Motivational Influences on Transfer: Dimensions and Boundary Conditions

by

Andreas Gegenfurtner

From the Centre for Learning Research
University of Turku, Finland

Supervisors
Academy Professor Erno Lehtinen
Centre for Learning Research
University of Turku, Finland

Professor Roger Säljö
Department of Education, Communication and Learning
University of Gothenburg, Sweden

Professor Marja Vauras
Centre for Learning Research
University of Turku, Finland

Reviewers
Professor Anastasia Efklides
School of Psychology
Aristotle University of Thessaloniki, Greece

Professor Mien Segers
School of Business and Economics
Maastricht University, The Netherlands

Opponent
Professor Anastasia Efklides
School of Psychology
Aristotle University of Thessaloniki, Greece

Dedicated to Katrin

Abstract

The focus of this dissertation is the motivational influences on transfer in higher education and professional training contexts. To estimate these motivational influences, the dissertation includes seven individual studies that are structured in two parts. Part I, *Dimensions*, aims at identifying the dimensionality of motivation to transfer and its structural relations with training-related antecedents and outcomes. Part II, *Boundary Conditions*, aims at testing the predictive validity of motivation theories used in contemporary training research under different study conditions. Data in this dissertation was gathered from multi-item questionnaires, which were analyzed differently in Part I and Part II. Studies in Part I employed exploratory and confirmatory factor analysis, structural equation modeling, partial least squares (PLS) path modeling, and mediation analysis. Studies in Part II used artifact distribution meta-analysis, (nested) subgroup analysis, and weighted least squares (WLS) multiple regression. Results demonstrate that motivation to transfer can be conceptualized as a three-dimensional construct, including autonomous motivation to transfer, controlled motivation to transfer, and intention to transfer, given a theoretical framework informed by expectancy theory, self-determination theory, and the theory of planned behavior. Results also demonstrate that a range of boundary conditions moderates motivational influences on transfer. To test the predictive validity of expectancy theory, social cognitive theory, and the theory of goal orientations under different study settings, a total of 17 boundary conditions were meta-analyzed, including age; assessment criterion; assessment source; attendance policy; collaboration among trainees; computer support; instruction; instrument used to measure motivation; level of education; publication type; social training context; SS/SMC bias; study setting; survey modality; type of knowledge being trained; use of a control group; and work context. Together, the findings cumulated in this thesis support the basic premise that motivation is centrally important for transfer, but that motivational influences need to be understood from a more differentiated perspective than commonly found in the literature, in order to account for several dimensions and boundary conditions. The results of this dissertation across the seven individual studies are reflected in terms of their implications for theory development and their significance for training evaluation and the design of training environments. Limitations and directions to take in future research are discussed.

Contents

Acknowledgments

List of Publications

Part I: Dimensions

1   Gegenfurtner, A., Veermans, K., Festner, D., & Gruber, H. (2009). Motivation to transfer training: An integrative literature review. *Human Resource Development Review*, *8* (3), 403-423.

2   Gegenfurtner, A., Festner, D., Gallenberger, W., Lehtinen, E., & Gruber, H. (2009). Predicting autonomous and controlled motivation to transfer training. *International Journal of Training and Development*, *13* (2), 124-138.

3   Gegenfurtner, A., Vauras, M., Gruber, H., & Festner, D. (2010). Motivation to transfer revisited. In K. Gomez, L. Lyons, & J. Radinsky (Eds.), *Learning in the disciplines: ICLS2010 proceedings* (Vol. 1, pp. 452-459). Chicago, IL: International Society of the Learning Sciences.

4   Gegenfurtner, A. (submitted). Dimensions of motivation to transfer: A longitudinal analysis of their influences on retention, transfer, and attitude change.

Part II: Boundary Conditions

5   Gegenfurtner, A. (2011). Motivation and transfer in professional training: A meta-analysis of the moderating effects of knowledge type, instruction, and assessment conditions. *Educational Research Review*, *6* (3), 153-168.

6   Gegenfurtner, A., & Vauras, M. (2012). Age-related differences in the relation between motivation to learn and transfer of training in adult continuing education. *Contemporary Educational Psychology*, *37*.

7   Gegenfurtner, A., Vauras, M., & Veermans, K. (submitted). Effects of computer support, collaboration, and time lag on performance self-efficacy and transfer of training: A longitudinal meta-analysis.

Introduction

A teacher returns to school after being trained off-the-job in a novel instruction method and reports to the school principal that this new way of teaching is extremely fascinating and will be readily applied in the classroom because "the kids will learn better." A surgeon stops participating in a seminar program invited by the clinic management because learning those new digital imaging technologies is "a waste of my time," as they will not result in higher patient safety. In both cases, the implementation of newly learned knowledge and skills from a training program into daily work practice depends on whether or not the trainee expects performance improvement. The expectancy of improved performance then motivates action—that is, the transfer of training to the workplace. As Latham (2007) notes:

> Motivation is an integral aspect of training. The time, money, and resources an organization devotes to ways of increasing a person's abilities are wasted to the extent that an employee chooses not to learn what is being taught, or chooses not to apply newly acquired knowledge and skills in the workplace. (p. 3-4)

The dissertation focuses on motivational influences on transfer. In this introduction, we will first discuss motivation to transfer, estimating dimensions of motivation to transfer, and estimating boundary conditions of motivation-transfer relationships. We will then present the aims of the dissertation, its methods and individual studies, as well as the implications for theory development, educational practice, and future research.

1.1. Motivation to Transfer

Motivation to transfer has been studied extensively over the past 25 years, largely because of its important implications in professional development and in the generation of theories of training and training effectiveness. It was first identified by Noe (1986), who coined the term *motivation to transfer* and defined it as the "trainees' desire to use the knowledge and skills mastered in the training program on the job" (Noe, 1986, p. 743). Holton (1996), Colquitt, LePine, and Noe (2000), and Beier and Kanfer (2010), as well as Kontoghiorghes (2004), among others, have since developed conceptual models of training effectiveness that facilitate the understanding of the motivational prerequisites for the occurrence of positive transfer. In the present dissertation, including the individual subset of studies, transfer is understood as the productive use of acquired knowledge and skills (De Corte, 2003).

During the past three decades, numerous reports on this topic have appeared in the research literature. Beier and Kanfer (2010) and Gegenfurtner, Veermans, Festner, and Gruber (2009) provided recent reviews of this literature with respect to different motivational conceptualizations, their antecedents, and their consequences in professional training. Although the concept of motivation to transfer originated in industrial psychology, an interest in motivational influences on transfer has a long

tradition as well in educational and educational psychology research (De Corte, 2003; Inagaki & Hatano, 1977; McKeachie, 1987; Pugh & Bergin, 2006; Renkl, Mandl, & Gruber, 1996; Volet, 1999). The question of whether motivation is relevant for transfer to occur is closely linked with heterogeneity and disagreement in the training literature. Some authors have argued that motivational-emotional aspects are among the critical components for transfer (Gegenfurtner et al., 2009; Renkl et al., 1996; Volet, 1999). Others have shown that there is reason to believe that the size of the motivation-transfer relationship is negligible (Burkolter, Kluge, Sauer, & Ritzmann, 2009; Karl & Ungsrithong, 1992; Wolfe, Nordstrom, & Williams, 1999).

In his seminal paper, Noe (1986) proposed in his model of motivational influences on training effectiveness that motivation to transfer mediates the influence of learning on behavior change. He further proposed that the mediating position of transfer motivation[1] is moderated by environmental favorability. Noe (1986) also recommended how to measure motivation to transfer, namely with items assessing the trainee's confidence in using the newly trained set of knowledge and skills as well as their perceived "applicability" to the job. Other important aspects beyond confidence and applicability were awareness when performance improvements are likely to occur as a result of trained knowledge, and a belief that transfer of training will be useful for finding solutions to work problems. Motivation to transfer was introduced without explicit grounding in motivation theories. This seems as a likely explanation of why very different items have been used in subsequent studies to assess motivation to transfer. Table 1 presents a review of sample items from studies of the past 25 years. Among the hodgepodge of components used to operationalize motivation to transfer, we see sample items that would also be appropriate to assess, for example, performance self-efficacy, emotional arousal, volition, or utility reactions. Although some items seem to reflect ideas from social cognitive (Bandura, 1997) or expectancy theory (Vroom, 1964), at least implicitly, these theories are not mentioned explicitly.

The lack of explicit theoretical grounding may also have paved the way for the assumption that motivation to transfer is one-dimensional. This assumption is reflected in the literature. However, analysis of existing sample items that measure motivation to transfer as a one-dimensional construct may inspire rethinking it as a multidimensional construct. Moreover, Noe's premise that motivation to transfer was moderated by social and task environmental favorability needs systematic empirical testing. Undoubtedly, the proposition of motivation to transfer has been a seminal contribution to the literature on training and development. Much research followed Noe's (1986) work and examined how motivation to transfer correlates with transfer of training. Unfortunately, however, there have not been many attempts to provide a robust theoretical grounding of the construct; this is surprising given the wealth of validated motivation theories in educational and industrial psychology, some of which could be readily applied to research on transfer motivation. To date, however, relatively little conceptual development has occurred for motivation to transfer. It follows that the multidimensionality of motivation to transfer, along with how these dimensions are moderated by different social and task conditions, would benefit from deeper inquiry.

To elaborate on these two issues listed above, the next two sections will describe estimating the dimensions of motivation to transfer and then estimating the boundary conditions of motivation-transfer relationships.

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[1] It is acknowledged that transfer motivation is a synonym of motivation to transfer. Both terms are used interchangeably.

Table 1

Sample Items Used to Operationalize Motivation to Transfer Training in Past Research

First Author (year)	Sample Items Reported
Baldwin (1991)	I will use the skills learned in this course to improve my professional competence in the job
Bates (2000)	I plan to use what I learned on the job. I believe the training will help me do my job better
Bates (2001)	Training increases my personal productivity. I get excited about using my new learning
Bell (2007)	I intend to apply what I learn from my course to my everyday driving
Burke (1997)	The skills I learned in the assertive communication session will be useful in solving problems encountered in everyday life
Chiaburu (2008)	I believe my job performance will likely improve if I use the knowledge acquired in training
Devos (2007)	I use this training in my job whenever I have the possibility to do so. The quality of my work has improved after using the new skills I learned in training
Egan (2004)	At work, I am motivated to apply new knowledge
Kirwan (2006)	I get excited when I think about trying to use my new learning in my job
Leitl (2006)	I believe my job performance will likely improve if I use the knowledge and skills acquired in training
Machin (2003)	I will look for opportunities to use the skills which I have learned
Noe (1993)	Before attending the training programs, I usually consider how I will use the content of the program
Rowold (2007)	I am highly motivated to apply the skills I learned in this training to my daily work
Seyler (1998)	I believe the training will help me do my current job better. I plan to use what I learned on the job
Smith (2008)	How committed are you to applying the skills and knowledge from this training program to your job?
Tai (2006)	I am willing to apply the skills and knowledge obtained from the program on the job. I can transfer the skills, competencies, and knowledge acquired from the training programs to my job
Warr (1999)	I feel very committed to apply what I have learned to my job

Note. Item reported in Leitl and Zempel-Dohmen (2006) was translated into English. Fifteen items reported in Machin and Fogarty (2004) were not listed owing to space limitations. Table reproduced from Study 1.

1.1. Estimating Dimensions of Motivation to Transfer

One of the most complex phenomena studied in the social sciences is human motivation. Over the course of time, researchers have explored numerous dimensions and depicted the subtle ramifications of motivational processes in human actions. To name just a few, we know about intrinsic and extrinsic motivation; conscious goal intentions and unconscious implementation intentions; expectancies, instrumentalities, and valences; and various types of motivational regulation and mindsets; and we differentiate between motivation, volition, and emotion. All contribute to our understanding of the many facets and colors of motivation.

Employee motivation to transfer trained knowledge and skills to the workplace arguably goes together with all of the dimensions just mentioned. Paradoxically, however, past research has investigated transfer motivation as a one-dimensional construct: each study has assessed the construct with single scales consisting of 1 to 11 items. Table 1 presents the sample items that were used in past research. These items, aimed at understanding transfer motivation, illustrate past efforts to answer the seemingly simple question of why trainees are motivated to transfer. Past studies have employed Vroom's (1964) valence x instrumentality x expectancy (VIE) framework as the theoretical basement for transfer motivation. Although VIE has been, and will undoubtedly continue to be, very important in training research, it is limited in scope. As Locke and Latham (2004) note:

> This theory implies determinism, because it is argued that people are constructed to be satisfaction maximizers, yet, in fact, people are usually not maximizers of anything (Simon, 1976), nor do they have to multiply E x I x V when deciding what to do. E, I, and V are only factors that they may choose to consider, and they may choose to weight the three components in different ways, or even to ignore one or more of them. (p. 399)

Beyond expectancy frameworks, there are many work motivation theories that have potential as the theoretical underpinning of one or more dimensions of transfer motivation. Considering alternate theory concepts that extend and complement current approaches may clear the way for recognizing the multidimensionality of transfer motivation. Two theory concepts are self-determination theory (Deci & Ryan, 2000) and the theory of planned behavior (Ajzen, 1991).

In self-determination theory, intrinsic motivation refers to engaging in behavior because of interest, enjoyment, or inherent satisfaction. By contrast, extrinsic motivation refers to engaging in behavior for reasons that are outside the self, such as gaining rewards, avoiding sanctions, or valuing the activity for other instrumental reasons (Deci & Ryan, 2000). Depending on the degree of internalization, that is, the process by which individuals acquire beliefs, attitudes, or behavioral regulations from an external source and progressively transform those controlled motivations into personal attributes, values, or regulatory styles (Gagné & Deci, 2005), extrinsic motivation can have both autonomous and controlled forms. Controlled motivation subsumes external and introjected regulation with an external locus of causality; autonomous motivation subsumes identified, integrated, and intrinsic regulation with an internal locus of causality. The difference between autonomous motivation and intrinsic motivation is that, although both have an internal locus of causality, the former originated outside the self. When evaluating the quality of motivational orientations, distinguishing between autonomous versus controlled motivation is more important than distinguishing between intrinsic and extrinsic motivation, because extrinsic

motivation encompasses both autonomous and controlled motivation behaviors (cf. Ratelle, Guay, Vallerand, Larose, & Senécal, 2007; Shahar, Henrich, Blatt, Ryan, & Little, 2003). In line with current directions in motivation theory, the two dimensions, autonomous motivation to transfer and controlled motivation to transfer, seem appropriate to address the multidimensionality of trainee motivation for transfer action: autonomous motivation to transfer can be defined as an internalized desire to transfer learning that is initiated and governed by the self (i.e., regulated by identification or by integration with one's values); controlled motivation can be defined as a desire to transfer learning that is not initiated and governed by the self (i.e., regulated by external rewards or sanctions).

Research on autonomous and controlled motivation to transfer has important theoretical and practical implications. From a theoretical standpoint, this dissertation can extend transfer motivation research by focusing not only on the total amount of transfer motivation but also on the kind of transfer motivation. This may provide new avenues for testing theories associated with motivation in the learning transfer system. From a practical standpoint, understanding the individual differences of trainees' motivational profiles can help to develop tailored tools and interventions. These interventions, in turn, can support favorable decision-making about applying training for employees who have autonomous and controlled motivation during the training program and also in the post-training period back on the job. Therefore, this dissertation combined Deci and Ryan's self-determination theory and Vroom's expectancy theory to study autonomous and controlled motivation to transfer for two reasons. First, expectancy theory was partly used in past research to support the one-dimensional approach to motivation to transfer. Despite its drawbacks, it remains an important theory supporting training transfer. Second, expectancy theory as a cognitive-choice approach and self-determination theory as a need-motive-value approach complement each other in predicting and explaining human performance in the workplace (Kanfer, 1990). Thus, instrumentality and valence items reflecting externally prompted reasons to transfer were used to assess controlled motivation; conversely, instrumentality and valence items reflecting internally regulated behavior were used to assess autonomous motivation.

In addition to autonomous and controlled motivation as measures of motivational traits, intentions to transfer are also included as measures of motivational states. This is because contrary to motivational traits, intentions represent a more activated, situation-specific motivational state. We used Ajzen's (1991) theory of planned behavior, a well-validated framework from social psychology, to conceptualize intentions to transfer. The underlying assumption was that the effects of autonomous and controlled motivation on training transfer are mediated by the more situation-specific state of transfer intentions; at the same time, situational but distal social (relatedness, support, control, and norms) and affective (attitudes and utility reactions) cues on transfer intentions are mediated by more stable motivational traits, such as autonomous and controlled motivation to transfer. Ajzen (1991) proposes that human action can be understood not only as a function of motivational orientations but also as the degree to which externally regulated behavior is internalized. His theory of planned behavior (Ajzen, 1991) offers a way to conceptualize human action as a function of intentions over a behavior. Intentions represent a more activated, situation-specific motivational state. According to this theory, attitudes toward a behavior determine the degree to which intentions are translated into corresponding behavior. In the context of transfer research, trainees would engage in transfer if the newly trained behavior were associated with corresponding positive attitudes toward the behavior, which in turn

would yield actualized intentions. For example, consider a trainee who returns from a training environment to the work environment. The trainee may experience that the work environment is positive toward the use of the behavior trained elsewhere; in such a situation the transfer would be socioculturally appropriate (Volet, 1999) and influence both the attitudes the trainee has toward the trained behavior as well as the intention to show the trained behavior at work (Ajzen, 1991; Volet, 1999). In contrast, the trainee may experience that the work environment is not positive toward the use of the behavior trained elsewhere; in this situation, the transfer would be socioculturally inappropriate and thus negatively affect the trainee's attitudes and intentions. A drawback of the theory of planned behavior is its emphasis on attitudes toward behavior. It can be argued that attitudes toward the training content are just as important. Attitudes toward training content are cognitive and affective judgments about the training content or object (Ajzen, 1991; Eagly & Chaiken, 1993). Though few empirical investigations exist on the role of attitudes toward training content in the context of motivation research (for an exception, see Gegenfurtner, Festner et al, 2009), the theory of planned behavior can provide a well-established theoretical grounding for including intention to transfer and attitudes toward training content in examinations of motivational influences on transfer.

In summary, self-determination theory (Deci & Ryan, 2000), expectancy theory (Vroom, 1964), and the theory of planned behavior (Ajzen, 1991) offer three theories that can be used to conceptualize three dimensions of transfer motivation: autonomous motivation to transfer, controlled motivation to transfer, and intention to transfer. This conceptualization is a novel approach because it suggests that transfer motivation not only varies in amount but also in kind. In addition, this multidimensional conceptualization contributes to the literature because it describes motivation to transfer both as a trait-like orientation (Gagné & Deci, 2005) and as a state-like characteristic (Ajzen, 1991). Based on these theories, one expects that the more stable traits—autonomous and controlled motivation—positively correlate with the more situation-specific intention to transfer. However, it seems plausible to assume that motivational influences on transfer vary from training to training as a function of the varying participant and training characteristics. An additional estimation of boundary conditions seems therefore warranted; this can help us to understand better how, to what extent, and under which conditions motivation influences transfer.

1.2. Estimating boundary conditions of motivation-transfer relationships

Part I of this dissertation includes studies that aim at identifying the dimensionality of motivation to transfer, particularly by being grounded in expectancy theory, self-determination theory, and the theory of planned behavior. Part II of this dissertation includes studies that aim at testing the predictive validity of (these and other) motivation theories used in contemporary training research under different boundary conditions. A boundary can be understood as "a sociocultural difference leading to discontinuity in action or interaction" (Akkerman & Bakker, 2011, p. 133). Boundaries are informative because of their power to highlight the arena within which theoretical premises and presuppositions are expected to work. In a given field of research, Mayer (2009) points at the value of understanding when certain effects appear and when they do not, and why, to better understand the generality of tentatively accepted theoretical premises.

Our focus was on theories explaining motivation-transfer relationships. For this purpose, motivation was conceptualized in several dimensions in order to reflect validated theories that are frequently used in the transfer of training literature,

including Bandura's (1997) social cognitive theory, Dweck's (1986) theory of goal orientations, and Vroom's (1964) expectancy theory. This eclectic choice of motivation theories aimed at covering the need-motive-value dimension (i.e., mastery orientation, performance orientation, and avoidance orientation), cognitive-choice dimension (i.e., expectancy and instrumentality), and self-regulation dimension (i.e., self-efficacy) of human motivation (Kanfer, 1990). It is theoretically relevant to test the predictive validity of these theories concerning whether or not they can predict motivational influences on transfer, and, maybe even more relevant, to identify the dimensions when they can and cannot. In line with Mayer (2009) and Akkerman and Bakker (2011), we therefore examined motivational influences on transfer under different boundary conditions. The selection of these dimensions was again eclectic, though informed by theoretical considerations prevailing in research on learning and instruction (as will be discussed in turn). However, the current selection needs to be seen as a first step. More efforts are needed to achieve a broader and more complex understanding in an attempt to identify training and participant features that promote and inhibit motivation and transfer. The following boundary conditions were investigated: age; assessment criterion; assessment source; attendance policy; collaboration among trainees; computer support; instruction; instrument used to measure motivation; level of education; publication type; social training context; SS/SMC bias; study setting; survey modality; type of knowledge being trained; use of a control group; and work context.

Details, along with theoretical hypotheses, are presented in Studies 5, 6, and 7. The investigation of these 17 different boundary conditions was meaningful to understand the extent to which certain theoretical premises from the abovementioned motivation theories generalize to, and are valid in, contemporary training research. Together these analyses do have implications for the development of theories of training motivation and training effectiveness, as well as for the refinement of existing conceptual frameworks on work motivation. Details will be discussed in section 5.1. In the next section, we will describe the aims that have guided our work in this dissertation. The aims are first listed for Part I and Part II in general and then for each of the seven studies in particular.

2. Aims

The dissertation is divided into two parts. Part I, *Dimensions*, aims at identifying the dimensionality of motivation to transfer and its structural relations with training-related antecedents and outcomes. Part II, *Boundary Conditions*, aims at testing the predictive validity of motivation theories used in contemporary training research under different study conditions.

The first part starts with an integrative literature review of motivation to transfer (Study 1), which identifies, among others, the assumption of transfer motivation's unidimensionality and theoretical reasons thereof. Study 2 then aims to integrate self-determination theory and expectancy theory to explore the psychometric properties of two dimensions of motivation to transfer: autonomous and controlled motivation to transfer; the study also assesses how attitudes toward training content, instructional satisfaction, and relatedness predict these two dimensions. Study 3 aims to add a third dimension, intention to transfer, by furthering the integration with the theory of planned behavior, and also aims to estimate the structural relations of the three measurement models with (social and affective) training-related antecedents and outcomes. Finally, the aim of Study 4 is to investigate the usefulness of measuring training outcomes with different assessment criteria and sources for explaining larger portions of variance between transfer and the three dimensions: autonomous motivation, controlled motivation, and intention to transfer; an additional aim of this study is to measure structural relations among the three dimensions as well as between the dimensions and the longitudinal development of attitudes and knowledge.

The second part of the dissertation starts with a larger quantitative synthesis of 25 years of training research on expectancy theory, social cognitive theory, and the theory of goal orientations, which aims at inquiring whether motivation, after controlling for sampling error and error of measurement, exhibits a stable influence on transfer (Study 5); in addition, the study aims to estimate the boundary conditions of knowledge type, instruction, and assessment conditions to account for artifactual variance in the total variance of the cumulated correlations. Study 6 aims to meta-analyze age-related differences in the relation between motivation to learn and training transfer by testing, in a range of study conditions, the theoretical predictions of those who argue for motivational decline as we age and those who argue that motivation is maintained over the course of a working life. Finally, the aim of Study 7 is to focus on social cognitive theory, particularly on cumulating evidence on how the longitudinal development of the population correlation estimate between self-efficacy and training transfer is moderated by time lag, computer support, and collaboration.

Both parts of the dissertation aim to advance conceptual clarity as it relates to investigations on motivation and transfer. Importantly, however, we also aimed (and hoped) in our research group to offer practically relevant information for those engaged in the very work of designing and evaluating trainings in corporate and higher education settings.

3. Methods

To address these aims, the studies in this dissertation used different methods. Table 2 presents an overview. Across all studies, data was gathered by questionnaires and was thus purely correlational. Therefore, all results should be interpreted as indicating the magnitude of the motivation-transfer relationships, not as causal effects of motivation on transfer. Study 1 had a narrative design and does not report statistical analyses. The remaining six studies used cross-sectional or longitudinal designs. This section describes in more detail which participants were investigated, how motivation and transfer were assessed, and how motivational influences on transfer were statistically estimated across the seven individual studies.

Table 2
Participants, Design, and Statistical Estimation by Study

Study	Participants	Design	Statistical Estimation
Part I			
Study 2	444	Cross-sectional	Exploratory factor analysis; Confirmatory factor analysis; Structural equation modeling
Study 3	128	Cross-sectional	Confirmatory factor analysis; PLS-based path modeling
Study 4	128	Longitudinal	Confirmatory factor analysis; PLS-based path modeling; Structural equation modeling
Part II			
Study 5	31,718	Cross-sectional	Meta-analysis; Nested subgroup analysis
Study 6	6,977	Cross-sectional	Meta-analysis; Subgroup analysis; WLS multiple regression
Study 7	4,158	Longitudinal	Meta-analysis; Nested subgroup analysis; WLS multiple regression

Note. Study 1 is a narrative literature review. It is excluded in Table 2 because of its theoretical character.

3.1. Participants

The data of studies 2, 3, and 4 originated from the project "Transfererfolg," which was an evaluation project of training programs in occupational health and safety. The project was funded by the Institute for Work and Health of the German Social Accident Insurance. Project leaders were Professor Hans Gruber of the Department of Education, University of Regensburg, Germany, and Dip. Ed. Dagmar Festner, now at the Department of Business and Human Resource Education, University of Paderborn, Germany. The aim of the project was to evaluate the training effectiveness of 23 five-day off-the-job seminars for improving employee safety and health. The seminars were held in five German training centers from August 2006 to January 2007. Participation in the study was voluntary and uncompensated; an accompanying cover letter guaranteed anonymity and confidentiality for all responses. Overall, 496 trainees participated in the training programs. Of these, 446 returned the questionnaire after training and 131 returned a follow-up questionnaire three months after the training. Elimination of multivariate outlying cases yielded final sample sizes of 444 participants in Study 2 and 128 participants in Studies 3 and 4. Study 2 was cross-sectional and used data collected immediately after training (T2). Study 3 was also cross-sectional, but used data collected three months after training (T3). Study 4 had a longitudinal design, using data collected before (T1), after (T2), and three months after training (T3).

The data of studies 5, 6, and 7 originated from a meta-analytic database. Generating this database was funded by the Doctoral Program of Multidisciplinary Research on Learning Environments (OPMON) and spanned November 2009 to December 2010. The second coder of the included studies was stud. phil. Erkka Laine, Department of Teacher Education, University of Turku, Finland. The aim of the database was to cumulate the available evidence of motivational influences on transfer in professional training. To represent the kaleidoscope of settings within which professional development programs are situated, the database covers studies that reported training in laboratory and field studies, including a wide range of professions such as undergraduate students, management, academic professions, non-academic professions, and the military. The database includes a total of 148 articles with 196 independent data sources reporting 376 effect sizes of 31,718 participants from studies covering 25 years of training research (January, 1986-December, 2010). Study 5 uses the full sample of 31,718 participants. Studies 6 and 7 use a subset of 6,977 and 4,158 participants, respectively. Table 3 reports participant age (in years), gender (in percentage of females), and tenure (in years).

Table 3
Mean (and Standard Deviation) of Participant Age, Gender, and Tenure by Study

Study	2	3	4	5	6	7
Age	2.51[1] (1.00)	2.64[1] (0.88)	2.64[1] (0.88)	30.72 (9.42)	30.45 (7.88)	29.98 (9.26)
Gender	-	-	-	43.62 (25.32)	37.70 (24.88)	49.76 (20.84)
Tenure	7.33 (6.88)	8.25 (7.59)	8.25 (7.59)	6.88 (6.47)	7.40 (5.89)	9.63 (7.16)

[1] With 5-point Likert scale 1 = *up to 30 yrs old*, 2 = *31–40 yrs*, 3 = *41–50 yrs*, 4 = *51–60 yrs*, 5 = *61 yrs or older*.

The sampling of participants in Studies 2 to 4 was non-random. In addition, much of the literature included in the meta-analytic database employed a convenience sampling. It is well understood that non-randomized sampling procedures have a biasing effect on the relations between independent and dependent variables. We are aware of the problem of "sample selection bias" (Heckman, 1979). Although the use of large sample sizes from a heterogeneous set of studies aimed to minimize this effect (Heckman, 1979), and although attendance policy is examined as a boundary condition (Study 6), it is clear that the used samples are not representative to the total population of all training participants in Finland, Germany, or more local contexts. It follows that the findings reported in this dissertation are limited to the samples used.

3.2. Assessment of Motivation

The dissertation has assessed motivation with different scales. In the next paragraph, we describe how autonomous motivation to transfer, controlled motivation to transfer, and intention to transfer were operationalized and measured. In the paragraph after next, we describe how those motivational constructs that we cumulated in our meta-analyses have been assessed in the original empirical investigations.

We argued in Study 1 that analysis of existing sample items measuring the one-dimensional construct of transfer motivation may inspire rethinking transfer motivation as a multidimensional construct. This argument was put forward in Studies 2, 3, and 4: three dimensions of motivation to transfer were developed, tested, and evaluated. Detailed descriptions of the measures can be found in Studies 2-4. All scales were self-reports, which seemed adequate to capture the subjective nature of self-perceived motivation (Heider, 1958). But we also acknowledge that self-report measures can induce artifactual variance. Therefore, a special effort was made to control for common method variance (Podsakoff, MacKenzie, & Podsakoff, in press). No evidence for method effects were found in Studies 2 and 3, indicating that common method variance was not a pervasive problem. Furthermore, the three scales were pilot-tested using a sample of 89 trainees, who attended eight health and safety training programs from March to June 2006 (prior to the data collections for Studies 2-4); minor revisions in expressions and the ordering of items were reflected in the final version of the instrument. Ultimately, the three dimensions, autonomous motivation to transfer, controlled motivation to transfer, and intention to transfer, were developed, tested, and evaluated and now indicate robust model fit and theoretical grounding.

We also argued in Study 1 that transfer motivation as a single factor might become redundant in the near future, whereas transfer motivation as a theoretical category might become increasingly important in providing a frame of reference for investigating the multidimensionality of motivational, emotional, and/or volitional forces in training application contexts. This argument was put forward in Study 5, where motivation was conceptualized in nine motivation dimensions: motivation to learn, motivation to transfer, pre- and post-training self-efficacy, mastery orientation, performance orientation, avoidance orientation, expectancy, and instrumentality. Assessment of these dimensions was secondary, not primary; that is, we cumulated the scales that were reported in the original empirical investigations and corrected for the bias of error of measurement (cumulative analysis of reliability estimate α). Details are presented in Study 5. In Study 6, we examined the moderating effect of different scales for measuring motivation to learn in the original studies; a special effort was also made to estimate the moderating effect of common method variance in the primary literature. Furthermore, in Study 7, we examined the moderating effect of time for measuring self-efficacy.

3.3. Assessment of Transfer

The dissertation assessed transfer within a *productive use* perspective on transfer (De Corte, 2003). Although there are important other conceptualizations of transfer as *boundary crossing* (Engeström, Engeström, & Kärkkäinen, 1995; Säljö, 2003), *consequential transition* (Beach, 1999; Gruber, Law, Renkl, & Mandl, 1995), or *preparation for future learning* (Bransford & Schwartz, 1999), to name but a few, we were most interested in whether or not newly learned knowledge and skills would be used after training on the job as a measurable performance improvement (De Grip, 2008). But even if we limit ourselves to the productive use perspective, we still see a broad range of alternative modes of assessment (Segers, Dochy, & Cascallar, 2003). To cope for this heterogeneity of assessment modes, we included different assessment criteria and assessment sources in both the primary original investigations and the secondary meta-analyses. Each is specified in turn.

First, in Part I, the original investigations included three different assessment sources: trainee self-reports, observations of trainees' supervisors, and external knowledge tests. We also included three different assessment criteria: transfer as distribution of training content, as increased effectiveness, and as post-test retention. The use of different modes of assessment steadily increased over time, with a broader range of alternative modes in more recent studies. Specifically, while Studies 2 and 3 used one assessment source and one assessment criterion, Study 4 used three assessment sources and three assessment criteria. This trend toward a broader range of alternative modes of assessment indicates a growing awareness that we get more robust conclusions when we use more kinds of evidence (Segers et al., 2003).

Second, in Part II, the secondary meta-analyses included assessment as a moderator variable. Particularly, Study 5 estimated the effects of assessment source and criterion on the relationship between motivation and transfer. We included four assessment sources (self, peer, supervisor, and external assessment) and four assessment criteria (subsequent use, frequency of use, increased effectiveness, and correct performance after training). Study 6 examined the effect of different survey modalities for assessing transfer (paper surveys vs. online surveys). Finally, Study 7 examined assessment time as a moderator, that is, the time lag after training when transfer of training was measured. All these analyses point to the importance of being aware how different methodological decisions can influence study results. Therefore, the use of different modes of assessment has practical relevance for those engaged in training evaluation (as will be discussed later).

3.4. Statistical Estimation

Motivational influences on transfer have been estimated with different methods. In Part I of this dissertation, we used two stages: (1) estimating factor structure, and (2) estimating structural relations. First, the factor structure was estimated with exploratory factor analysis, which was used to identify the underlying factor structure in the data; we employed maximum likelihood as an EFA extraction method, OBLIMIN as a rotation method, and a combination of Kaiser's rule of eigenvalues larger than one and Cattell's scree test and variance proportion of at least 60 percent as criteria for determining the number of factors (Conway & Huffcut, 2003; Fabrigar, Wegener, MacCallum, & Strahan, 1999). The identified factor structure was then estimated with confirmatory factor analysis, which was used to evaluate and validate the fit of the extracted measurement models; data were screened to test for multivariate outliers, normality, and multi-collinearity (Kline, 2005). We used the direct maximum likelihood approach as a missing data specification procedure and, as offered in EQS, robust

methods as normality estimator corrections (Bentler, 2005). Second, the structural relations among the identified factors were then estimated. In studies with larger samples, we used structural equation modeling (Study 2). In studies with smaller samples, we used partial least squares (PLS) based path modeling (Study 3). Both techniques were compared in Study 4. Given evidence of inadequate fit in the structural equation modeling (SEM), the structural model was modified post hoc to add causal paths identified by the Lagrange Multiplier Test (LM-Test) and to delete non-significant parameters identified by the Wald Test (W-Test), respectively; to validate the final model further, the model was compared with an equivalent alternative model generated by the replacing rule for covariance structure models (Lee & Hershberger, 1990). Assessment of model fit was based on four criteria reflecting statistical and theoretical considerations. The criteria were as follows: (1) the Yuan-Bentler scaled χ^2 test statistic, (2) the comparative fit index (CFI), (3) the standardized root-mean square residual (SRMR), and (4) the root-mean square error of approximation (RMSEA), with its 90 percent confidence interval (CI). This rationale was based upon literature recommendations (Bentler, 2005; Kline, 2005; MacCallum & Austin, 2000). For cut-off criteria, we carefully followed guidelines for CFI > 0.95, SRMR < 0.09, and RMSEA < 0.06 (Hu & Bentler, 1999; Marsh et al., 2004) to indicate appropriate goodness-of-fit. Partial least squares (PLS) based path modeling was used because, contrary to other estimation techniques like multiple regression or structural equation modeling, PLS can be applied to a non-normally distributed data set collected with a small sample (Chin & Newstead, 1999), which was the case in Studies 3 and 4. Based on SmartPLS 2.0 (Ringle, Wende, & Will, 2005) software, the relationships among the variables were assessed using the path weighting scheme algorithm. Importantly, PLS is an approach for predicting relationships in a model, not for assessing overall model fit. However, three reliability indices were also reported to indicate appropriate psychometric properties of the measurement models. For cutoff-criteria, guidelines were followed for Cronbach's α > 0.70, average variance extracted (AVE) > 0.50, and composite scale reliability (CSR) > 0.60 (Hair et al., 2006). Finally, and associated with both SEM and PLS, mediation analysis was used to estimate the mediating position of motivation in the 0235 transfer process. We used the approach recommended by MacKinnon and colleagues (MacKinnon, Fairchild, & Fritz, 2007), which "assesses the statistical signify-cance of the X to M relation, a path, and then the M to Y relation, b path. If both are statistically significant, there is evidence of mediation" (MacKinnon et al., 2007, p. 608). We used the MacKinnon approach instead of the maybe most widely used Baron and Kenny (1986) approach, because the latter was shown to result in lower statistical power and higher Type I and Type II error rates (see the Monte Carlo simulations reported in MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

In Part II of this dissertation, we used two stages to estimate motivational influences on transfer. The first stage was a primary meta-analysis using the methods of artifact distribution meta-analysis of correlations (Hunter & Schmidt, 2004). These methods provide an improvement from earlier statistical formulae, when information such as reliability estimates was only sporadically reported in the original studies. First, study information was compiled in three distributions: the distribution of the observed Pearson's r of the transfer-motivation relationship, the distribution of Cronbach's α of the independent variable, and the distribution of Cronbach's α of the dependent variable. Next, the distribution of Pearson's r was corrected for sampling error. Note that the correction was conducted using a weighted z transformation, since Pearson's r was shown to produce upwardly biased correlation estimates (Hall & Brannick, 2002).

The distribution corrected for sampling error was then further corrected for error of measurement using the compiled Cronbach's α reliability estimates. This last step provided the final estimate of the true score population correlations ρ between transfer and motivation. Finally, standard deviations of the corrected observed correlation r_c and of the population correlation ρ were calculated; these were used to derive the percentage of variance attributable to attenuating effects, the 95% confidence interval around r_c, and the 80% credibility interval around ρ.

The second stage was a meta-analytic moderator analysis, which was done in two steps: moderator detection and moderator estimation. In the moderator detection step, we identified moderators theoretically and statistically. Theoretically, they were derived from existing conceptual frameworks. Statistically, they were derived from two indicators: the breadth of the 80% credibility interval and the percentage of variance explained. Computation of credibility intervals followed recommendations by Whitener (1990) as being critical for random-effects models due to possible variation in parameters across studies. Specifically, larger spans of credibility intervals and those that include zero often indicate an increased probability that moderating biases exist (Koslowsky & Sagie, 1993; Whitener, 1990). The percentage of variance explained was computed as an indicator that suggested that unless 25% or more of the variance in the population correlation ρ remains after correcting for sampling and measurement artifacts, the remaining variance is likely to be attributable to moderator effects (Schmidt & Hunter, 1977). In the moderator estimation step, different methods were used for categorical and continuous variables. For categorical variables, theory-driven sub-group analyses were used to estimate moderator effects. In the case of confounded moderators (Study 5: assessment conditions; Study 7: computer-supported collaborative learning), variables were entered in combination. This allowed estimation of confounding effects (Hunter & Schmidt, 2004). Nested sub-group analysis assumes that the moderator variables are independent and additive in their effects. A criticism of the use of sub-groups is that it reduces the number of data sources per analysis, resulting in second-order sampling error. Although the present study contained a large number of data sources and participants, the possibility of second-order sampling error cannot be totally ruled out. This is therefore indicated when warranted for interpreting the results. For continuous variables, weighted least squares (WLS) regression was used. This method was chosen because, when estimating continuous moderators, WLS tends to be largely unaffected by multicollinearity and converges toward the true moderator effect size, despite variations in heteroscedasticity (Steel & Kammeyer-Mueller, 2002). All calculations were based on the assumption that the population parameter value ρ varies from study to study, so we used a random-effects model to obtain realistic estimates of the width of the confidence intervals (Cafri, Kromrey, & Brannick, 2010). Moreover, some authors advocate performing an outlier analysis. Because current approaches for identifying outlier coefficients in meta-analytic data sets tend to over-identify small correlations relative to large ones (Beal, Corey, & Dunlap, 2002), the removal of outlying cases becomes problematic. Furthermore, the formula for sampling error variance used in the present study allows and corrects for occasional extreme outlying values. It follows that eliminating outliers can overcorrect for sampling error and underestimate SD_ρ (Hunter & Schmidt, 2004). Based on these problems with outlier removal in meta-analytic work, the calculations in the present study were based on the full data set.

In summary, different methods were chosen to estimate motivational influences on transfer. Figure 1 offers a summary. The rationale for using different methods was driven by the different study purposes. The studies that aimed toward identifying diffe-
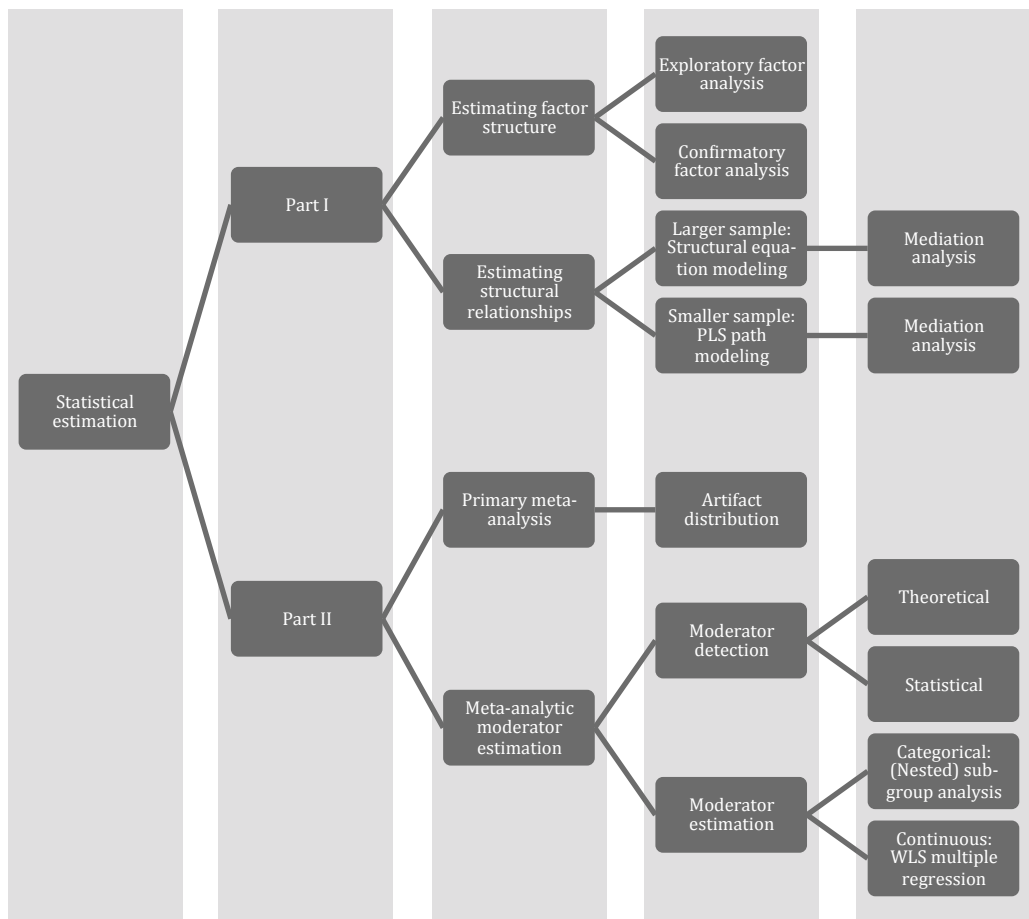
Figure 1. Statistical estimation techniques used in this dissertation.

rent dimensions of motivation to transfer used factor analytic methods (Studies 2 and 3 in particular); the studies that aimed toward exploring mediated structural re lations between motivation and training-related antecedents and outcomes used model estimation methods (Studies 2-4 in particular); and the studies that aimed toward detecting boundary conditions of motivational influences on transfer used moderator analyses (Studies 5-7 in particular). Although these methods differed, a common interest was to advance our understanding of how, to what extent, and under which conditions motivation influences transfer in professional training settings. The results of these analyses are presented in turn: the next section offers a brief overview of what the results were in each of the seven studies individually; the section after that offers a brief overview of some common themes that emerged post hoc in a synopsis of the seven individual studies.

4. Overview of Studies

The purpose of this section is to give an overview of the studies included in this dissertation. The main findings of each study are reported with reference to the overarching aims of this thesis, namely to identify the dimensionality of motivation to transfer and its structural relations with training-related antecedents and outcomes (Part I) and to test the predictive validity of motivation theories used in contemporary training research under different study conditions (Part II).

Study 1: Gegenfurtner, A., Veermans, K., Festner, D., & Gruber, H. (2009). Motivation to transfer training: An integrative literature review. *Human Resource Development Review*, *8* **(3), 403-423.**
In this first study, the purpose was to provide a critique of past research on motivation to transfer and to suggest directions for future investigations. Specifically, we were most interested in exploring which antecedents, correlates, and consequences of transfer motivation have been identified in past research and, second, how future research should proceed. As such, this integrative literature review was a starting point from which subsequent studies in this dissertation unfolded.

The review included 31 empirical investigations, which assessed antecedents, correlates, and consequences of trainees' motivation to transfer training. These studies were published in peer-reviewed journals between January 1, 1986, and April 1, 2008. We used the year 1986 as the starting point owing to Noe's (1986) publication, which introduced motivation to transfer as a construct in training and HRD research. Each of the retrieved articles was carefully studied to identify the relationships between transfer motivation and other constructs. Variables in the review were substantiated by significant ($p < .05$) findings reported in at least two peer-reviewed empirical articles. The relationships between variables have been synthesized in an integrative model of motivation to transfer training (Figure 2).

The results suggested a number of relationships between motivation to transfer and its antecedents and consequences. These are detailed in seven propositions in the text and correspond with the numbers in Figure 2. More importantly, the review also unravels directions for future research. First, it uncovers the assumption in past research that motivation to transfer is one-dimensional. This assumption is explained by a lack of theoretical grounding of the construct motivation to transfer; thus, the review calls for theory-guided research into the multidimensionality of motivation to transfer. Second, the review highlights a lack of empirical investigations examining the mediating position of motivation in the transfer process; thus, the review calls for mediation analyses to test the assumption that motivation is central for transfer. Finally, the review points at the practice in past research to measure motivation to transfer immediately after training; thus, the review calls for measuring motivation to transfer at different times or to explore its longitudinal development to overcome what we termed the "dynamic problem of transfer motivation research" (p. 419). These recommendations were derived from motivation research in general (multidimensionality, temporal dynamics, mediation), so our own work attempted to translate these directions into empirical investigations on training and development in particular. Six of these investigations are described in turn.
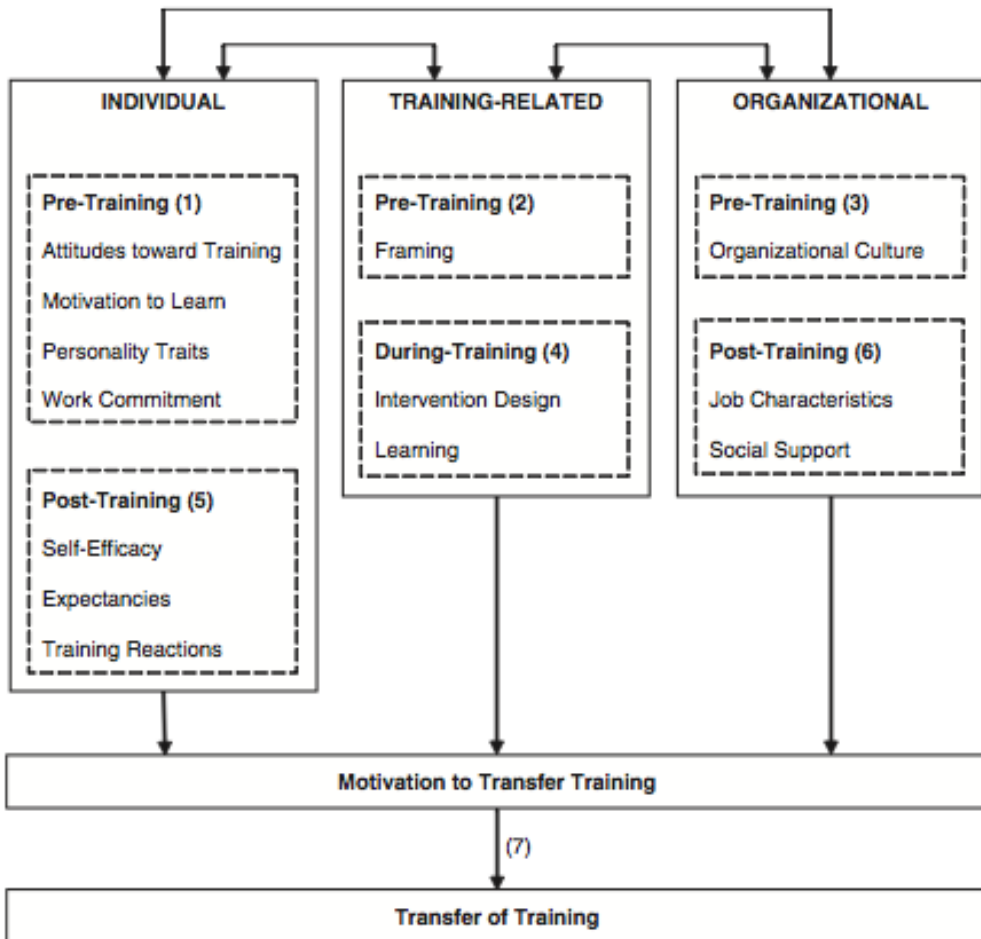
Figure 2. An integrative model of motivation to transfer training (p. 406).

Study 2: Gegenfurtner, A., Festner, D., Gallenberger, W., Lehtinen, E., & Gruber, H. (2009). Predicting autonomous and controlled motivation to transfer training. *International Journal of Training and Development*, *13* **(2), 124-138.**

In this second study, the purpose was to combine expectancy theory (Vroom, 1964) and self-determination theory (Deci & Ryan, 2000) for the test of two dimensions of motivation to transfer: autonomous and controlled motivation to transfer. The study measured both dimensions immediately after training. Attitudes toward training content, relatedness, and instructional satisfaction were assessed as predictor variables.

Participants were 444 safety inspectors of diverse industrial organizations who attended 1 of 23 5-day training programs in occupational health and safety. The off-the-job training courses took place from August 2006 to January 2007 in five German training centers. Immediately after the end of training, the training instructors administered a multi-item questionnaire to all trainees. Participation in the study was voluntary; an accompanying cover letter guaranteed anonymity and confidentiality for all responses. Two 4-item self-report measures were created to assess trainees'

autonomous and controlled motivation to transfer. (1) For controlled motivation, two pairs of items were included to measure instrumentality and valence of controlled motives for training transfer. Sample items are as follows: for instrumentality, "Successful application of the training content will probably result in a materialistic reward, such as a financial bonus," and for valence, 'This reward is important for me." Cronbach's alpha was 0.75. (2) For autonomous motivation, two pairs of items were included to measure instrumentality and valence of autonomous motives for training transfer. Sample items are as follows: for instrumentality, "While applying training
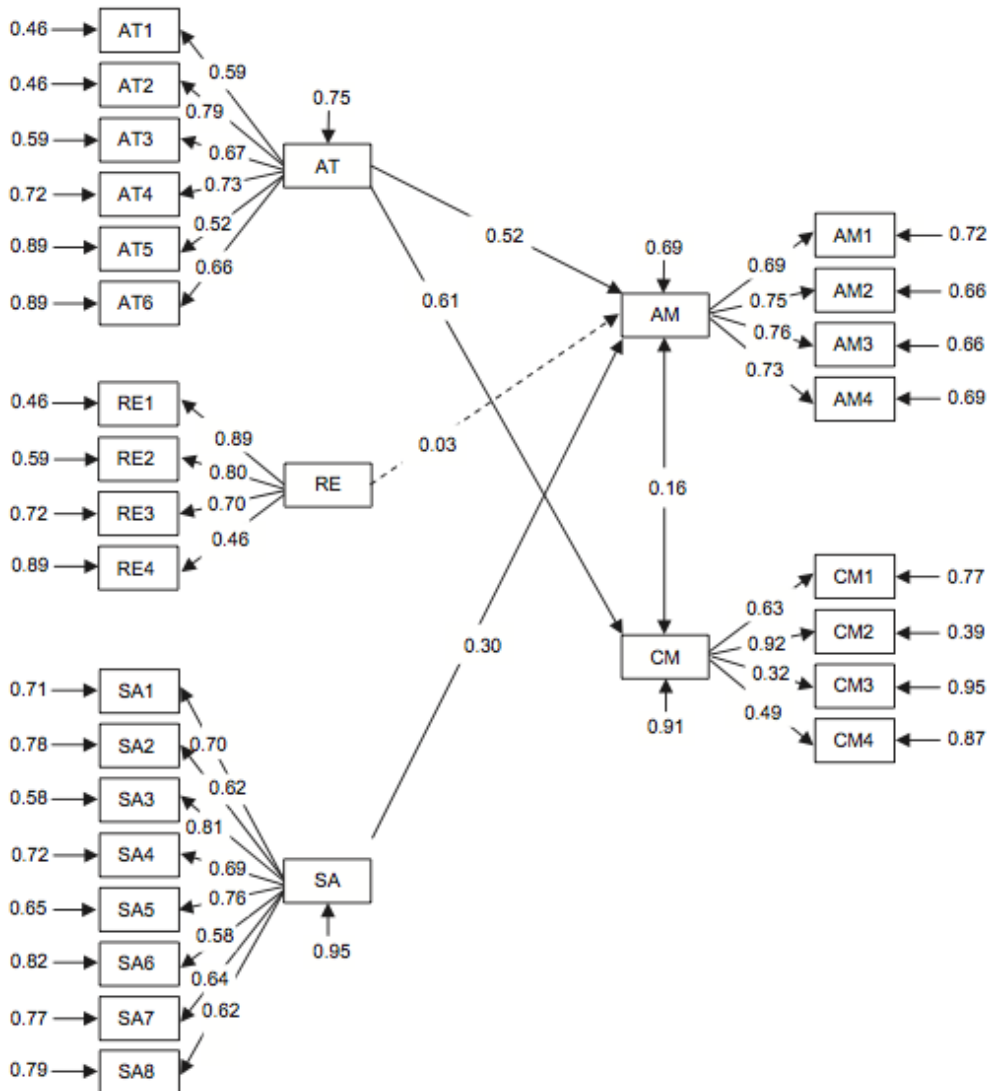

Figure 3. Final model parameter estimates (p. 132). AT = attitudes towards training content, RE = relatedness, SA = instructional satisfaction, AM = autonomous motivation to transfer, CM = controlled motivation to transfer.

At work, I can learn a lot," and for valence, "This learning is important for me." Cronbach's alpha was 0.84. Analyses included exploratory and confirmatory factor analysis and structural equation modeling.

Results suggested an acceptable fit to the data, with Yuan-Bentler scaled (294) = 659.57, CFI = 0.90, SRMR = 0.08, and RMSEA = 0.06 with its 90 percent CI = 0.05, 0.06; however, it did not fit as well as expected (i.e., CFI). Application of the LM-Test indicated substantial covariance between three factor pairs and among a magnitude of error terms. Concerning the factor pairs, covariance was indicated between (1) relatedness and instructional satisfaction, (2) relatedness and attitudes, and (3) instructional satisfaction and attitudes. Concerning the error covariances, correlated errors are suggestive of content overlap and are in need of respecification. However, it is widely agreed that model respecification should not be based on empirical findings but on a thorough theoretical rationale (Kline, 2005; MacCallum & Austin, 2000). Because meaningful theoretical explanations for the covariances could not be found, respecification was considered inappropriate. Finally, results stemming from the W-Test indicated one non-significant causal path leading from relatedness to autonomous motivation. Although this path was shown to be of low statistical importance for the model, and thus could be dropped, further respecification was not made for theoretical reasons. In particular, self-determination theory indicates that relatedness is essential for the internalization of externally regulated behavior (Deci & Ryan, 2000). Hence, Figure 3 displays the final model of transfer motivation predictors: parameter estimates of both measurement models and a structural model representing standardized regression coefficients.

In summary, the study[2] suggested that conceptualizing motivation to transfer in two dimensions (autonomous and controlled) is possible, if the rationale for doing so is grounded theoretically (in our case: expectancy theory and self-determination theory). The study also suggested that relatedness was a weak predictor of autonomous motivation to transfer, while attitudes toward training content were a strong predictor. Among the limitations of this study was that it did not examine the influence of two transfer motivation dimensions on transfer, and that it measured motivation immediately after training. As a remedy to these limitations, another study was done to measure motivation to transfer three months after training and to test its correlates with a transfer measure. This study is reported in turn.

Study 3: Gegenfurtner, A., Vauras, M., Gruber, H., & Festner, D. (2010). Motivation to transfer revisited. In K. Gomez, L. Lyons, & J. Radinsky (Eds.), *Learning in the disciplines: ICLS2010 proceedings* **(Vol. 1, pp. 452-459). Chicago, IL: International Society of the Learning Sciences.**
In this third study, the purpose was to continue theory integration by combining expectancy theory (Vroom, 1964), self-determination theory (Deci & Ryan, 2000), and the theory of planned behavior (Ajzen, 1991). This combined motivational theory approach aimed at testing three dimensions of motivation to transfer: autonomous motivation to transfer, controlled motivation to transfer, and intention to transfer. A second purpose was to estimate the structural relations of these three dimensions with

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[2] This study has received the JURE 2008 Best Paper Award: Gegenfurtner, A., Lehtinen, E., & Gruber, H. (2008, July). *Predicting autonomous and controlled motivation to transfer: Test of a model*. Paper presented at the 12th Conference of Junior Researchers of EARLI, Leuven.

training-related antecedents and outcomes, including transfer, three months after training.

Similar to Study 2, participants were safety inspectors of diverse industrial organizations who attended 1 of 23 5-day training programs in occupational health and safety. The off-the-job training courses took place from August 2006 to January 2007 in five German training centers. Three months after the training, trainees received a paper-and-pencil questionnaire sent to their workplace. The questionnaire collected self-report data that, despite the known problems (e.g., leniency, self-serving bias), seemed adequate to use because a major interest was trainees' self-perceived attitudinal and motivational states. A total of 128 trainees returned the questionnaire and were included in this study. There was no statistically significant difference between respondents and non-respondents. Measures included independent variables (social cues: relatedness, supervisory support, perceived behavioral control, and social norms, as well as affective cues: utility reactions and attitudes toward training content), mediating variables (autonomous motivation to transfer, controlled motivation to transfer, and intention to transfer), and dependent variables (self-reported transfer of training). Analyses included confirmatory factor analysis and, because of the smaller sample size and non-normal distribution, partial least squares (PLS) path modeling.

Results indicated adequate fit of the proposed three-factor structure of motivation to transfer. Specifically, three models were tested. The first model was a three-factor model composed of autonomous motivation to transfer, controlled motivation to transfer, and intention to transfer. The second model was a two-factor model in which autonomous and controlled motivation were merged as if representing one factor. Finally, the third model was a one-factor model that forced autonomous motivation to transfer, controlled motivation to transfer, and intention to transfer into one factor (which is the current research practice). Based on the EQS software (Bentler, 2005), the statistics relative to these models suggest that the three-factor model (χ^2 = 112.24, CFI = .97, SRMR = .08, RMSEA = .05 with 95% CI = .04; .08) represented a better fit to the data than the two-factor model (χ^2 = 148.45, CFI = .85, SRMR = .10, RMSEA = .09 with 95% CI = .07; .12) and the one-factor model (χ^2 = 176.59, CFI = .97, SRMR = .10, RMSEA = .11 with 95% CI = .09; .13). Construct validity of the three-factor solution was tested by assessing convergent, discriminant, nomological, and face validity; we followed the guidelines from Hair and colleagues (2006). Figure 4 presents the parameter estimates of the hypothesized path model. Mediation analysis (MacKinnon et al., 2007) indicates that intention to transfer mediated the effect of autonomous motivation on training transfer; autonomous motivation had a stronger effect on intentions than controlled motivation. Supervisory support, social norms, and utility reactions significantly affected controlled motivation, while attitudes toward training content and utility reactions affected autonomous motivation. Despite the hypotheses, the paths from relatedness, support, and perceived behavioral control to autonomous motivation were non-significant, as was the path from controlled motivation to transfer to intention to transfer. This indicates that autonomous motives lead to more activated intentions than controlled motives three months after training.

In summary, this study found evidence for three dimensions of motivation to transfer: autonomous motivation to transfer, controlled motivation to transfer, and intention to transfer. Limitations of this study are that measurement of motivation was restricted to three months after training and that transfer was measured with a single scale based on trainees' self-reports. Attempting to remedy these limitations, additional analyses were conducted in Study 4, which we present in turn.
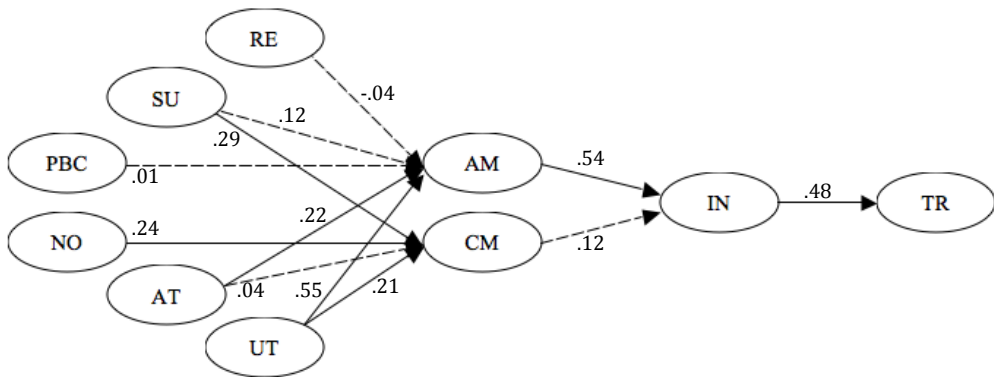
Figure 4. Parameter estimates of the hypothesized path model (p. 454). Solid lines indicate statistically significant relations ($p < 0.5$), while dotted lines indicate non-significant relations. RE = relatedness, SU = social support, PBC = perceived behavioral control, NO = social norms, AT = attitudes towards training content, UT = utility reactions, AM = autonomous motivation to transfer, CM = controlled motivation to transfer, IN = intention to transfer, TR = transfer of training.

Study 4: Gegenfurtner, A. (submitted). Dimensions of motivation to transfer: A longitudinal analysis of their influences on retention, transfer, and attitude change.

In this fourth study, the purpose was to examine the dimensionality of the construct motivation to transfer. Specifically, it was hypothesized that estimates of model fit and construct validity would indicate statistical support for the theoretical assumptions of a three-factor structure specifying autonomous motivation to transfer, controlled motivation to transfer, and intention to transfer. A second purpose was to examine the extent to which trainees' intentions would mediate the transfer process. Specifically, it was hypothesized that autonomous motivation to transfer, controlled motivation to transfer, attitudes toward training content, and knowledge test performance immediately after training would positively predict intention to transfer. In turn, intention to transfer would positively predict increased effectiveness, distribution of training content, attitudes toward training content, and knowledge test performance three months after training. A third purpose was to examine training-related changes in attitudes toward training content and knowledge test scores over a three-month period. It was hypothesized that training would improve trainees' knowledge and attitudes immediately after training and three months after training, controlling for prior knowledge and attitudes before training.

The study used the same sample as Study 3. To examine the additional value of measuring transfer with different criteria and sources (see also Study 5), the present study used three sources of data. First, trainees completed a paper-and-pencil questionnaire immediately before (T1), immediately after (T2), and three months after training (T3). Second, the trainees' supervisors received a questionnaire sent to their workplace three months after training (T3). Third, knowledge tests were administered to trainees immediately before (T1), immediately after (T2), and three months after training (T3). Overall, the present study used three sources of assessment at three measurement times. The longitudinal design was also intended as a first step toward exploring the dynamics of motivational influences on transfer.

Results demonstrated adequate psychometric properties for the three-factor solution of motivation to transfer. Results also indicated that intentions mediated the influence of autonomous motivation and attitudes toward training content (T2) on increased effectiveness and retention. Contrary to expectations, however, there was no mediation with supervisory-assessed transfer and attitudes toward training content three months after training, or statistical significance in mediating paths with controlled motivation to transfer. That is, controlled motivation was non-significantly related to intention to transfer. A post-hoc explanation for the latter finding may be the strong relationship between autonomous motivation to transfer and intention to transfer, indicating that autonomous motivation explained a larger proportion of shared variance than controlled motivation did, resulting in a non-significant role of controlled motivation and, consequently, a limited mediating position. All estimates are shown in Figure 5. Knowledge gains were highest immediately after training. Knowledge test performance three months after training decreased slightly but remained at a significantly higher level than knowledge assessed before training; hence, training seemed to have a positive effect on knowledge gains (Cohen's $d = 1.00$), controlling for prior knowledge. Contrary to expectations, however, there was marginal, non-significant attitude change, albeit in the positive direction (Cohen's $d = 0.27$). One possible explanation of this unexpected finding may be a ceiling effect, that is, a large increase was unlikely because of the high ratings of attitudes toward training content at the beginning of training. Therefore, the favorable view toward occupational health and safety at the outset of the training program (4.39 on a five-point scale) needs to be taken into consideration in evaluating these results.

In summary, this study is informative in its longitudinal evaluation of how knowledge and attitudes develop before, immediately after, and three months after training. The study also makes a new contribution to the field, because it estimates the structural relations of three dimensions of motivation to transfer on different measurements of transfer. Together, Study 4 and its predecessors, Study 2 and Study 3, point at the robust psychometric properties of conceptualizing motivation to transfer in three dimensions, grounded in validated motivation theories. These three studies were limited, however, in examining the boundary conditions of motivational influences on transfer. These are estimated in more detail in Studies 5, 6, and 7 in Part II of this thesis.
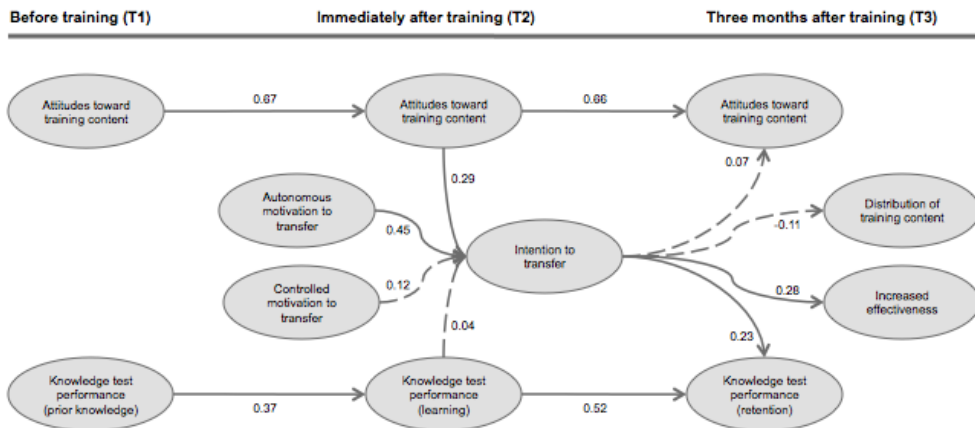

Figure 5. Parameter estimates of the hypothesized path model.

Study 5: Gegenfurtner, A. (2011). Motivation and transfer in professional training: A meta-analysis of the moderating effects of knowledge type, instruction, and assessment conditions. *Educational Research Review*, *6*.

In this study, the purpose was to inquire whether motivation, after controlling for sampling error and error of measurement, exhibits a stable influence on transfer; for this purpose, motivation was conceptualized in several dimensions in order to reflect validated theories that are frequently used in the transfer of training literature, including Bandura's (1997) social cognitive theory, Dweck's (1986) theory of goal orientations, and Vroom's (1964) expectancy theory. This eclectic choice of motivation theories aimed at covering the need-motive-value dimension (i.e., mastery orientation, performance orientation, and avoidance orientation), cognitive-choice dimension (i.e., expectancy and instrumentality), and self-regulation dimension (i.e., self-efficacy) of human motivation (Kanfer, 1990). A second purpose of this study was to estimate the extent to which knowledge type (Schraw, 2006), instruction (Bransford et al., 1999), and assessment conditions (Segers et al., 2003) moderate the motivation-transfer relationships.

Meta-analysis (Hunter & Schmidt, 2004) was used to estimate motivational influences on the transfer of training. A total of 146 articles, book chapters, conference papers, and dissertations that contributed at least one effect size to the meta-analysis were included in the database and coded for effect size estimates, study characteristics, training characteristics, and transfer assessment conditions. Intercoder reliability was generally high (Cohen's κ = .96). Relationships between transfer and nine motivation dimensions (motivation to learn, motivation to transfer, pre- and post-training performance self-efficacy, mastery orientation, performance orientation, avoidance orientation, expectancy, and instrumentality) were estimated with the methods of artifact distribution meta-analysis of correlations (Hunter & Schmidt, 2004). Boundary conditions of knowledge type, instruction, and assessment conditions were estimated with (nested) subgroup analysis. Details are discussed in Section 3 of this dissertation.

Results demonstrated predictive validity of the tested motivation theories (Bandura, 1997; Dweck, 1986; Vroom, 1964). However, the results of the meta-analytic moderator analyses illustrated boundary conditions for the motivation-transfer relationships. Knowledge type, instruction, and assessment conditions were found to moderate the size of the population correlation estimates for all nine of the motivation dimensions. In the case of avoidance orientation, the direction of the correlation was also altered from negative to slightly positive when training self-regulatory knowledge. However, this finding may be subject to second-order sampling error.

In summary, this meta-analysis[3] has implications for the development of theories of training effectiveness and for the practice of training evaluation (which will be discussed later). Study 5 can be seen as a follow-up of Study 1, because it offers a psychometric assessment of the narrative analyses associated with the relation between motivation to transfer and transfer of training (Proposition 7 in Study 1). A limitation of Study 5 was that it assessed only three boundary conditions. As a remedy, more moderator variables are estimated in Studies 6 and 7, which we will describe next.

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[3] This study has received the 2011 Student Research Excellence Award of the Special Interest Group "Motivation and Emotion" (SIG 8) of the European Association for Research on Learning and Instruction (EARLI): Gegenfurtner, A. (2011, August). *Effects of motivation on transfer: A meta-analysis*. Paper presented at the 14th EARLI Conference, Exeter.

Study 6: Gegenfurtner, A., & Vauras, M. (2012). Age-related differences in the relation between motivation to learn and transfer of training in adult continuing education. *Contemporary Educational Psychology*, *37*.

In this study, the purpose was to test the predictive validity of two views of age-related differences on the relation between motivation to learn and transfer of training: a view of age-related motivational decline, which was grounded in socioemotional selectivity theory (Carstensen, 2006) and a lifespan approach to expectancy theory (Kanfer & Ackerman, 2004), and a view of age-related motivational maintenance, which was grounded in research on workplace curiosity (Reio & Choi, 2006) and the person-object theory of interest (Krapp, 2005). A second purpose of the study was to estimate the boundary conditions of social training context, as well as different study (publication type, study setting,, SS/SMC bias, use of control group, survey modality, type of instrument used to measure motivation to learn) and participant characteristics (level of education, attendance policy, work context).

The study uses a subset of the meta-analytic database developed for Study 5. A total of k = 38 studies with N = 6,977 participants has been included. Methods were equivalent to Study 5, with the exception of using weighted least squares (WLS) multiple regression for assessing the continuous moderator variable of biological age. In all, the data were found to be normal and linear. The Levene test indicates heteroscedasticity of the spread of variance of the correlation between motivation to learn and transfer across the range of age values. Heteroscedasticity was compensated for using weighted least squares (Steel & Kammeyer-Mueller, 2002).

Results demonstrated that age has a non-significant main effect on motivation to learn, $F(1, 24)$ = 6.62, and a significant moderating effect on the relation between motivation to learn and transfer of training, $F(1, 26)$ = 13.54, $p < .01$. Subgroup analyses illustrated that the positive effect of age on motivation to learn and transfer of training is higher in social than individual training contexts, which we interpreted as evidence for superior emotion regulation of older learners in social settings (Baltes, 1997; Vauras, Salonen, & Kinnunen, 2008; Volet, Vauras, & Salonen, 2009).

The findings of this study[4] suggest that the relationship between motivation to learn and transfer of training increases with increasing age. Therefore, this finding supports the predictive validity of the view of age-related motivational maintenance. Implications for theory development are associated with refining ageist assumptions in some conceptual frameworks on work motivation. Importantly, this study does indicate significant boundary conditions of age differences on the relation between motivation to learn and transfer of training, suggesting implications for the design of adult continuing education and training. A limitation of this study was the use of a restricted set of moderator variables. Importantly, the social training context needs to be investigated more deeply and time has also not been assessed in detail. Therefore, Study 7 focuses on computer-supported collaborative learning and on time lag.

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[4] Together with Study 5, this study has received the 2011 Student Research Excellence Award of the Special Interest Group "Motivation and Emotion" (SIG 8) of the European Association for Research on Learning and Instruction (EARLI). This study has also received the 2011 Best Poster Award of the Working Group Empirical Educational Research (AEPF): Gegenfurtner, A., & Vauras, M. (2011, September). *Fakten und Fiktion zum Altersproblem in der Lehrerweiterbildung: Eine Meta-Analyse von 25 Jahren empirischer Forschung*. Poster presented at the 76th Tagung der Arbeitsgruppe für Empirische Pädagogische Forschung (AEPF), Klagenfurt.

Study 7: Gegenfurtner, A., Vauras, M., & Veermans, K. (submitted). Effects of computer support, collaboration, and time lag on performance self-efficacy and transfer of training: A longitudinal meta-analysis.

In this study, the purpose was to cumulate 25 years of previous research in order to correct the size of true score population correlations between transfer of training and performance self-efficacy, when self-efficacy was measured both before (T1) and after (T2) training. A second purpose was to estimate the moderating effects of time lag on this longitudinal development, as well as the effects of computer support and collaboration. The meta-analysis was grounded in social cognitive theory (Bandura, 1997). In light of the growing interest in computers and learning, and of constant technological innovations that enter education, Study 7 also tested the assumption in contemporary computer-supported collaborative learning (CSCL) research that "deep learning is more likely in complex social and technological environments" (Sawyer, 2006, p. 13). If it is true that deep learning is associated with transfer (Pugh & Bergin, 2006), then it follows that higher population correlation estimates should be obtained in training environments that contain elements of CSCL environments.

The study uses a subset of the meta-analytic database developed for Study 5. A total of k = 29 studies with N = 4,158 participants has been included. Methods were equivalent to Studies 5 and 6, that is, WLS multiple regression has been used for the continuous moderator "time lag" (coded as the number of days between training end and the transfer measure) and nested subgroup analysis has been used for the categorical moderators "computer support" (coded as yes/no) and "collaboration" (coded as yes/no), resulting in four different training conditions: computer-supported collaborative training, computer-supported individual training, collaborative training without computer support, and individual training without computer support.

Results suggested four trends. First, time lag had no statistically significant effect (p > .05) on the relationship between self-efficacy and training transfer. Second, computer support moderated the relationship between self-efficacy and training transfer, with higher estimates for computer-supported trainings. Third, collaboration moderated the relationship as well, with higher estimates for individual trainings. Fourth, when examining computer support and collaboration as confounded moderators, positive longitudinal development of the self-efficacy transfer of training from pre- to post-training was highest when technology did enhance collaboration.

To summarize, the study highlighted the usefulness of investigating the relationship between motivational variables (in this case, performance self-efficacy) and transfer from a dynamic perspective; as such, the study addresses one limitation that was identified in the integrative literature review in Study 1. Importantly, our analyses point at boundary conditions for the development of motivational influences on transfer; these boundary conditions (computer support, collaboration, and time lag) are illustrated in Figure 6.

As noted at the outset of this section, we attempted here to give an overview of the studies included in this dissertation; it was not possible to describe the findings of all seven studies in full detail. However, we did attempt to discuss the main findings of each study with particular reference to the overarching aims of this thesis, namely to identify the dimensionality of motivation to transfer and its structural relations with training-related antecedents and outcomes (Part I) and to test the predictive validity of motivation theories used in contemporary training research under different study conditions (Part II). Table 4 provides a final overview. The next section elaborates on these findings in greater detail and also discusses theoretical and practical implications that follow from the work on this dissertation.
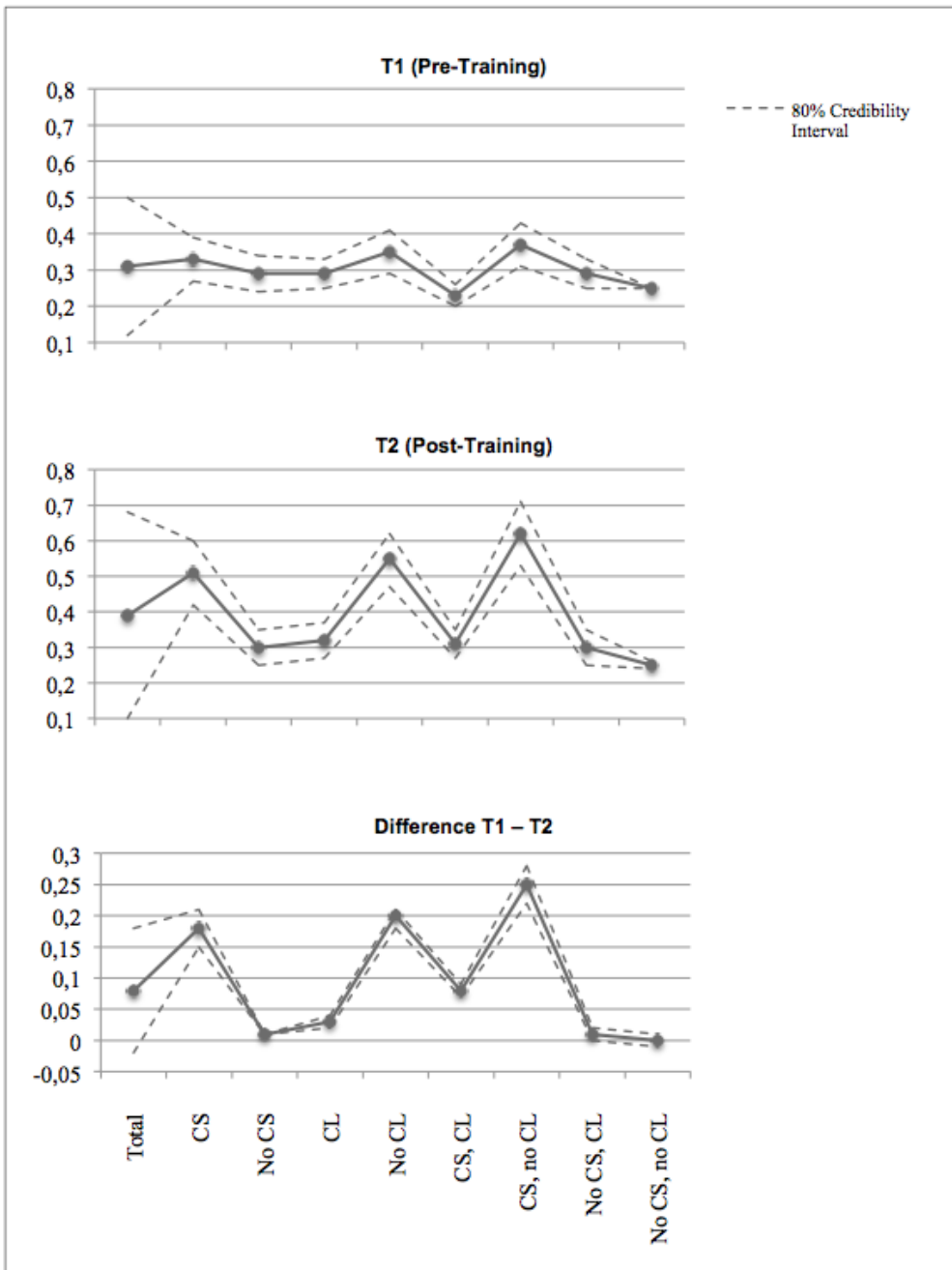
Figure 6. Population correlation estimates ρ between performance self-efficacy and training transfer by condition and measurement time. CS = computer support, CL = collaboration, T1 = pre-training, T2 = post-training.

Table 4

Summary of Theoretical Grounding, Dimensions, and Boundary Conditions

Study	Theory	Dimensions	Boundary conditions
Study 1	-	Motivation to transfer	-
Study 2	Expectancy theory, self-determination theory	Autonomous and controlled motivation to transfer	-
Study 3	Expectancy theory, self-determination theory, theory of planned behavior	Autonomous and controlled motivation to transfer, intention to transfer	-
Study 4	Expectancy theory, self-determination theory, theory of planned behavior	Autonomous and controlled motivation to transfer, intention to transfer	-
Study 5	Social cognitive theory, theory of goal orientations, expectancy theory	Motivation to learn, motivation to transfer, pre- and post-training performance self-efficacy, mastery orientation, performance orientation, avoidance orientation, expectancy, instrumentality	Knowledge type, instruction, assessment conditions
Study 6	Socioemotional selectivity theory, lifespan approach to expectancy theory, workplace curiosity, person-object theory of interest	Motivation to learn	Age, social training context, study characteristics, participant characteristics
Study 7	Social cognitive theory	Pre- and post-training performance self-efficacy	Computer support, collaboration, time lag

5. Main Findings and Discussion

The aim of the dissertation's studies was, first, to explore separate dimensions of motivation to transfer by using a theoretical grounding in validated motivation frameworks, and, second, to test the predictive validity of those motivation theories that are frequently used in contemporary training research by examining their predictions under different boundary conditions. The main focus of this research was to achieve a detailed understanding of motivational influences on transfer, as they relate to adult learning in higher education and corporate training settings. This detailed understanding was informed by theoretical considerations. Specifically, and associated with a growing trend in motivation research to strive toward synergy (Locke & Latham, 2004), the theoretical framework in Part I for assessing separate dimensions of motivation to transfer was based on expectancy theory, self-determination theory, and the theory of planned behavior. First, the rationale for combining expectancy theory as a cognitive-choice approach and self-determination theory as a need-motive-value approach to assess autonomous and controlled motivation to transfer was that both theory frameworks complement each other in predicting and explaining human performance in the workplace (Kanfer, 1990). Thus, instrument and valence items reflecting externally prompted reasons to transfer were used to assess controlled motivation; conversely, instrument and valence items reflecting internally regulated behavior were used to assess autonomous motivation. Second, the rationale for using the theory of planned behavior was to conceptualize a more activated dimension of transfer motivation. Although the currently used methods and designs do not allow the statement that intention to transfer reflects a state measure, while autonomous and controlled motivation to transfer does reflect a trait measure, the nature of intentions is indeed more situation-specific and can contribute to the implementation of motivational beliefs into concrete action.

Our results led to a three-dimensional conceptualization of transfer motivation that comprises autonomous motivation to transfer, controlled motivation to transfer, and intention to transfer. Moreover, the theoretical conceptualization could be psychometrically confirmed, particularly in Studies 2, 3, and 4. There, our results demonstrate empirically the differential impact of the three dimensions of transfer motivation on post-test retention and transfer, and they do additionally indicate a nomological network of social and affective cues affecting the three dimensions of motivation to transfer immediately and three months after training.

In an attempt to estimate motivational influences on transfer more broadly, the set of meta-analyses in Part II contributed to our understanding of how population correlation estimates are contingent on the contextual affordances of the study setting. It follows that the predictive validity of some frameworks on work motivation can be compromised, suggesting a reconsideration of some of the underlying premises (as will be discussed later). The results outline how study estimates are moderated by the type of knowledge trained (declarative, procedural, self-regulatory knowledge); by the type of instruction (learner-centered, knowledge centered); and by the way transfer is

assessed (assessment source and assessment criterion). Furthermore, the results demonstrate that the relationship between motivation to learn and transfer of training increases with increasing age, and that this increase is even stronger in social training conditions. Finally, the results from Part II also suggest that computer support is more significant than collaboration in the longitudinal development of the relation between performance self-efficacy and transfer of training; those findings help demystify some of the (maybe tacit) assumptions in the CSCL arena that deep learning and transfer are more likely in complex social and technological settings. Some consequences for our educational design are covered below to critically appraise implications of what was learned from the meta-analytic cumulations of 25 years of empirical research.

Overall, the present set of studies is the first to estimate different dimensions of motivation to transfer; to explore motivation's relationship to transfer; and to systematically examine a range of boundary conditions under which motivational influences on transfer are particularly prevalent. We note the tentative nature of these results. It follows that the present set of studies is seen as the first steps into a more exact understanding of the nexus between motivation and transfer, and hence replications, modifications, and extensions are necessary to deepen or revise our conclusions. In closing this introductory chapter of the dissertation, this final section discusses implications for theory development, implications for educational practice, and directions for future research.

5.1. Implications for Theory Development

Our estimations of motivational influences on transfer have several implications for the development of theories of training motivation and training effectiveness. First, the assumption in previous research that motivation to transfer reflects a one-dimensional construct has been challenged by our explorations into the multidimensionality of transfer motivation. Our work suggests that the motivational processes of trainees aiming at the productive use of newly learned knowledge and skills after a training program cannot be sufficiently conceptualized in terms of earlier frameworks that describe only the amount of motivation to transfer. Rather, the empirical portions of our work clearly argue for conceptualizing motivation to transfer with alternative theories (alternative to contemporary training theories) that describe not only the amount, but also the kind of motivation to transfer. It seems that separating the dimensions of transfer motivation explains a larger portion of variance, hence accounting for higher degrees of individual differences among trainees and their motivational processes involved in the application of training at work. Importantly, these implications for the development of a multidimensional theory of motivation to transfer—reflecting both a cognitive (instrumental) and affective (valence) dimension as well as an additional, more activated situational intention—need further elaboration with different samples of varying age or cultural background to test its contextual stability and to develop a more precise terminology of the processes involved when we transfer content from training to work.

A second implication for theory development concerns the integration of motivation into our existing theories of training effectiveness. In all studies included in this dissertation, the motivation dimensions showed correlation estimates with transfers different than zero. Therefore, we can conclude that motivation is relevant for transfer. Some conceptual models of the transfer of training may appear to disregard motivational determinants because they emphasize cognitive or work environmental factors. However, no contradiction arises between an emphasis on cognition or on context if we assume that why we act is not directly initiated or maintained by our

environment, but instead is mediated by how we perceive the environment and ourselves (Heider, 1958). This basic assumption is reflected in all motivation theories included in this study (Bandura, 1997; Dweck, 1986; Noe, 1986; Vroom, 1964) and is in line with further elaborations in a range of transfer-related studies (Inagaki & Hatano, 1977; McKeachie, 1987; Pugh & Bergin, 2006; Renkl et al., 1996; Volet, 1999). Thus, theories of training effectiveness that do not include motivation do not deny the existence of motivational mediation; instead, they simply emphasize other factors. On the other hand, some theoretical models already do address the central role of motivation in the transfer process (Beier & Kanfer, 2010; Kontoghiorghes, 2004). Our findings empirically support these theoretical notions, which in turn indicates the need to incorporate motivation in future theories of training and training effectiveness. Theories that assume either the absence of, or a negligible role for, motivation are unlikely to be scientifically productive (Bransford et al., 1999; Kanfer, 1990; Lehtinen, 2008). At the same time, a need clearly exists for the inclusion of refined dimensions of motivation. Motivation is too complex a phenomenon to be downsized to a single factor. As the trend toward theory refinement continues, the dimensionality of established constructs such as motivation to transfer might be reconsidered from individual perspectives to consider, for example, autonomous and controlled dimensions of transfer motivation, as well as from sociocultural perspectives to consider how motivation shapes and is shaped by social and social-regulatory mechanisms in the training environment (Billett, 2009; Volet et al., 2009).

A third implication for theory development concerns the refinement of existing frameworks on work motivation. For example, as is evidenced in our meta-analysis of surveying more than 4,000 trainees in Study 6, some ageist assumptions on the decrease of motivation to transfer can be reconsidered. Specifically, Kanfer and Ackerman (2004), as well as Carstensen (2006), hypothesize a relative reluctance of older workers to engage in new skills training. They support this assumption with changes in the perception of time and in performance-utility/effort-utility functions. We shall note that neither theory directly aims at explaining motivation in training and adult continuing education, but rather (work) motivation in general. However, our results do have implications for challenging some of the assumptions related to older workers in these theories. Specifically, we found no support for the notion that employees become less curious to novelty as they age (see also Reio & Choi, 2006, for a similar conclusion). Still, in the context of motivation to participate in training and to learn new content, we cannot totally rule out age-related motive changes. It seems obvious that not all older employees attend training programs with the same underlying motive. However, this is also true for younger employees. The empirical evidence would tend to indicate a need to reconsider some assumptions on age-related changes in theories addressing the temporal unfolding of motivation to transfer over the course of a working life.

Finally, a last implication for theory development concerns the integration of boundary conditions in theories on motivation to transfer more generally (see also Heider, 1958; Kanfer, 1990; Krapp, 2005; Pugh & Bergin, 2006; Renkl et al., 1996; Säljö, 2003). Across all studies, we do see evidence for the fact that motivational influences on transfer are not constant or universal; rather, different conditions moderate whether and to what extent motivation correlates with transfer. The need to focus on these boundary conditions is explicated in the following quote by Rich Mayer (2009), who discusses boundary conditions in the context of multimedia learning:

As the field of research (on multimedia learning) matures, new research can be expected to clarify boundary conditions under which the principles apply. Sometimes researchers may frame such results as 'failures to replicate,' but a more productive approach is to search for boundary conditions based on cognitive theory. (p. 273)

Clearly, his statement refers to multimedia learning, not to transfer of training. But if we try to transfer the core message from multimedia learning to our context of study, then we may begin to understand how meaningful it is to cumulate the available evidence on different study situations to a more complete (or less fallible) picture of how motivation influences training transfer. Then these investigations into boundary conditions, which we started with Studies 5-7, can inform us on revising the generality of certain elements that we have, maybe tentatively, included in or excluded from our theories (Akkerman & Bakker, 2011; Mayer, 2009).

5.2. Implications for Educational Practice

Our analyses in Studies 1 to 7 have implications for educational practice; these are discussed in turn for those engaged in training evaluation and then for those engaged in the design of training environments. First, for those engaged in training evaluation, our findings from Study 5 illuminating the confounded moderator effect of assessment criterion and source tends to highlight the danger of basing conclusions about the effectiveness of a program on single assessment conditions. It seems plausible to consider multiple criteria and sources to assess transfer—advice that has previously been advocated in the training literature (Aguinis & Kraiger, 2009; Bates, Holton, Seyler, & Carvalho, 2000). Specifically, cross-correlations between assessment criterion and source may contribute to our understanding of the robustness of the results of training evaluations, thereby offering a more accurate estimate of the effectiveness of individual training programs. An additional implication is the use of alternative modes of assessment. Recent training literature noted that peer ratings are an especially promising new approach (Brown & Latham, 2002). While peer assessment still needs to undergo identity formation, recommending its use alongside other sources would appear to be a safe strategy for assessing training effectiveness. Not only can peers validate trainees' self-ratings or ratings from their supervisors, but peer assessment also seems to exert a positive influence on trust and psychological safety in work groups (Van Gennip, Segers, & Tillema, 2009). Thus, although Study 5 signals a current dearth in the use of peers as assessment sources, greater numbers of individual studies in the near future are expected to employ peer ratings to evaluate training programs. Furthermore, analyses of boundary conditions indicate the risk of basing conclusions on the effectiveness of a training program on what may seem to be objective criteria; however, as was evident in Studies 5-7, relationships between motivation and transfer are not universal. It follows that training evaluators may want to be aware of how training and participant characteristics can moderate evaluation results.

Second, our analyses have implications for those engaged in the design of training environments. First, Study 2 found that instructional satisfaction affects autonomous motivation to transfer. This finding highlights the importance of using adequate instructional methods and activities. For instance, feedback and practice were shown to facilitate learning and transfer (Burke & Hutchins, 2007; Kuchinke, 2000). The trainees' satisfaction with these interventions leads to transfer motivation and to better application outcomes. One major aspect of designing training is thus to provide various and diversified instructional techniques and methods. Based upon the items

used in Study 2, such aspects include the following: encouraging active participation, providing vivid and demonstrative examples, allowing trainees to provide their own examples, taking into account trainees' working experiences and views, and creating a helpful and cooperative atmosphere. These steps can help to enhance trainees' instructional satisfaction and, in turn, enhance their motivation to apply training content in the workplace. Another implication concerns the design of learner-centered environments. Study 5 suggests that stronger motivation-transfer relationships exist for learner-centered environments. This finding cannot be taken as a blind recommendation for designing all training programs in this manner (Bransford et al., 1999), since the importance of knowledge-centered elements for efficient instruction cannot be ignored (Mayer, 2009). However, the finding can serve as an empirical illustration for the benefits of considering learner-centered elements in a training program. A similar recommendation can be given with respect to a social training context (Study 6) and computer support (Study 7). Finally, in light of our results of Study 6, we did not find any evidence for an age-related decline in motivation, so we do not join the call for designing extra environments for older learners. While an age-related decline in working memory capacity (Baltes, 1997) may justify specialized instructional design, our data do not support initiation of managerial practices to raise motivation to learn in older employees. Based on our findings, however, training programs should offer the possibility for social interaction, because the expectation of contact with peers seems to be emotionally meaningful (Vauras et al., 2008; Volet et al., 2009), especially for older employees (Carstensen, 2006). In their review of aging and work motivation, Kanfer and Ackerman (2004) note, "[T]he reorganization of goals and exchange of motive primacy associated with midlife alter the work motivation landscape for numerous employees and present a conundrum for many organizations" (p. 452). They recommend redesigning work to permit new learning opportunities for younger employees. In light of our present findings and the positive relation between motivation to learn and transfer as a function of age, we would extend Kanfer and Ackerman's recommendation to older employees. Whereas research and theory on work transitions and cognitive novelty-seeking support this notion (Reio & Choi, 2006), validating the effectiveness of this recommendation remains an important empirical question. A last implication derived from our findings of Study 6 concerns the design of adult education for younger learners. As our analyses suggest, the relation between motivation to learn and transfer of training is weaker for younger learners. We would therefore recommend redesigning training programs and follow-up interventions for this training audience. Particularly, adult educators may wish to increase feelings of accountability (Burke & Saks, 2009) toward training transfer. As older employees typically show positive organizational citizenship behavior (Maurer, Weiss, & Barbeite, 2003), including applying training at work, younger employees may benefit from interventions that adjust organizational responsibility (see also Burke & Saks, 2009, for a similar conclusion in the context of HRD).

5.3. Directions for Future Research

At the end of this introductory chapter, let us look back at the individual seven studies and, in particular, at their limitations. These limitations, it is assumed, can inform directions to take in future research to further our understanding of motivational influences on transfer. A first limitation is the exclusive focus on out-of-school environments, concentrating on adult samples in higher education and corporate settings (restricted to occupational safety and health). It would be interesting to explore whether the motivation-transfer relationships are stable for child populations.

One could expect differences owing to the more playful attitude of children (Dewey, 1911) and the less outcome-oriented internalization of external values, such as rewards or monetary incentives that are considered to drive much engagement in organizational settings (Gagné & Deci, 2005; Vallerand & Ratelle, 2002). Testing the assumptions from our study with school and classroom populations in primary or secondary grades may explore the generality of motivational influences on transfer.

A second limitation was that all data was correlational. Even sophisticated estimation methods cannot produce causality. The underlying premise in all our studies was that motivation influences transfer, not vice versa. But based on the methods used, we can only limit the likelihood of error associated with reverting the direction of causality. It seems plausible to assume that, after some weeks back at work, a training participant may have applied newly learned skills, which then results in a temporary increase in effort-utility functions and a subsequent increase in motivation to transfer. The possibility of a reversed direction of causality provides an interesting point for future examinations. Based on the limited affordances of correlational data, we would highlight the option of conducting controlled experiments (in lab or field studies) to be able to draw firmer conclusions on the direction of the correlations identified in the present set of studies. This option would be a second direction for future research.

A third limitation pertains to the measurement of intention to transfer in particular and the question of state and trait motivation in general. We argued in Study 4 (and partly in Study 3) that intention to transfer represents a more activated motivational state, which mediates the effects of the stable and more distal motivational traits of autonomous and controlled motivation to transfer. The rationale for this argument was grounded in self-determination theory and the theory of planned behavior. Importantly, however, our measures of intention to transfer were not repeated. Therefore, we cannot draw definite conclusions on the dynamics of intention to transfer or on the temporal stability of autonomous and controlled motivation to transfer. It follows that the arguments in Study 4 on the state/trait discussion need to be regarded as tentative. What we need are multiple measures of intentional states over a short period of time to be able to explore the situational nature of transfer intentions and changes in effort-utility functions. A related direction for future research is the use of alternative assessment tools, because it seems plausible that paper-and-pencil questionnaires afford limited time-sensitive distribution options. Digital or virtual assessment could be a remedy, but this direction needs to be tested empirically for a more rigorous understanding of the situational unfolding of motivation, and of transfer as well.

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