) at the posttest. We observed statistically significant and large interaction effects of time  $\times$  group for all three dimensions: learner characteristics ( $\eta_p^2 = 0.196$ ;  $p \leq 0.001$ ), training design ( $\eta_p^2 = 0.246$ ;  $p < 0.001$ ) and the work environment ( $\eta_p^2 = 0.279$ ;  $p \leq 0.001$ ). This indicated a more pronounced increase in test performance across all three dimensions for the experimental group. Hypothesis 2 was thus also supported.

These results indicate that our train-the-trainer programme can positively affect trainers' transfer knowledge. This finding is consistent with meta-analyses that examined the effectiveness of training programmes on learning outcomes (Arthur et al. 2003; Lacerenza et al. 2017). Furthermore, this finding is in line with prior intervention studies from empirical educational research that found evidence of the effects of an intervention on teacher (candidate) skills and competencies (Findeisen et al. 2021; Günther et al. 2016; Piwowar et al. 2013). Moreover, the findings indicate that our conceptualization of the construct of transfer knowledge was accurate and that transfer knowledge exhibited a three-dimensional structure that included knowledge about learner characteristics, training design and the work environment. The findings are therefore consistent with the three transfer input

areas identified by Baldwin and Ford (1988) and numerous studies and meta-analyses (e.g., Blume et al. 2010; Colquitt et al. 2000; Hughes et al. 2020).

## 7.1 | Limitations

The study had certain limitations that should be acknowledged. The first limitation pertains to the relatively small sample size of this research. Although the sample size is deemed sufficient based on the findings of the power analysis, replication studies are recommended to provide additional support for the results.

Furthermore, it was not possible to assign trainers randomly to the two groups (experimental group vs. control group). Research has shown that time intervals between exercises (spaced practice) are conducive to transfer (J. J. Donovan and Radosevich 1999), and thus, the training programme was implemented over a period of 5 weeks. Therefore, the main focus of this study was on recruiting trainers for the experimental group who had sufficient time to participate in the training.

Additionally, it is important to note that this study focused on a convenience sample that included only trainers who were contacted via their homepages or via career networks and who voluntarily agreed to participate in the study. Therefore, it can be assumed that the experimental group had some degree of interest in the topic of the transfer of training when they registered for the training programme.

## 7.2 | Implications for Future Research and Practice

Despite its limitations, this study has several implications that are relevant to both research and practice. One implication for future research is that transfer knowledge can be both taught and learned and our training programme is an appropriate method for enhancing trainers' transfer knowledge. These findings could be integrated into the discourse focusing on the professional competencies of CVET trainers (Bonnes et al. 2019; Grohmann et al. 2021). Studies attempting to assess trainer competencies distinguish between four aspects of competence: method, professional, social and self-competence (Grohmann et al. 2021; Mehner and Kauffeld 2023). Research findings of Mehner and Kauffeld (2023) indicate that method competence, which includes aspects of transfer knowledge, is associated with learners' perceived transfer. Consequently, it is recommended that CVET trainers possess a certain level of transfer knowledge, which can be specifically promoted through a training programme.

As demonstrated by Alliger et al. (1997), knowledge acquisition alone does not result in transfer. Building on this, future research should focus on evaluating transfer. Specifically, researchers should investigate whether trainers also transfer what they have learned in training programmes to their own training courses.

In a further step, future research could investigate whether transfer knowledge and the application of transfer-promoting measures in the context of training courses affect the success of learners' attempts to transfer. Such research could provide stronger empirical evidence regarding trainers' influence on transfer. For example, the *Questionnaire for Professional Training Evaluation* (Q4TE; Grohmann and Kauffeld 2013) could be used to validate transfer in such research.

Furthermore, the findings demonstrate that the instrument that we used to assess transfer knowledge is sensitive to change and can be used to assess learning progress over time. Moreover, the instrument is capable of accurately measuring transfer knowledge as a total scale and among the three dimensions. Building on this, future studies can utilize the instrument to assess trainers' transfer knowledge.

Certain important practical implications must also be considered. Once the instrument is published, trainers can use it to identify their current transfer knowledge and their respective needs. As the instrument provides information regarding each of the three transfer knowledge dimensions, trainers can subsequently choose to attend either individual modules of the train-the-trainer programme or the whole course.

Given that the work environment is regarded as a pivotal transfer factor (Baldwin and Ford 1988; Botke et al. 2018; Hughes et al. 2020), it could be beneficial for HRD practitioners to also attend the training programme and thus strengthen their transfer knowledge. This is particularly relevant when organizations rely on external trainers who may not be involved in the transfer process in the workplace.

## 7.3 | Conclusion

In summary, this article provides an empirical contribution to the requested research on the relevant stakeholders involved in the transfer process, with a particular focus on CVET trainers (Baldwin et al. 2017). Regarding the aforementioned gap between research and practice in the context of trainers' transfer knowledge (Hutchins et al. 2010), the results provide guidance for attempts to bridge this gap. Thus, the design of an evidence-based training programme for CVET trainers represents a 'new and more influential way[...] to translate research into practice', as Kraiger (2014, 406) demanded.

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### Endnotes

<sup>1</sup>As the assumption of homogeneity of variance was violated for the dimension *work environment* at the posttest, we additionally applied non-parametric tests. A Friedman test (nonparametric repeated-measures ANOVA) also revealed significant time effects ( $\chi^2(1) = 20.25, p \leq 0.001$ ). The Mann-Whitney *U* test revealed no

significant group differences at T1 ( $U = 1786.50$ ,  $z = -1.358$ ,  $p = 0.174$ ,  $r = -0.15$ ). However, significant group differences were observed at T2 ( $U = 1003.50$ ,  $z = -3.780$ ,  $p \leq 0.001$ ,  $r = -0.42$ ). These tests provide support for the findings of the mixed ANOVA.

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