UNIVERSITÄT DES SAARLANDES

Fakultät HW

Bereich Empirische Humanwissenschaften

Testing a Model of Self-regulation in Preschool Age

and

Evaluating a Self-regulated Learning Promotion Strategy Training for Kindergarten Teachers and Parents under Consideration of Individual Influences

Dissertation zur Erlangung des akademischen Grades eines Doktors der Philosophie der Fakultät HW

Bereich Empirische Humanwissenschaften

der Universität des Saarlandes

vorgelegt von

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Saarbrücken, 2019

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Tag der Disputation: 10.10.2019

Acknowledgements

First of all, I would like to thank my doctoral supervisor Prof. Dr. Franziska Perels. Since she gave me the opportunity to work on the project and to do my doctorate, I was given the chance to build on the knowledge and scientific working methods acquired during my studies and to combine them profitably with practical work in elementary context. Her interest and expertise in self-regulated learning, to which I have had little reference so far, quickly convinced me to become part of such a valuable project for preschool-aged children.

I would like to express my thankfulness for her great support throughout the entire duration of the project. I would also like to express my thankfulness for having been part of a very pleasant working group. All colleagues were always open to my questions and willing to share their personal experiences, from which I was able to benefit greatly. Special thanks go to my former room-mate, Lisa Dörr, with whom the cooperation throughout all phases of the project was very pleasant and profitable.

I would also like to thank the numerous student assistants who have always supported us with their full commitment.

Finally, I would like to thank my family for their unconditional support. Even in difficult times they were always there for me and gave me support. As a university professor, my father was always a role model when it came to my professional development. I was able to benefit from his experience in everyday life at the university several times and I always had an excellent contact person for work matters. The feeling of always being able to rely on the support of my family has given me strength and self-confidence to take on the challenge of a doctorate and actually complete it.

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List of Abbreviations

ANCOVA	analysis of covariance
ANOVA	analysis of variance
BIC	Bayesian information criterion
CFA	confirmatory factor analysis
CFI	comparative fit index
CG	control group
df	degrees of freedom
EF	Executive Functions
FIML	full information maximum likelihood
LCA	latent class analysis
LMRT	Lo-Mendell-Rubin test
LPA	latent profile analysis
M	mean
ML	maximum likelihood
MLR	robust maximum likelihood estimator
RMSEA	root mean square error of approximation
SD	standard deviation
SEM	structural equation modelling
SPSS	Statistical Package of Social Sciences
SRL	self-regulated learning
SRMR	standardized root mean square residual

List of Publications

The present dissertation is based on three articles that are published in peer-reviewed journals. Full articles can be found in the appendix of this dissertation and are available online through the respective publishing company.

1. Venitz, L. & Perels, F. (2017). Empirische Überprüfung eines Modells der Selbstregulation für das Vorschulalter. *Zeitschrift für Grundschulforschung*, *10*(2), 110-121.
2. Venitz, L. & Perels, F. (2018). Promoting self-regulated learning of preschoolers through indirect intervention: A two-level approach. *Early Child Development and Care*, 1-14.
3. Venitz, L. & Perels, F. (2019). The Promotion of Self-regulated Learning by Kindergarten Teachers: Differential Effects of an indirect intervention. *International Electronic Journal of Elementary Education*, *11*(5), 437-448.

Summary

Because of study results reviewing school achievement (e.g., Programme for International Student Assessment, see Klieme et al., 2010) self-regulated learning (hereinafter SRL), defined as a process, in which "self-generated thoughts, feelings and actions are planned and cyclically adapted to the attainment of personal goals" (Zimmerman 2000, p. 14) has become an integral aim of the German education system. Despite of multiple empirical findings confirming a predictive influence of early SRL on future academic achievement (e.g., Nota, Soresi & Zimmerman, 2004; Blair & Razza, 2007; McClelland et al., 2007; Denham, Warren-Khot, Bassett, Wyatt, & Perna, 2011), interventions concerning SRL in young children are rare (Perels, Merget-Kullmann, Wende, Schmitz, & Buchbinder, 2009). In fact, particularly at preschool, an implementation of interventions promoting SRL seems to be useful because the development of many SRL abilities (e.g., attention-focusing) progress quickly in this time period (Larkin, 2010). In addition, children in this age group face many new challenges associated with the transition to primary school which can be better facilitated if the children are equipped with abilities to organize their learning processes independently (Morrison, Ponitz, & McClelland, 2010). Developmental-psychological findings (e.g., Bronson, 2000; Whitebread et al., 2009) clarify, that the support of important reference persons plays a decisive role in the development of SRL behavior in the first years of life. This is why they must be included into an intervention for preschool-aged children in any case.

Based on these empirical assumptions, study I investigated the structure of SRL in preschool-aged children by developing and evaluating a model of self-regulation for preschool age in reference of Bronson's (2000) research findings. Because it is still discussed if and how many (meta-)cognitive conditions for SRL have already been developed by preschool age, a model for this target group has to consider developmental-psychological abilities. As this age group is rarely examined empirically, a new conceptualization of self-regulation in preschool age was developed based on the research of Martha Bronson (2000). The model which distinguishes between the components emotional, prosocial, cognitive and motivational self-regulation was empirically tested by the means of confirmatory factor analysis in MPlus (Muthén & Muthén, 2012). Because of preliminary findings of studies concerning the importance of SRL for performance (e.g., McClelland et al., 2007; Ponitz, McClelland, Matthews, & Morrison, 2009; Von

Suchodoletz et al., 2013), the relation of self-regulation on performance was further examined by the means of structure equation modeling. The results of the study indicate that self-regulation in preschool age can be adequately represented by these four theoretically assumed components. However, a predictive value of performance for self-regulation in preschool age could not be confirmed. As teachers report having difficulties to implement suitable methods in teaching practice (e.g., Dignath-van Ewijk & Van der Werf, 2012; Serratore, 2015; Tilema & Kremer-Hayon, 2002), study II aimed at the development and evaluation of a suitable SRL promotion training for kindergarten teachers and parents. Theoretical assumptions of Bandura (1977), Vygotsky (1978) and Pramling (1988), underline the importance of an adequate support of essential reference persons for the development of SRL behavior in the first years of life. In conclusion, an intervention for kindergarten teachers and parents of preschool-aged children which aimed to optimize the SRL behavior of the participants and mediate suitable strategies to foster SRL in preschoolers was developed and investigated concerning its effectiveness. The results of the study revealed, that the SRL behavior of kindergarten teachers as well as their knowledge in terms of SRL promotion strategies could be enhanced through the training. However, an indirect training effect on the SRL of the preschool-aged children could not be found. Because of the natural heterogeneity of training groups, it can be assumed that the training has different effects on the single participants of the training (Lapka, Wagner, Schober, Gradinger, & Spiel, 2011). By using a variable-oriented approach, as it was implemented in study II, these individual differences are neglected and only global effects of the training can be revealed. However, with the help of a person-centered approach, changes through the training in relation to special subgroups can be analyzed additionally. Based on these assumptions, study III aimed at an investigation of differential effects of the SRL promotion strategy training for kindergarten teachers. The results of LPA revealed that there are three different profiles within the trained kindergarten teachers which differ significantly concerning the knowledge of SRL promotion strategies. Moreover, results speak in favor of differences in the effectiveness of the training in dependence of the detected profiles. Whereas kindergarten teachers with low SRL promotion strategy profile benefited significantly through the training, kindergarten teachers with high SRL promotion strategy profile did not. Consequently, the development of an intervention that responds to the needs of the different profile groups seems to be necessary. Taken together, the present thesis contributes to a more profound theoretical view of SRL in preschool-aged children by investigating its empirical structure, by confirming preliminary findings

of the effectiveness of an intervention of kindergarten teachers and parents (see Perels et al., 2009) and by supplementing the results by further investigating differential effects within the training group. Based on these findings, the provision of optimized contents, methods and learning environments within a SRL promotion strategy training for kindergarten teachers seems feasible.

Zusammenfassung

Vor dem Hintergrund von Ergebnissen aus Schulleistungsstudien (z.B., PISA, vgl. Klieme et al., 2010) wurde selbstreguliertes Lernen, welches als Prozess definiert wird, in dem selbstgenerierte Gedanken, Gefühle und Handlungen geplant und zyklisch auf die Erreichung persönlicher Ziele hin angepasst werden (Zimmerman, 2000), zum integralen Bestandteil des deutschen Bildungssystems erklärt. Trotz verschiedener Studien, die den bestimmenden Einfluss von frühem selbstregulierten Lernen auf zukünftige (schulische) Leistung bestätigen (z.B. Nota et al., 2004; Blair & Razza, 2007; McClelland et al., 2007; Denham, Warren-Khot, Bassett, Wyatt, & Perna 2011) sind Untersuchungen in Bezug auf selbstreguliertes Lernen von Vorschulkindern noch selten (Perels et al., 2009). Dabei erscheint eine Implementierung von Interventionen besonders im Vorschulalter gewinnbringend, da sich in dieser Zeit viele SRL Fähigkeiten (wie z.B. die Aufmerksamkeitsfokussierung) rasant weiterentwickeln (Larkin, 2010). Hinzu kommt, dass Kinder in dieser Altersklasse sich vielen neuen Herausforderungen, die in Verbindung mit dem Übergang vom Kindergarten in die Grundschule stehen, stellen müssen. Diese können sie besser bewältigen, wenn sie mit Fähigkeiten ausgestattet werden, die ihnen helfen ihren Lernprozess zu organisieren (Morrison et al., 2010). Entwicklungspsychologische Befunde (z.B., Bronson, 2000; Whitebread et al., 2009) verdeutlichen, dass die Unterstützung durch wichtige Bezugspersonen eine entscheidende Rolle in der Entwicklung des SRL in den ersten Lebensjahren spielt. Aus diesem Grund sind sie grundlegend in eine Intervention zur Förderung von Vorschulkindern mit einzubeziehen.

Ausgehend von diesen empirischen Annahmen, untersucht Studie I die Struktur selbstregulierten Lernens anhand der Evaluation eines Modells der Selbstregulation für das Vorschulalter in Bezugnahme auf die Befunde von Bronson (2000) entwickelt wurde. Da weiterhin diskutiert wird, ob und welche meta(-kognitive) Voraussetzungen für selbstreguliertes Lernen bereits im Vorschulalter entwickelt sind, muss ein Modell selbstregulierten Lernens für diese Zielgruppe entwicklungspsychologische Fähigkeiten berücksichtigen. Diese Altersklasse wurde bisher nur wenig empirisch untersucht, sodass zunächst ein neues Konzept von SRL im Vorschulalter aufbauend auf Untersuchungsergebnissen von Martha Bronson (2000) entwickelt wurde. Das Modell, welches zwischen vier Komponenten der emotionalen, prosozialen, kognitiven Selbstregulation unterscheidet, wurde mit Hilfe einer konfirmatorischen Faktorenanalyse

in MPlus (Muthén & Muthén, 2012) empirisch getestet. Aufgrund vorangegangener Befunde in Bezug auf die Bedeutung des selbstregulierten Lernens für schulische Leistung (z.B. McClelland et al., 2007; Ponitz et al., 2009; Von Suchodoletz et al., 2013), wurde außerdem die Beziehung der Selbstregulation zu Leistung mittels Strukturgleichungsmodellierung (SEM) untersucht. Die Ergebnisse der Studie weisen darauf hin, dass Selbstregulation im Vorschulalter adäquat durch diese vier theoretisch angenommenen Komponenten repräsentiert werden kann, wohingegen der angenommene positive Einfluss der Selbstregulation auf Leistung nicht bestätigt werden konnte. Da empirische Befunde aus dem schulischen Kontext darauf hinweisen, dass Lehrer Probleme besitzen, geeignete Methoden zur Förderung des selbstregulierten Lernens in der Unterrichtspraxis anzuwenden (vgl. z.B. Dignath-van Ewijk & Van der Werf, 2012; Serratore, 2015; Tilema & Kremer-Hayon, 2002), hat Studie II – unter Annahme, dass sich diese Ergebnisse auch auf den Elementarbereich übertragen lassen – die Entwicklung und Evaluation eines geeigneten Trainings für ErzieherInnen und Eltern von Vorschulkindern zum Ziel. Theoretische Annahmen von Bandura (1978), Pramling (1988) und Vygotsky (1978) unterstreichen die Bedeutung einer adäquaten Unterstützung durch wichtige Bezugspersonen für die Entwicklung des selbstregulierten Lernens in den ersten Lebensjahren. Aus diesem Grund wurde eine Intervention für ErzieherInnen und Eltern entwickelt, die im Sinne eines 2-Ebenen-Ansatzes erstens darauf zielt, das selbstregulierte Lernverhalten der Teilnehmer zu optimieren und zweitens geeignete Strategien zur Förderung des selbstregulierten Lernens von Vorschülern zu vermitteln, und welche hinsichtlich ihrer Effektivität untersucht wurde. Die Ergebnisse der Untersuchung machen deutlich, dass das selbstregulierte Lernverhalten von ErzieherInnen und Eltern und ihr Wissen zu SRL Förderstrategien durch das Training (teilweise) verbessert werden konnte, dass der vermutete indirekte Trainingseffekt auf das SRL der Vorschulkinder aber nicht nachgewiesen werden konnte. Aufgrund der natürlichen Heterogenität innerhalb einer Trainingsgruppe wird angenommen, dass das Training unterschiedliche Effekte für die einzelnen Teilnehmer des Trainings aufweist (Lapka, et al., 2011). Durch die Verwendung eines variablen-orientierten Ansatzes werden diese individuellen Unterschiede außer Acht gelassen und es können nur globale Effekte aufgezeigt werden. Mit Hilfe eines personenorientierten Ansatzes hingegen, können zusätzlich Veränderungen, die durch das Training bewirkt werden, in Bezugnahme auf spezielle Subgruppen analysiert werden. Beruhend auf diesen Annahmen, hat Studie III die Untersuchung differenzieller Effekte des SRL Förderstrategien-Trainings für ErzieherInnen zum Ziel. Die Ergebnisse der

Latenten Profilanalyse zeigen, dass sich innerhalb der Gruppe der trainierten ErzieherInnen drei unterschiedliche Profile identifizieren lassen, die sich in Bezug auf das Wissen zu SRL Förderstrategien signifikant unterscheiden. Außerdem sprechen die Ergebnisse für Unterschiede in der Effektivität des Trainings in Abhängigkeit von den ermittelten Profilen. Während ErzieherInnen, die dem Profil mit geringem Wissen zu SRL Förderstrategien zugeordnet wurden, signifikant von dem Training profitierten, taten dies ErzieherInnen aus dem Profil mit hohem Wissen zu SRL Förderstrategien nicht. Die Entwicklung eines Trainings, welches die Bedürfnisse der unterschiedlichen Gruppen berücksichtigt, erscheint somit notwendig.

1 Introduction

Because of an increasingly faster alteration of knowledge in a high technically developed society, an independent acquisition and continuous extension of knowledge is required. In this context, "self-regulated learning has been highly praised as the key competence to initiate and maintain lifelong learning" (Dignath, Büttner, & Langfeldt, 2008, p. 102). In the last years, empirical findings in elementary context have contributed to an increasing recognition of early education processes, which are now seen as an essential part of lifelong learning (Lüftenegger et al., 2012; Finsterwald, Wagner, Schober, Spiel, & Lüftenegger, 2013). As a result, the promotion of independent, self-directed forms of learning was getting one of the most important aims of the early education system (Kultusministerkonferenz, 2004) and should begin – against the background of lifelong learning – as soon as possible (OECD, 2004). Results of a meta-analysis of Dignath, Büttner, and Langfeldt (2008) pointed out that an early promotion even has an advantage over later support, because learning behaviors are not yet deadlocked but still more malleable, so a positive influence on the SRL processes is easier (Dignath et al., 2008; Perels & Otto, 2009). Thus, an early promotion of SRL can even have a preventive character. To facilitate a promotion of SRL in preschool age, a deepened understanding of learning processes and present abilities is indispensable. Existing models of SRL have been mainly developed in view to students and adults. Developmental-psychological findings (e.g., Anderson, 2001; Bronson, 2000; Larkin, 2010) provide hints, that SRL in preschool age has to be seen as an exception, because the development time point of (metacognitive) abilities, which are need to learn self-regulated, is controversial. Therefore, it is questionable if established SRL models can be transferred to preschool-aged children. Based on intensive research of SRL behaviors of children from age zero to eight, Bronson (2000) states that children in preschool age already have the basic abilities to learn self-regulated, but that there are also differences in terms of the SRL of adults or older children. Therefore, a development or an adaption of a SRL model for preschool-aged children seems to be necessary. Starting from Bronson's (2000) findings, a model of SRL in preschool-aged children was developed and empirically investigated by using confirmatory factor analysis in MPlus (study I). Because multiple studies (e.g., Blair & Razza, 2007; Denham, Warren-Khot, Wyatt, & Perna, 2011) indicate that SRL has a predictive effect on academic performance, the present thesis also investigated whether these findings are also identifiable in the present sample of preschoolers. Certainly, the main part of studies were carried out in school or university context (e.g., De Corte,

Mason, Depape, &Verschaffel, 2011; Hidi & Ainley, 2008), but first studies concerning the relation of SRL and performance in preschool age revealed, that relevant learning abilities like SRL essentially contribute to early school success, too (De la Riva & Ryan, 2015). Blair and Razza (2007) could show, that high inhibitory control – which is seen as a main part of SRL in a lot of theoretical assumptions – is positively correlated to precursor skills in mathematical knowledge and letter knowledge. Similar findings could also be shown in a study by McClelland and Tominey (2015), who indicate that behavioral regulation has a positive influence on the development of emergent literacy, vocabulary, and math. Based on these empirical findings, the present thesis aimed at evaluating the assumed interrelation between SRL and performance by the means of structural equation modeling (SEM).

Within the investigation of SRL in childhood, the relevance of essential reference persons cannot be neglected. Several theoretical approaches like Bandura (1977), Vygotski (1978), Pramling (1988) Siraj-Blatchford et al. (2002) emphasize the role of adults in supporting the development of SRL in children. Therefore, they have to be fundamentally involved into an intervention concerning the promotion of SRL in preschool age.

Proceeding from the described change of educational aims in elementary context, kindergarten teachers need to dispose a profound knowledge of SRL processes, considering the specificity of SRL in preschool age. This knowledge provides a basis to recognize SRL behavior of children in kindergarten every day live which again acts as the foundation for a targeted promotion of SRL. In addition, educational staff is always more encouraged to develop its knowledge concerning the promotion of young children continuously (e.g., Lindeboom & Buiskool, 2013; Secretariat of the Standing Conference of Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany, 2015). Because of the demand for a steady further education, the ability to learn self-regulated has to be seen as highly relevant for educational staff, too. Following these assumptions, an intervention to promote the SRL behavior of kindergarten teachers as well as their knowledge about SRL promotion seems to be useful. Whereas the influence of kindergarten teachers is getting relevant from the age of about three years, parents affect the behavior of their children since the first day of life. In this assumption, parents of preschool-aged children have to be considered as a second group of essential reference persons into an SRL promotion intervention. It can be assumed that the effect on the SRL of preschoolers is the greatest if both, parents and kindergarten teachers, are trained. In this way, a consistent promotion at home and in kindergarten – the two most important learning

contexts of preschool-aged children – is ensured (El Nokali, Bachmann, &Votruba-Drzal, 2010). Following these assumptions, study II consists of the development and evaluation of an intervention for kindergarten teachers and parents of preschool-aged children. Based on a two-level-approach, the training first aimed at knowledge building concerning SRL processes which leads to the reflection and adaption of the SRL behavior of the participants. Second, it aims at a mediation of concrete strategies to foster SRL in preschool-aged children. Because findings of prior evaluations (e.g., Dörrenbächer & Perels, 2016b) indicate that interventions must not be equally effective for all participants, it can be assumed that training effects differ sometimes strongly in dependence of special characteristics of the participants (Lapka et al., 2011). To account for these differences, a person-centered approach which facilitates the analyzation of changes through the training in relation to special subgroups was used in study III. Based on the investigation of differential effects, a profound foundation of individual training becomes possible and it provides the basis of adaptive trainings which consider claims and needs of different subgroups. Concerning the promotion of SRL strategies, studies indicate that the SRL behavior of educational staff (Peeters et al., 2014; Randi, 2004) is a relevant aspect that influence the promotion of SRL strategies. Consequently, an investigation of different SRL promotion strategy profiles and their relation to the SRL behavior of kindergarten teachers was implemented.

Taken together, the present thesis aims at modeling and promoting SRL in preschool-aged children through the development and investigation of an intervention for kindergarten teachers and parents. Starting from a more theoretical point by analyzing the empirical structure of SRL in preschool-aged children in study I, the focus shifts to more practical implications by developing and evaluating an indirect intervention which offers the mediation of concrete strategies for kindergarten teachers and parents to promote SRL in their children. Looking to the future, the analyses of differential effects of the training provide approaches for adaption or optimization of the intervention in reference of the needs of different subgroups of participants. To build up a further theoretical foundation of the research questions presented above, an overview of the definition, theoretical models and research finding concerning the promotion of SRL in preschool age will follow in the subsequent sections.

2 Theoretical and Empirical Framework

In the following sections, the theoretical and empirical framework of self-regulation and SRL will be described. Starting from an embedding of the construct of self-regulation in a broader framework (social cognitive theory), the term self-regulated learning is defined and discussed in detail with regard to its individual components. Hereinafter, requirements of the age group of preschoolers that is focused in the present thesis will be highlighted, and on this basis, the model of self-regulation in preschool age in reference of Bronson's findings is presented. Subsequently, the special role of kindergarten teachers and parents as essential reference persons for preschool-aged children who support their SRL, will be shown. In this context, also current interventions with regard to the promotion of SRL of preschool-aged children and their reference persons will be presented. Finally, the importance of a consideration of individual differences in training participants will be shown and an appropriate handling of it in accordance with the Aptitude-Treatment-Interaction approach will be discussed.

2.1 Self-Regulation and Self-Regulated Learning

According to Zimmerman (2000), self-regulation describes the ability to initiate actions independently, to adapt them continuously as a result of self-monitoring in reference on determined goals and to reflect upon them adequately. The definition of self-regulation by Zimmerman (2000) has his origins in a social-cognitive perspective (Bandura, 1977), that is characterized by a mutual influence of personal, behavioral, and environmental processes. In this assumption, self-regulation is not meant as an ability that is acquired once, but as an ongoing cyclical process in which "the feedback from prior performance is used to make adjustments during current efforts" (Zimmerman, 2000, p.14). To adequately adopt the own behavior in orientation towards changes of factors in the environment, self-observation and self-monitoring using self-oriented feedback loops is necessary (see Figure 1). These feedback loops entail behavioral self-regulation, meaning the adjustment of performance processes, environmental self-regulation, meaning the note of environmental conditions or outcomes and covert self-regulation which comprises the observation and adaption of the own cognitions and affections (Zimmerman, 2000).

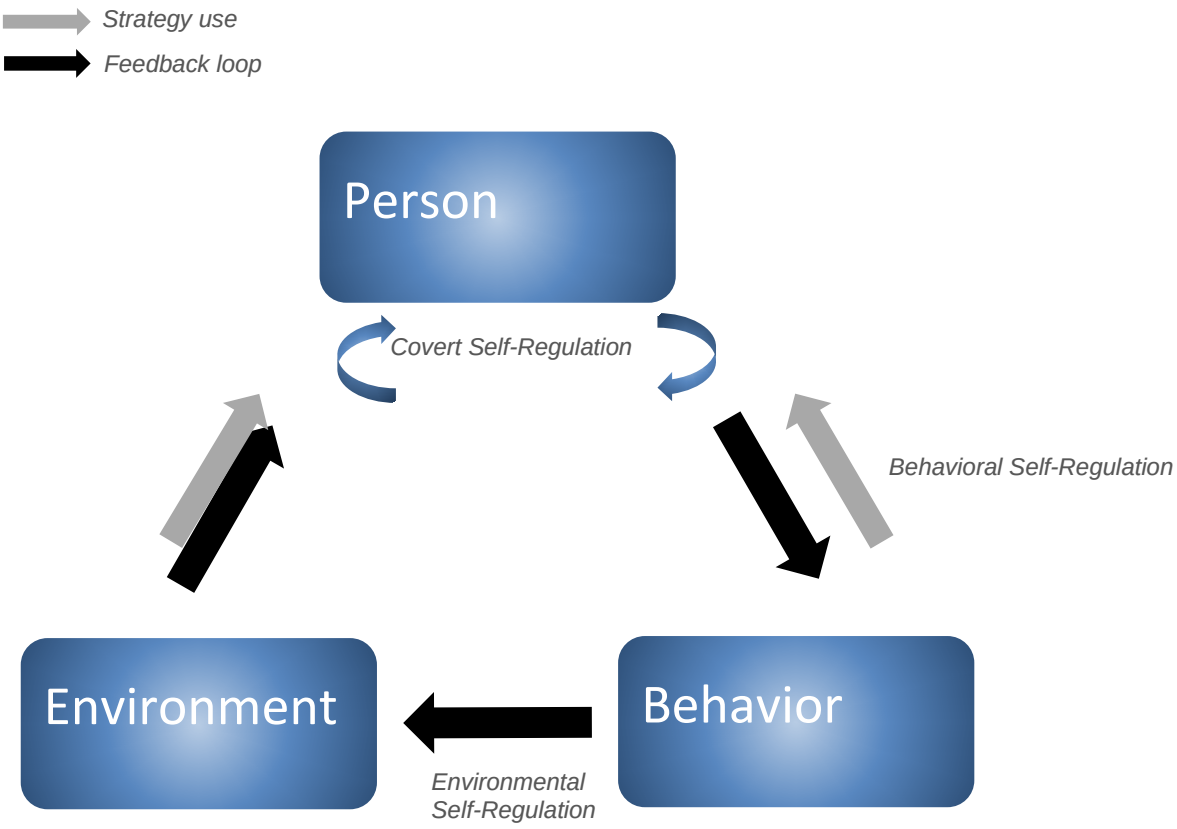

Figure 1. Triadic model of self-regulation (adapted from Zimmerman, 1989).

2.1.1 Process Model of Self-Regulation

As the theoretical foundation of the present thesis, the social-cognitive process model of self-regulation by Zimmerman (2000) was chosen, because it distinguishes three central learning phases (forethought phase, performance phase, and self-reflection phase) and related strategies, so it offers a useful frame to better structure unconscious learning processes. In addition, it is not mandatory bound on a research area and entails – in reference of the social-cognitive perspective – processes or abilities that can be used to adapt behavior, interpersonal processes as well as environmental features. Moreover, it describes SRL as a continuous process that can be improved through training. The model has proved its worth within different previous training conceptions (e.g., Dörrenbächer & Perels, 2016a; Perels et al., 2009). In the first phase of the model (forethought phase), the planning of the action is focused. This phase is determined by the analysis of the task, meaning a clarification of the challenges of the task and motivational processes. One essential motivational factor is self-efficacy, meaning "the manner in which people construct their beliefs about their abilities and competence to perform a given task" (Serratore, 2015, p. 11). Self-efficacy in this sense does not mean the abilities someone

really possess, but the abilities he believes to have to perform competently. In several studies, a positive influence of self-efficacy on several academic learning strategies that are related to SRL like academic time management (Britton & Tessor, 1991; Kandemir, Ilhan, Ozpolat, & Palanci, 2014) or goal setting (Zimmerman & Bandura, 1994) has been shown. Studies in school context also indicate a positive relation between high self-efficacy and the usage of SRL strategies in pupils (Parajes & Valliante, 2002; Zimmerman, Bandura, & Martinez-Pons, 1992), but also between the teacher's sense of self-efficacy and the frequency with which they create situations that foster SRL in the classroom (Serratore, 2015; Tanriseven, 2013).

The second phase (performance phase) places pivotal importance on competencies like self-control and self-monitoring, meaning the conscious perception and analysis of inner experience and behavior. Maintaining a focus on the planned aims, the learning action is implemented. In this phase, strategies to focus attention are used.

Central elements of the third phase (self-reflection phase) are self-evaluation and self-reaction, meaning that the task that was completed is compared with the aims set forth at the beginning of the task and evaluated in terms of its success (self-evaluation). As a consequence of the self-evaluation, a self-reaction takes place. If learners are displeased with the result of their work, they should adapt their original aims or the strategies used in future learning actions. The model of Zimmerman (2000) describes several processes that are subjected to continuous adaptation and therefore, an optimization of the learning behavior, so it offers suitable points of references for an intervention study.

2.1.2 Definition and components of self-regulated learning

If the construct is transferred to the academic context, one speaks of SRL which can be described as "processes whereby learners personally activate and sustain cognition, affects, and behaviors that are systematically oriented towards the attainment of personal goals" (Zimmerman & Schunk, 2011, p.1). Although the conception of SRL differs between several researchers, it is widely accepted that SRL entails three main components to which importance is attached: a cognitive, a metacognitive, and a motivational component (Landmann, Perels, Otto, & Schmitz, 2009). The cognitive component comprises "conceptual and strategic knowledge as well as the ability to apply appropriate strategies" (Landmann et al., 2009, p. 50). The metacognitive component, on the other hand, entails abilities used to proceed as planned, to observe oneself and to reflect on the own learning process by continuously adopting the procedure to the set goal (Landmann et al., 2009).

The motivational component comprises abilities that are necessary to initiate and to continue acting even in distractions. Another essential part of the motivational component is „action-promoting attributions of successes and failures and self-efficacy beliefs" (Landmann et al., 2009, p. 50).

2.1.3 SRL in preschool age: developmental-psychological requirements

As a result of studies concerning future necessary skills of children like e.g. the German study "Arbeitslandschaft 2030" (Blossfeld et al., 2012) learning methodical competencies (which also comprise SRL) are seen as the central basis for a successful accomplishment of lifelong learning. To foster these lifelong learning processes, it is important to start promoting them in the early stages of childhood with the aim to support the development of appropriate learning behaviors as soon as possible (Otto, Perels, & Schmitz, 2011). However, a targeted promotion of SRL in the early stages was not driven forward for a long time because it is still unclear, if and how many (meta-)cognitive conditions for SRL have already been developed by preschool age. In addition, the often not clear distinction in the definition of the two constructs SRL and executive functions (hereinafter EF) hamper (Garner, 2009) a clear operationalization of the constructs that is necessary for a solid training conceptualization. There are several findings (e.g., Effeney, Carroll, & Bahr, 2013; Garner, 2009) which indicate interrelations between SRL and EF as both constructs are intended to control and regulate thinking and behavior in goal directed ways. Despite of this general conformity, the two terms cannot be equated with each other, because they entail different subcomponents. EF can be defined as "interrelated cognitive abilities that are required when one must intentionally or deliberately hold information in mind, manage and integrate information, and resolve conflicts or competition between stimulus representations and response options" (Blair & Ursache, 2011). This definition already refers to three central facets of EF that are commonly divided: working memory, inhibitory control and attentional set-shifting (often referred to as cognitive flexibility) (e.g., Schmitt, McClelland, Tominey, & Acock, 2015). While working memory facilitates the conscious retention of relevant information (for example of a task) as well as an adequate replacement of irrelevant information (Mountry et al., 2016), inhibitory control allows the suppression of inadequate actions and the performing of more adaptive reactions (McClelland et al., 2007). A third facet of EF entails attentional set-shifting or cognitive flexibility which means the ability to switch between different mental sets or tasks (Hofmann, Schmeichel, & Baddeley, 2012). Based on this understanding, the relation

between SRL and EF is explained differently whereby there is a consensus about several overlaps of the two constructs. Hofmann and colleagues (2012) argue that EF is a prerequisite for SRL as abilities connected to the different facets of EF (working memory, behavioral inhibition and task-switching) are essentially for SRL, especially the definition of adequate goals, the maintenance of attention, the inhibition of behavior contrary to the attainment of determined goals and the switching between different actions, related means and goals. However, Blair & Ursache (2011) assume a bidirectional relation with the justification that "top-down processes of executive function are a mechanism of self-regulation, and bottom-up processes of emotion, attention, and the stress response affect executive function ability" (Blair & Ursache, 2011, p. 314). In addition to the lack of clarity regarding the term of SRL, an increased promotion of SRL in preschool age is complicated by persistent doubts about preschooler's developmental stage concerning abilities that underlie SRL. There is still a group of researchers who stick to the long-standing opinion that younger children do not possess the biological and psychical requirements to learn self-regulated until school age (e.g., Veenman, Hout-Wolters, & Afflerbach, 2006). The underlying rationale is that abilities related to SRL like EF are linked to the pre-frontal cortex, which is known to develop very slowly and still develops until adulthood (Bryce & Whitebread, 2012; Huttenlocher, 2002). On the other hand, the assumption arises that SRL skills of children have been underestimated because of the lack of age-appropriate assessment instruments (Isquith, Crawford, Espy & Gioia, 2005; Bryce & Whitebread, 2012) and that basic abilities for the control and the regulation of one's own cognitive processes are already existent and teachable in preschool age (Anderson, 2001; Bronson, 2000; Larkin, 2010; Whitebread et al., 2009).

Extensive observational studies by Bronson (2000) provided a deepened insight into the development of self-regulation in children from birth to eight years. The results indicate that self-regulation as the human pursuit to adopt the own behavior in dependence of the environment and the situation develops from birth (Bronson, 2000).

In her literary work "Self-regulation in early childhood: nature and nurture" (2000), she describes several SRL relevant skills that can be linked to the three phases of Zimmerman's model of self-regulation (2000). On the basis of her observations, Bronson supposes that the ability to choose skill-appropriate goals and tasks which is an essential part of the forethought phase in Zimmerman's model (2000), is already developed in preschool age (Bronson, 2000). In addition, the action of preschoolers is increasingly guided by concrete aims instead of the wish to intensively explore the environment, a

behavior that is dominant in early childhood (Büttner, Perels, & Whitbread, 2011). This shift from an intuitive desire for exploration to a more goal-directed approach facilitates the development of skills which are formulated within the forethought phase like targeted goal setting or strategic planning (Zimmerman, 2000). Furthermore, by preschool age, intrinsic motivation is still highly developed, which facilitates the initiation and maintenance of learning action (Carlton & Winsler, 1998).

In the action phase in Zimmerman's model of self-regulation (2000), metacognitive control strategies (Flavell, 1978) play an important role concerning volitional processes. These strategies enable the learner to observe himself and to adopt his behavior in coordination with the initially established aims (Zimmerman, 2000). Results of Bronson's study (2000) revealed that there already is a significant development in terms of the control of attention, monitoring behaviors and the adaption of strategies until preschool age. Based on her observations, she assumes that preschool-aged children can use strategies effectively to reach determined goals and that they already monitor the application of these strategies (Bronson, 2000). In a study of Whitebread and colleagues (Whitebread et. al, 2009) the findings of Bronson (2000) concerning the development of metacognitive control strategies were approved. Their observations in naturalistic context of preschool classrooms revealed that children in preschool age already use metacognitive control strategies like self-commentary, reviewing the progress or to adopt their learning process as a result of self-observations (Bryce & Whitebread, 2012). The results of the study also illustrated that preschool-aged children were already able "to inhibit behaviors that are perceived as inappropriate" (Whitbread & Basilio, 2012, S. 20), which can be seen as an essential volitional competence that is necessary to sustain attention while learning process. Based on their observations, they could also show that children between three and six years were able to sustain attention over a longer period, an ability which is needed for a focused approach to a task (Whitebread & Basilio, 2012). Following the assumptions of Bandura (1986), basic abilities like self-evaluation and related self-reaction, meaning an adequate adaption of deployed strategies, seem to be developed by preschool age. The results of the observational study by Whitebread et al. (2009) confirmed these results. While observing preschool-aged children in self-initiated learning actions, they discovered an implementation of strategies used to evaluate the level of difficulty of the task as well as their effort used to solve the task, and the performance or result of their work (Bryce & Whitebread, 2012). Taken together, the results of the mentioned observational studies (Bronson, 2000; Whitebread et al., 2009) indicate that since at least the basic

developmental-psychological abilities needed to learn self-regulated are already present in preschool age and that a targeted promotion of SRL is possible and meaningful. Certainly, children in this age period still often need the help of interaction partners (Bruder, 2006; Vygotsky, 1978). Therefore, the importance of essential reference persons has to be considered further in more detail.

2.14. Model of self-regulation for preschool age

Because of developmental-psychological characteristics in preschool age, it can be stated that established models of self-regulation like the process model of self-regulation by Zimmerman (2000), cannot be directly transferred to preschool context. Since (meta-)cognitive abilities that are supposed to be necessary for the own behavior and thinking are located in the prefrontal cortex which has been shown to ripen only slowly (Huttenlocher & Dabholkar, 1997), the presence of these abilities in early childhood have been doubted for a long time. In the last years, first studies were get off the ground which investigated the trajectory of SRL in childhood (e.g., Anderson, 2001; Davidson, Amso, Anderson, & Diamond, 2006; Bryce & Whitbread, 2012; Garon, Bryson, & Smith, 2008; Raffaelli, Crockett, & Shen, 2005). Nevertheless, the level of development in terms of self-regulation in preschool age is still controversially discussed. Furthermore, these studies are often focused on single components of self-regulation (e.g., EF, emotional self-regulation). A first attempt to regard self-regulation in a more holistic approach is the study of Martha Bronson (2000). Based upon observational studies with children from birth to year eight, she describes four central components of self-regulation at this age group. Her theoretical assumptions consider developmental-psychological characteristics and present a very overarching view on self-regulation. Therefore, they build up a solid theoretical basis for the development of an intervention for preschoolers. In her literary work “Self-regulation in early childhood: nature and nurture” she distinguishes between motivational, emotional, prosocial and cognitive self-regulation. Motivation in her theoretical assumptions forms an important part of self-regulation as it essentially contributes to the initiation and maintenance of targeted behavior. Intrinsic motivation is necessary to get deeply involved with (learning-)actions and it contributes to a concentrated orientation towards tasks as well as a competent way to handle distractions (Bronson, 2000). Emotions also play a decisive role in the regulation of younger children’s thinking and actions. While from adults and older children it is expected that they can adapt their emotions and related behavior to the environmental context (e.g., remain seated and listening to instructions in spite of restlessness), younger children still have to learn appropriate techniques. With

growing emotional self-regulation, they increasingly learn to suppress dominant emotions if they are opposed to a goal-oriented task. Emotional self-regulation is strongly related to prosocial self-regulation as both types of self-regulation are characterized by the consideration of conditions on the environment. Prosocial self-regulation in Bronson's view is guided by the wish to help others or to accommodate their wishes. Therefore, prosocial self-regulation means that the thinking and the behavior is suited to external standards that are mediated in early social contexts (e.g., family or kindergarten) and that are internalized stepwise. In contrast, cognitive self-regulation is comprised of the ability to formulate goals for oneself in accordance to the own current skills and to use strategies to monitor, control and evaluate the own proceeding (Bronson, 2000). Following the assumptions of Bronson (2000), a model of self-regulation in preschool age arises that comprises four central components and which can be displayed as follows (Figure 2.).

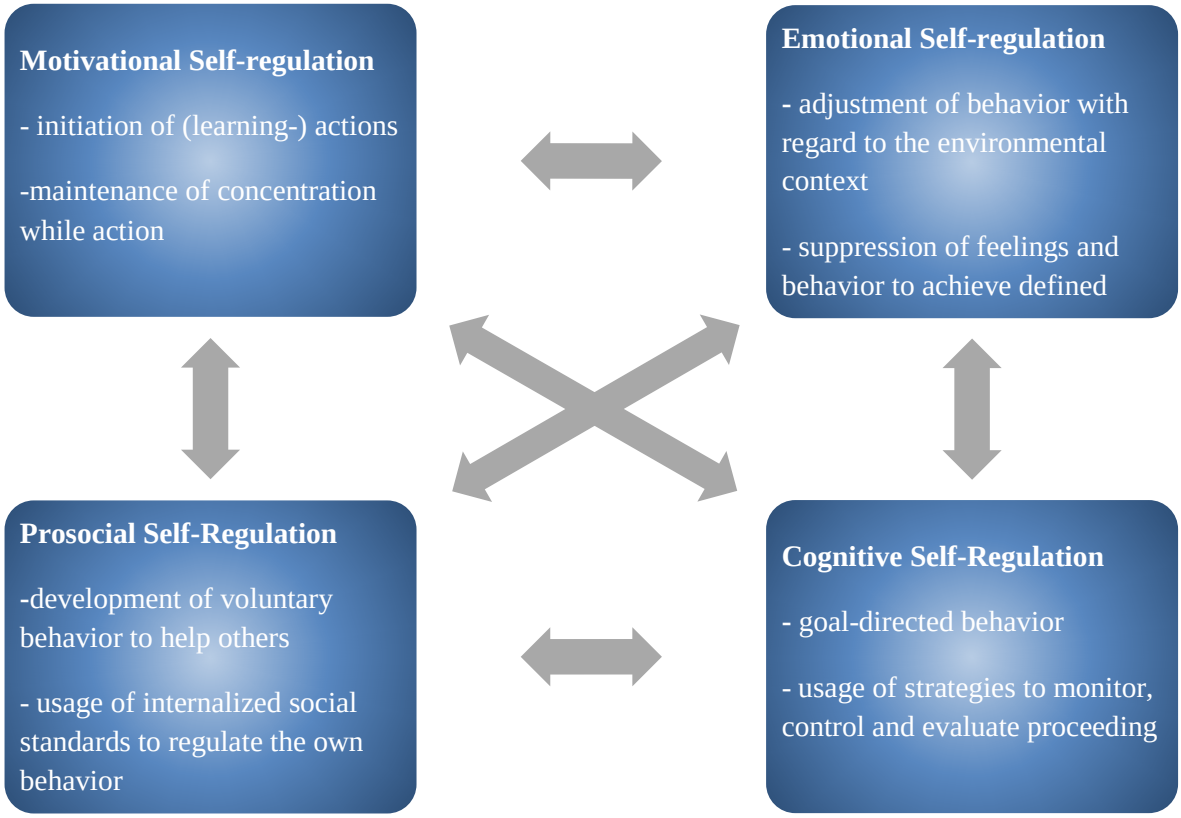

Figure 2. Model of self-regulation in preschool age (adapted from Bronson, 2000).

2.1.5 Support of SRL by essential reference persons

In the tradition of social-cognitive theory, SRL does not develop automatically with growing age, but is fundamentally influenced by experiences in social interactions

(Bronson, 2000). The importance of interactions with "competent others" (Vygotsky, 1978) for the development of SRL abilities is emphasized by several authors like Bronson (2000), Bandura (1977), Vygostsky (1978) or Pramling (1988). Essential reference persons like parents or kindergarten teachers represent important role models for children in preschool age and they can support the strengthening of SRL abilities in interaction processes (Dembo & Eaton, 2000; Perels & Otto, 2009; Pino-Pasternak & Whitebread, 2010). As a result of these theoretical assumptions, two fundamental ways of support by essential reference persons can be distinguished: First, they can facilitate the development of SRL in children by first acting as a competent model, meaning the demonstration of proven ways to regulate the own learning process, and second, by mediating SRL strategies.

The hypothesized importance of learning through modeling was highlighted by Bandura (1977), who assumed that the learning processes of children are based on observations and imitations of behavior of competent models. The importance of interaction with others was also discussed within Vygotsky's work (1978). He assumed that an "other-regulation" (Vygotsky, 1978), meaning the regulation of the behavior by competent others, is a prerequisite for the independent regulation of the own behavior. To be able to switch to self-regulation, children in his thinking first dependent on other-regulation, in which social standards are mediated. Over time, children learn to comprehend and internalize these standards successively until they finally begin to use them to evaluate their own behavior.

One essential way of mediating these standards is a (verbal) exchange between children and competent interaction partners (adults or older children), in which children can reach the "zone of proximal development" (Vygotsky, 1978). In this zone, they are enabled to use "higher mental functions" (Bodrova & Leong, 2006), which facilitate the independent organization and upgrade of their knowledge. The importance of verbal interaction for the support of SRL development in children is also highlighted in the metacognitive promotion-concept of Pramling (1988). In this concept, caregivers or parents have the task to facilitate the development of (especially metacognitive) abilities necessary for SRL by (re-)directing the childish attention on special aspects of the learning process by targeted questions within a metacognitive dialogue (Pramling Samuelsson & Asplund Carlsson, 2007). In her study, she could show that working with metacognitive dialogue contributed to a change in childish assumptions about learning, developing a more reflective understanding of learning as knowing or comprehending instead of simply doing. The assumed importance of modeling and the support of SRL by mediating SRL strategies are

also part of the "Parental Inducement of Self-Regulation-model" (PIASR model) by Martinez-Pons (1996), which formed the theoretical basis of the trainings concerning the methods to promote SRL. It has been selected as the foundation for the present training conception because it had been already successfully implemented in previous studies concerning the promotion of children's SRL by parents and teachers (González-Pienda, Núñez, Álvarez, & Bernardo, 2002; Martinez-Pons, 2002; Perels et al., 2009). The PIASR model is defined by four central dimensions (parental modeling, encouragement, facilitation, and rewarding), which represent methods adults can use to support the SRL of children and which were mediated and practiced in the present indirect interventions. The first dimension, *modeling*, entails parental behaviors which are aligned to a demonstration of positive examples of SRL and which are hypothesized to be imitated by children if they are regularly seen by them in everyday life (Martinez-Pons, 1996). The ability, to strengthen the child's effort to imitate observed behavior adequately, is referred to as *encouragement*, which forms the second dimension in the PIASR-model. By the means of an ongoing encouragement, an improvement in motivation and thus in persistence while task proceeding as well as a more frequent mastery of the task, can be obtained. The third dimension, *facilitation*, entails parental behaviors that contribute to the mastery of a task by offering little encouragements like targeted steering of attention towards the essential dimensions of the task. Finally, the last dimension, *rewarding*, represents parental behaviors that are aligned to influence the children's behavior by providing (verbal) rewards if SRL strategies are intentionally used in learning process. In accordance with behavioristic assumptions (e.g., Skinner, 1974), it is likely that behavior that is rewarded will be shown more often. Taken together, parents as well as kindergarten teachers can be seen as essential reference persons who can mainly influence the development of SRL by demonstrating wishful SRL-strategies as a positive role model and who can support the frequency of childish usage of SRL strategies by mediating them, e.g. in a metacognitive dialogue (Pramling, 1988). Whereas parents are relevant from the first days of life, kindergarten teachers become more and more important with growing age (and related longer presence at kindergarten, see Bronson, 2000), so both reference groups should be involved into an intervention with the aim to promote SRL in preschool-aged children. Additionally, it can be assumed that the effect on the SRL of preschoolers is the greatest if both reference groups are trained together. In this way, a consistent promotion at home and in kindergarten – the two most important learning contexts of preschool-aged children – is ensured (El Nokali et al., 2010).

2.2 Interventions to promote SRL

So far, interventions to promote SRL have been mostly implemented in school or university context (e.g., Fuchs et. al, 2003; Leidinger & Perels, 2012; Rosário et al., 2007), but only few in kindergarten (e.g., Perels et al., 2009; Bodrova & Leong, 2012). Nevertheless, a targeted promotion of SRL seems to be particularly useful in this age group because in this period many SRL abilities (e.g., attention-focusing) develop quickly (Bronson, 2000; Larkin, 2010). Additionally, children at this time point face many new challenges associated with the transition to primary school which can be better facilitated if the children are equipped with the ability to organize their learning processes independently (Morrison et al., 2010). In a meta-study of Dignath, Büttner, & Langfeldt (2008) it could be shown that especially an early promotion of SRL is effective, because learning behaviors have not already been solidly established, so they still can be shaped easier (Dignath et al., 2008; Perels & Otto, 2009). Thus, an early promotion of SRL can even have a preventive character. In terms of the conceptualization of interventions to foster SRL, it can be distinguished between direct and indirect interventions (Schmidt & Otto, 2010). While direct interventions are directly attached to the target group, indirect interventions focus the environment of the target group (e.g., parents, kindergarten teachers, teachers). In several studies, the effectiveness of direct interventions (e.g., Glaser & Brunstein, 2007; Perels, Gürtler, & Schmitz, 2005) as well as indirect interventions (Werth et al., 2012) concerning the promotion of SRL in different target groups could be confirmed. Concerning the conceptualization of an intervention in preschool context, an indirect intervention which attaches parents and/or kindergarten teachers seem to be a suitable approach, because they play an important role in the support of the development of SRL in preschool-aged children (e.g., Martinez-Pons, 2002; Perels et al., 2009; Karremann, van Tuijl, van Aken & Deković, 2006). Because of their function of multiplier referring the mediation of SRL skills, indirect interventions also offer the advantage of increased efficiency (Bruder, 2006). Despite these obvious benefits of an indirect intervention in preschool context, there is still a lack of research concerning SRL promotion interventions which are explicitly aimed at essential reference persons of preschool-aged children (Perels et al., 2009). In school context, indirect interventions were often developed with the aim to offer material to teachers which can be used in in daily class to support SRL of students (e.g., DeCorte, Verschaffel, & Van de Ven, 2001; Fuchs et al., 2003; Perels, Dignath, & Schmitz, 2009). In contrast, there are also interventions which are conceptualized as professional development programs for teachers on the subject of SRL which achieved

positive effects on the level of the teachers (Allshouse, 2016) the students (e.g., De Jager, Jansen, & Reetzig, 2005; Rozendaal, Mineart, & Boekaerts, 2006). The only known example of an indirect intervention for kindergarten teachers in the context of a similar construct to SRL is EMIL, a further education program for educational professionals on the topic of the promotion of EF in preschool-aged children (Walk, Evers, Quante, & Hille, 2018). The training program includes a total of eight sessions in which knowledge about EF are mediated and ways to support EF in preschoolers in the daily routines of the preschools are developed and discussed. The evaluation of the intervention yielded significant benefits of the training on the level of the children with regard to three of seven EF tests, namely behavioral inhibition, visual-spatial working memory, and combined executive function (working memory, inhibitory control, and cognitive flexibility). Results of the evaluation of the training on the level of the educators are not known so far.

An indirect intervention concerning the promotion of SRL for parents was developed by Bruder (2006) which mediated methods to support the SRL of primary school-aged children. The results of the study revealed that the frequency of the parental usage of methods to foster SRL in their children raised through the intervention and that the children's SRL increased, too (Bruder, 2006). In a study by Otto (2007), a combined training concerning the promotion of SRL was developed for elementary school-aged children, their teachers and parents. The aim of the intervention was to mediate knowledge about SRL processes and strategies concerning the promotion of SRL in class and in the homework situation. The results of the study revealed significant improvements in terms of SRL on the level of the children, especially in the training conditions where children took part at the intervention and not only the teachers and/or parents. One of the rare indirect intervention studies concerning the promotion of SRL in preschool context was developed by Perels et al. (2009). The training was conceptualized with the aim of an optimization of kindergarten teacher's own SRL as well as the mediation of strategies to improve SRL in preschool-aged children. Results were obtained on the level of the kindergarten teachers and parents as well as on the level of the children. On both levels, positive training effects could be revealed.

Research desiderates: Although the requirement of an early support of SRL processes was mentioned several times (e.g., Schmitt, Finders, & McClelland, 2015) and is even part of a lot of education plans in early childhood, interventions which are attached to parents and kindergarten teachers who can mainly influence the development of SRL in their children,

are very rare (Perels et al., 2009; Walk et al., 2018). Therefore, it is necessary to conceptualize direct and indirect interventions which are tailored to the needs of young children. Additionally, for the development of future training programs it is important to select a theoretical background that offers a comprehensive framework for the participants and in which they can file the mediated knowledge concerning strategies and processes of SRL. In terms of the strategies that are mediated through the training, it is important to note that they do not only focus on a single component of SRL, but can be used to support cognitive, as well as metacognitive, motivational and emotional aspects of SRL and that they consider all phases of SRL (Zimmerman, 2000).

2.2.1 Individual differences in SRL and the Promotion of SRL and their impact on training outcomes

Following the Aptitude-Treatment-Interaction approach, personal characteristics of learners have to be considered to create adequate learning contexts. If the aim is to develop a training that is tailored to the different needs of the participant groups, individual differences cannot be disregarded. In consequence, increasingly more research has been done with regard to individual differences in SRL in the last years (e.g., Barnard-Brak, Lan, & Osland, 2010; Dörrenbächer & Perels 2016b; Valle et al., 2008; Broadbent & Fuller-Tyszkiewicz, 2018). Barnard-Brak and colleagues (2010) investigated profiles of SRL skills and strategies of 279 students in an online environment and its connection with academic achievement. Results of latent class analysis revealed the presence of five different classes, labelled as *super self-regulators, competent self-regulators, forethought-endorsing self-regulators* (with high values on goal setting and environment structuring), *performance/reflection-endorsing self-regulators* (with high values on task strategies, time management, help seeking and self-evaluation) (Barnad-Brak et al., 2010) which were significantly different from each other with regard to academic achievement (measured by grade point average). In a study by Dörrenbächer & Perels (2016b) the presence of several SRL profiles and differences in achievement in dependence of these profiles could be confirmed. Results of latent profile analyses, based on the data of 337 college students, revealed four different profiles named high SRL group, conflicting SRL with high motivation group, moderate SRL group and low SRL with moderate motivation, indicating that the students did not only differ with regard to the level of SRL in general, but also with regard to subcomponents of SRL (motivational aspects). Valle and colleagues (2008) also examined SRL profiles in a sample of 489 university students, using cluster analysis. The results of the study revealed the presence of three SRL profiles which significantly

differed in terms of their level of SRL and therefore were named *low SRL group*, *intermediate SRL group* and *high SRL group*. Taken together, the results of all studies indicate that different profiles of self-regulators can be distinguished within the learning group of students. The number of groups varied as the instruments that were used to assess SRL assign different importance to the subcomponents of SRL. Whereas much research has been done with regard to individual differences in the SRL within the group of students, relatively little is known about individual differences in the SRL of (kindergarten-)teachers – the target group of the present intervention – and their promotion of it. While students' individual differences in SRL are the central point of interest of training programs which aimed to improvements in the SRL of students, in a training for teachers which focusses on improvements on their supportive methods in terms of SRL, more emphasis have to be put on individual differences in their knowledge and usage of SRL promotion strategies. However, empirical findings with regard to individual differences in the SRL of teachers and their promotion of SRL are rare. Virtanen, Niemi, and Nevgi (2017) investigated individual differences in the self-regulation of 422 student teachers. Clustering analysis revealed three different profiles, characterized as *moderate SRL* with moderate scores on learning motivation and regulation strategies, *dissonant SRL* with high scores for motivation and lower scores on regulation strategies and *excellent SRL* with high scores for motivation as well as regulation strategies (Virtanen et al., 2017). With regard to individual differences in the promotion of SRL among (kindergarten-)teachers even less research have been done so far, even though theoretical assumptions indicate that there are individual differences in the support of SRL (Moos & Ringdal, 2012). Therefore, the lacking empirical foundation of this theoretical assumption is to be counteracted with the present study by investigating SRL promotion strategy profiles within the group of kindergarten teachers.

Following the Aptitude-Treatment-Interaction approach, sound information about individual differences (for example different levels of SRL) can be used to evaluate educational interventions in a differentiated manner and to adapt them according to the special needs of subgroups of training participants. Nevertheless, the investigation of individual differences by following person-centered approaches is still underrepresented in current research. As one example for the consideration of individual differences of a SRL training, is a study by Lapka and colleagues (2011) which was focused on the evaluation of an internet supported program for the promotion of SRL in an academic context (Vienna E-Lecturing). Cluster analysis revealed three motivational subgroups (*motivationally*

balanced students, competence oriented students and students with motivational deficits) which displayed different benefits of the training. Whereas *competence oriented students* and *students with motivational deficit* benefit of the intervention, *motivationally balanced students* did not. Another example for an evaluation of a SRL training for university students by considering individual differences is a study by Dörrenbächer & Perels (2016b). The study revealed significant differences in training gain. Whereas students who were previously assigned to a *moderate and motivated SRL profile* improved their SRL skills through the intervention, students who were assigned to a high and a low SRL profile did not change their SRL behavior from pre- to posttest. Concerning the evaluation of an intervention with focus on SRL knowledge and usage of SRL strategies, the study of González-Pienda and colleagues (2014) has to be mentioned. Starting from previously determined SRL baseline levels (low, moderate and high), a SRL strategy training with 277 students was evaluated. Results of ANOVAs displayed statistical differences in pre-post-test-comparison for the low SRL baseline level, but not for the high SRL baseline level. In terms of the high baseline level, pre-post-differences where even statistically significant in a negative way, meaning that this group of participants even worsened their scores on SRL strategies. One explanation for this compensation effect is that students who already possess a high level of SRL skills have little room for improvement, whereas students with low levels of SRL skills can take the opportunity to expand their knowledge and practice the newly learned strategies through training. But there are also results from studies (e.g., Alexander, Carr, & Schwanenfluegel, 1995) indicating a contrary effect, named the Matthew effect (Walberg & Tsai, 1983). A Matthew effect occurs when participants who already start with a high level of knowledge profit more from an intervention than participants with a low starting level (see e.g., Otto & Kistner, 2017). Taken together, the empirical findings presented above indicate significant differences in training gain in dependence of the characteristics of different subgroups which have to be considered for the optimization of interventions.

2.2.2 Aptitude-Treatment-Interactions

The consideration of Aptitude-Treatment-Interactions is of special interest for the present study, as in Aptitude-Treatment-Interactions research assumes that “learners with different traits will not respond similarly to each form of instruction” (Jonassen & Grabowski, 2011, p. VIII). Most interventions are evaluated based on a variable-centered approach which reveals effects for the whole training group in terms of the interesting dependent variable. But within the training sample in real live settings, it can be assumed that there are

individual differences for example regarding different starting levels concerning the main teaching subject. Because these differences can lead to different benefits of a training (Lapka et al., 2011), changes through the training in relation to special subgroups have to be considered to develop adequate instructional environments, tailored to the needs of different subgroups (Snow, 1992). In conclusion, research on differential training effects can contribute to a profound foundation of individual trainings.

Research desiderates:

Despite a growing awareness about the influence of learners' individual characteristics on achieved effects in educational interventions, few studies have taken these differences into account so far. Therefore, it would be interesting to consider the various prerequisites of kindergarten teachers in the evaluation of an intervention to promote SRL in preschool age children. By using an Aptitude-Treatment-Interaction framework, existing differences in the benefit of such an intervention can be further investigated and then be used as a profound foundation for the design of optimal instructions for the different subgroups within the training group. A first step could be the investigation of different profiles of kindergarten teacher's knowledge about SRL promotion strategies and an examination of distinct training benefits in dependence on the detected profiles.

3 Research Aims

Based on the abovementioned research desiderates, for the present thesis three essential research aims arise which will be presented in the following. They are formulated to add to theoretical, as well as practical implications and to close already mentioned research gaps. In study I, a first step to address to the previous shortcomings of investigations concerning the theoretical structure of SRL in younger children, should be made by empirically investigating a theoretical model for preschool age children in reference of Bronson's findings (2000). Based on the knowledge of the development of SRL in preschoolers, study II investigates if and how SRL in kindergarten teachers and parents of preschool-aged children can be promoted through an intervention and if a training can increase their knowledge about SRL promotion strategies. To contribute to a sophisticated insight in the effectiveness of the developed intervention for kindergarten teachers, study III investigates differential effects of the training in dependence of several SRL promotion strategy profiles by using a person-centered approach.

3. 1 Research Aim I

Although the investigation of processes and components of adults' and students' self-regulation have led to the establishment of well recognized models (e.g., Boakaerts, 1999, Schmitz & Wiese 2006; Zimmerman 2000), nearly no attempts have been made to systematically develop and evaluate an adequate theoretical model for younger children, although it can be assumed that there are differences because of developmental-psychological factors (Veenman et al., 2006). Therefore, the first aim of the thesis is to investigate if the hypothesized model of self-regulation in preschool age, which is based on the observations of Martha Bronson (2000), can be empirically confirmed in the present study. By using structural equation modeling, it is also tested if there is a positive interrelation between self-regulation and achievement which is hypothesized by some authors (e.g., Blair & Razza, 2007; Weis, Heikamp, & Trommsdorf, 2013).

3.2 Research Aim II

In recent years, interventions to foster SRL have been developed for school (e.g., Leidinger & Perels, 2012; Perels et al., 2009b; Throndsen, 2011) and university context (e.g., Bellhäuser, Lösch, Winter, & Schmitz, 2016; Schmitz & Wiese, 2006), and their implementation has been proved to be effective (Dignath & Büttner, 2008). However, in preschool context, nearly no interventions have been developed so far. In the context of the development of early childhood curricula that emphasise the importance of learning skills and changing demands on the promotion of these skills by kindergarten teachers, the development and implementation of interventions designed to support educational staff in adequately promoting SRL in preschool age appears necessary. Therefore, the second aim of the thesis, was to develop and to evaluate indirect interventions for parents and kindergarten teachers to improve their own SRL behavior as well as their knowledge about SRL promotion strategies.

3.3 Research Aim III

Against the background of the Aptitude-Treatment-Interaction approach, empirical research provides hints that consisting characteristics of participants can lead to differences in the effectiveness of interventions (e.g., Dörrenbächer & Perels, 2016b). To consider these individual differences, the third aim of the thesis was to investigate different profiles concerning SRL promotion strategies of kindergarten teachers and to evaluate the developed trainings by considering the differences between these profiles.

4 Overview of the studies

Overall, three separate studies were conducted in order to fulfill the main objective, namely to develop and evaluate an indirect intervention for kindergarten teachers and parents which is based on a profound theoretical model of self-regulation in preschool age, having regard to differential needs of the participants. In the first study, a valuable theoretical foundation was created by evaluating a model of self-regulation that was proposed to be adequate for preschool-aged children. In the second study, the promotion of SRL was in focus by developing and evaluating an adequate training for kindergarten teachers and parents of preschool-aged children. In the third study, a differential perspective was taken in order to investigate differences in the requirements and needs of the participating kindergarten teachers. In this context, different levels of knowledge concerning SRL promotion strategies prior to training as well as their influence on the effectiveness of the training were investigated.

4.1 Study I

Venitz, L. & Perels, F. (2017). Empirische Überprüfung eines Modells der Selbstregulation für das Vorschulalter. *Zeitschrift für Grundschulforschung, 10*(2), 110-121.

Abstract

Despite the increasing appreciation of early education processes, including SRL (e.g., Kunze & Gisbert, 2003), some important gaps still to be filled in regard to the investigation of SRL in younger children. Even though first programs aiming at the promotion of SRL before school entrance (e.g., Bodrova & Leong, 2012; Barnett et al., 2008; Baron, Evangelou, Malmberg, & Melendez-Torres, 2015) already exist, a profound theoretical foundation is still missing. Because of developmental-psychological characteristics of this age group, it can be doubted that established models of SRL in school-age or senior can be transferred to preschool-aged children. For this purpose, the present study aimed at the development and the evaluation of a self-regulation model that considers the requirements of preschool-aged children. Based on the theoretical assumptions of Bronson (2000), a model of self-regulation was conceptualized which comprised the components emotion, prosocial behavior, cognition and motivation. Based on the data of 198 children (45.5% female; Mage = 5.6, SD = .50), measured by an observational tool used by kindergarten teachers, the measurement model was evaluated using confirmatory factor analysis (CFA) in the first step. Deriving from previous study results (e.g., Blair & Razza, 2007; McClelland & Tominey, 2015; Ponitz et al., 2009) which indicated a positive, predictive

value of achievement on SRL, the self-regulation-model was related to a performance measure by using structural equation modeling (SEM) with the aim to prove the relation between the two constructs. By developing and empirically testing a hypothesized model of self-regulation of preschool-aged children, study I contributes to a more profound insight into self-regulation processes in preschool age and therefore provides a theoretical foundation for interventions that come out before school entrance.

4.1.1 Theoretical background and aims

Established models of self-regulation distinguish between three central components: a cognitive, a metacognitive and a motivational component (Landmann et al., 2009). With regard to preschool-aged children, this theoretical conception is doubted because, in reference on neuropsychological findings, the developmental state of preschoolers' metacognitive abilities which are necessary for SRL is fundamentally different from the one of school-age children or adults because of a deficient maturation of the pre-frontal cortex (e.g., Huttenlocher, 2002). Veenman and colleagues (2006) for example assume that these metacognitive requirements are not fulfilled before the age of eight. However, findings of other studies (e.g., Bodrova & Leong, 2006; Bronson, 2000; Chernokova, 2014; Whitebread & Basilio, 2012) indicate that at least basic (meta-)cognitive abilities needed for self-regulation already exist before school age and can be systematically promoted by competent others (e.g., Bodrova & Leong, 2012; Barnett et al., 2008; Baron, Evangelou, Malmberg, & Melendez-Torres, 2015). Based on extensive observational studies, Bronson (2000) could show that children of preschool age increasingly acquire capacity for information processing that is a necessary ability to adequately understand task demands. Furthermore, because of a highly developed intrinsic motivation in preschool age (Carlton & Winsler, 1998), the initiation and the maintenance of learning-action is facilitated. In addition, it was shown that five to six-year-old children already possess the basic abilities to monitor and execute volitional control over their learning actions, which are necessary to finish a task in accordance with the initially established aims (Zimmerman, 2000). Deriving from the observations of Bronson (2000), it can be also assumed that there already is significant development until preschool age in terms of the control of attention, monitoring behaviors and the adaption of strategies in comparison with infants and toddlers. Despite these indications for an increasing development of basic (meta-)cognitive abilities, it is uncontroversial that preschool age is an age span in which a lot of abilities are still making progress and that the developmental state of preschool-aged children cannot be put on a level with the one of school-age children or adults. Therefore,

developmental-psychological requirements of this age group must be considered for the conceptualization of a theoretical model of self-regulation. Because of the specific occupation of self-regulation in the early years by Martha Bronson, her empirical findings seemed to be a suitable foundation for the development of a theoretical model of self-regulation in preschool age. In her main literary work (2000), she describes four central components, self-regulation is composed of: motivation, emotion, prosocial behavior and cognition (Bronson, 2000). Motivation is an essential component of self-regulation since it has an importance for the initiation of (learning) actions and influences the aims set at the beginning of an action (Zimmerman, 2000). While in the first year of life, actions are mainly determined by a general exploration urge, in preschool age acting already becomes more goal directed (Bronson, 2000). Motivation also plays an important role with regard to the maintenance of concentration while acting. Bronson (2000) in this context, assumes that preschoolers are already more capable to protect themselves against distractions and to finish a task in spite of recurring difficulties. The second component, emotion is not included in established models of self-regulation but in the theoretical assumptions of Bronson (2000). This is because her observations indicate that the adoption of impressed emotions (e.g. restlessness, fury, sadness) and related behaviors (e.g., cry, fidgeting) to the social context, an ability which can be seen as a prerequisite of SRL, is still very difficult for children at the ages of five to six years, whereas this ability is already more trained and seen as rather self-evident in later age. Under the term prosocial behavior, as a further component of self-regulation, Bronson (2000) comprises voluntary behaviors that are carried out with the aim to help or support others. Therefore, prosocial behavior is an important part of self-regulation since thoughts and actions are regulated in accordance with internal appraisals but also with external (social) standards. Prosocial behavior is developing very fast in preschool age so that children learn to incorporate the experiences and feelings of others in the adjustment of their behavior during this time period. Through growing metacognitive abilities, children learn to understand social standards of behavior and to use them to regulate their own behavior (Bronson, 2000). Cognition plays an essential role for self-regulation as it facilitate the choice of adequate goals in accordance with the own abilities (Bronson, 2000). By the usage of cognitive strategies, children are more and more able, to monitor, control and evaluate their own behavior. To sum up, in reference of Bronson (2000), self-regulation is an ability that already exists in preschool age but it has to be conceptualized differently to self-regulation in later ages. The main difference is that a theoretical model for preschool age should consider emotions and

prosocial behavior, two components that are not focused in self-regulation models for later age groups because it can be assumed that the social standards standing behind that are used to regulate the own behavior and thoughts are already internalized in later age.

Despite these specifics of self-regulation in childhood, the systematic development of a theoretical model that builds the basis for a targeted promotion seems to be of pivotal interest, because the regulation of the own behavior, thoughts and learning processes is seen as a key qualification for lifelong learning (e.g., Baumert et al. 2001; Finsterwald et al., 2013; Fthenakis 2003). Although SRL is referred to academic or school context, its promotion is already important in earlier years because in early childhood, the basis for future learning attitudes is created (Perels et al., 2009). Additionally, a promotion of self-regulation or SRL in preschool age can help to facilitate dealing with the demands children are confronted with in transition from kindergarten to school (Von Suchodoletz, Trommsdorf, Heikamp, Wieber, & Gollwitzer, 2009). The ability of self-regulation is growing in interest for researchers as well as practitioners because it is seen as a predictor of successful learning (Veenman & Spaans, 2005). While a predictive effect of SRL for academic success was already proven in school and university context several times (De Corte, Mason, Depaepe, & Verschaffel, 2011; Hidi & Ainley, 2008), kindergarten context has been neglected for a long time. First results of research in terms of the relation of SRL and performance indicate that relevant learning abilities like SRL can essentially contribute to early academic success (De la Riva & Ryan, 2015). In their study, Blair and Razza (2007) could show that a high inhibitory control, as a part of behavioral self-regulation, was positively correlated with preparatory math skills and literal knowledge. Within the evaluation of an intervention of behavior related self-regulation in preschool age, McClelland and Tominey (2015) came to the conclusion that the independent regulation of behavior could be increased significantly through the intervention and that it mainly correlated with forerunner abilities in early literacy. Ponitz and colleagues (2009) investigated the relation between behavioral self-regulation and mathematical skills, expressive vocabulary and word-reading skill as indicators of academic achievement within a sample of altogether 343 children from kindergarten in Michigan and Oregon. The findings of the study displayed a predictive value of self-regulation for mathematics but not for literacy or vocabulary knowledge (Ponitz et al., 2009). A positive predictive influence of behavioral self-regulation on academic skills (letter knowledge, vocabulary and math skills) was also revealed within a study of Von Suchodoletz and colleagues (2013) which was conducted with 412 children between 65 months and 86 months in

Germany as well as Iceland. A study by Schmitt and colleagues (2015), on the other hand, could not confirm a predictive value of the SRL of preschool-aged children on their academic outcomes. Nevertheless, altogether, empirical findings speak in favor of a positive influence of self-regulation on academic performance, so in the present study, we also expected this predictive value.

In conclusion, study I first aimed at the development and the evaluation of a model of self-regulation in preschool age that was based on the empirical findings of Bronson (2000) by using CFA. Second, in order to prove the hypothesis (e.g., Blair & Razza, 2007; Denham et al., 2011) that SRL has a predictive value for performance, the tested model was related to performance with the help of SEM.

4.1.2 Methods

In study I, the central aim was to develop and to evaluate a model of self-regulation for preschool age and to investigate its relation to performance. For the analyses, data of N = 198 preschool-aged children (45.9% female, *Mage* = 5.60, *SDage* = .50) was collected. The sample included all children for who a performance measure as well as a rating of their self-regulation was available. The rating in terms of the self-regulation of the preschoolers was assessed by an adapted rating scale for kindergarten teachers which originally derived from the Cambridge Independent Learning Project (C.Ind.Le) (see Whitbread et al., 2009). By means of 23 items, kindergarten teachers had to value to which extent the observed children shows certain behaviors related to the four components of self-regulation (e.g., “the child initiates activities by himself”). Cronbach’s Alpha was satisfying for all subscales and the two measurement points (see Table 1).

Table 1

Scales, item examples, and reliabilities of the questionnaire for T1 and T2

		Cronbach's alpha	
Scale	**Items**	**T1**	**T2**
Emotional Self-Regulation	e.g., "*The child can focus his attention and resist distractions*." (5)	.88	.86
Prosocial Self-Regulation	e.g., "*The child is aware of the feelings of others, helps them and comforts them*." (6)	.89	.85
Cognitive Self-Regulation	e.g., "*The child can talk about how something was done or what was learned*." (7)	.94	.94
Motivational Self-Regulation	e.g., "*The child can initiate activities*." (5)	.89	.92

Performance measure was recorded by a problem-solving task, named Train Track Task (see Bryce & Whitebread 2012, Whitebread et al., 2009), in which children had to reconstruct shapes in accordance with a template with the help of Brio railway tracks. The performance measurement's amount of scored points was determined by the fitting of the construction with the template. The instrument was comprised of nine items (e.g. "the shape is closed") for which each, one point was given so that a maximum of nine points could be achieved maximally. In order to test whether the collected data empirically reflected the four-factorial structure (the differentiation into the fields of motivational, emotional, prosocial and cognitive self-regulation) proposed by the model of self-regulation in preschool age in reference of Bronson (2000), a CFA with the help of MPlus (Muthén & Muthén, 2012) was conducted in the first step. For the analysis, the ratings of the kindergarten teachers concerning the self-regulation of the preschoolers prior to training (first point of measurement T1) were used. In the second step of data analysis, the tested measurement model was put into context with the factor performance by using SEM. By means of a CFA, measurement models which derived a priori from theory and which include a previously fixed number of factors (latent variables) that are based on indicators (manifest variables) are investigated in terms of their fit with empirical data (Kline, 2005). With the help of SEM correlation patterns between different latent variables or latent

variables and manifest variables can be investigated. In study I, CFA was used to empirically test a four-factor-model as well as a one-factor-model of self-regulation. SEM then was conducted to investigate the relation between latent SR and an achievement score (manifest variable). The decision whether the theoretically hypothesized model is consistent with the empirical data is determined by several fit statistics. A first important fit-index is the χ^2-value which is reported alongside its degrees of freedom and a significance value. The value indicates whether the tested null hypothesis which consider a match between the covariance matrix implied by the hypothesized model and the estimated population covariance matrix (Christ & Schlüter, 2012) has to be accepted or discarded. A significant χ^2-value therefore, is an indication for a mismatch of the postulated model and the empirical data. As this test is less reliable within large samples (Kline, 2005), it should be complemented with further fit indices. One example is the χ^2/df-ratio which indicates an acceptable fit if it is below 2:1 (Schermelleh-Engel, Moosbrugger, & Müller, 2003). Another possible fit index is the CFI (Comparative Fit Index). By means of the CFI, the fit of the hypothesized model and the fit of an independent model are compared, whereby null correlations between the variables are supposed. CFI value indicates how much better the postulated model fits the data than the independent model. Values for CFI can range from 0 to 1, whereby values > .90 are considered as acceptable fits (Kline, 2005). Another fit index that is often reported, is the RMSEA (root mean square error of approximation). The RMSEA value represents an approximative model fit. Lower values for RMSEA indicate a better fit. To reach an acceptable model fit, values should be ≤ .08 (Kline, 2005). Finally, the SRMR (standardized root mean square residual) represents a further important fit index, which is used to inform about the overall evaluation of the residues. Values ≤.08 indicate an acceptable model fit (Kline, 2005). If the fit of competitive models should be compared, information-theoretical criteria like the BIC (Bayesian information criterion) and the AIC (Akaike information criterion) have to be considered. Especially the usage of the BIC-index as the decisive criterion for the selection of the better fitting model is advised. The better model fit is indicated by the lowest BIC and AIC value. Before CFA was carried out, data was screened in terms of the identification of statistical outliers and missing values and a verification of the linearity- and the normal distribution assumption was accomplished. To examine missing values, Little´s MCAR test (Little & Rubin, 2002) was used. Little's MCAR test tests the null hypothesis that missing values are completely at random (MAR), meaning that the missing data is not related to any other variable. As Little's MCAR *p*-value was nonsignificant, missing data was completely at random and

therefore occurred by chance. In MPlus (Muthén & Muthén, 2012), there is the possibility to use FIML-estimator (Full information maximum likelihood) which handles missing patterns by calculating parameter estimates of available data directly, so that a deletion or imputation of data is avoided. To deal with non-normal distribution of the data, MPlus provides the MLR estimator (maximum likelihood robust estimator) which was used for the following study.

4.1.3 Results

In the first step, CFA was conducted in order to investigate the factorial structure of self-regulation in preschool age, measured by the rating scale CHILD-checklist. Therefore, a model with four first order factors (motivation, emotion, prosocial behavior and cognition) and one second order factor (self-regulation) was tested. Model fit indices indicate an acceptable model fit ($\chi^2(221) = 419.09$, $p < .001$, $\chi^2/df = 1.93$, RMSEA = .077, SRMR = .059, CFI = .912). Since loadings of the first order factors on the second order factor were very high, a one-factor model was compared to the four-factor model with the aim to prove whether the manifest variables may be traced back to only one superordinate latent dimension. Fit statistics showed acceptable values for both models, but the four-factor model was to prefer because it showed a lower BIC than the one-factor model. Fit indices of both models are displayed in Table 2.

Table 2

Fit indices of the tested models (Model 1: 2nd order model of self-regulation factor with emotional, prosocial, cognitive and motivational self-regulation as 1st order factors; Modell 2:1-factor-model of self-regulation)

Modell	χ^2	*df*	χ^2/df	RMSEA	SRMR	CFI	AIC	BIC
1	419.09	221	1.93	0.077	0.059	0.912	5822.15	6057.50
2	435.87	225	1.94	0.079	0.061	0.906	5835.31	6058.58

In the second step, the relationship between SR and performance was evaluated by using SEM. Therefore, the performance score was integrated in the structure equation model as manifest endogenous variable. The identified fit statistics spoke for a “reasonable fit” of the model (Browne & Cudeck (1993) ($\chi^2(243) = 431.63$, $p < .001$, $\chi^2/df = 1.78$, RMSEA = .07, SRMR = .06, CFI = .92). Figure 3 displays the tested model. All factor loadings are significant ($p < .001$). The path from SR to SRL is not significant, meaning that a predictive value of performance could not be confirmed.

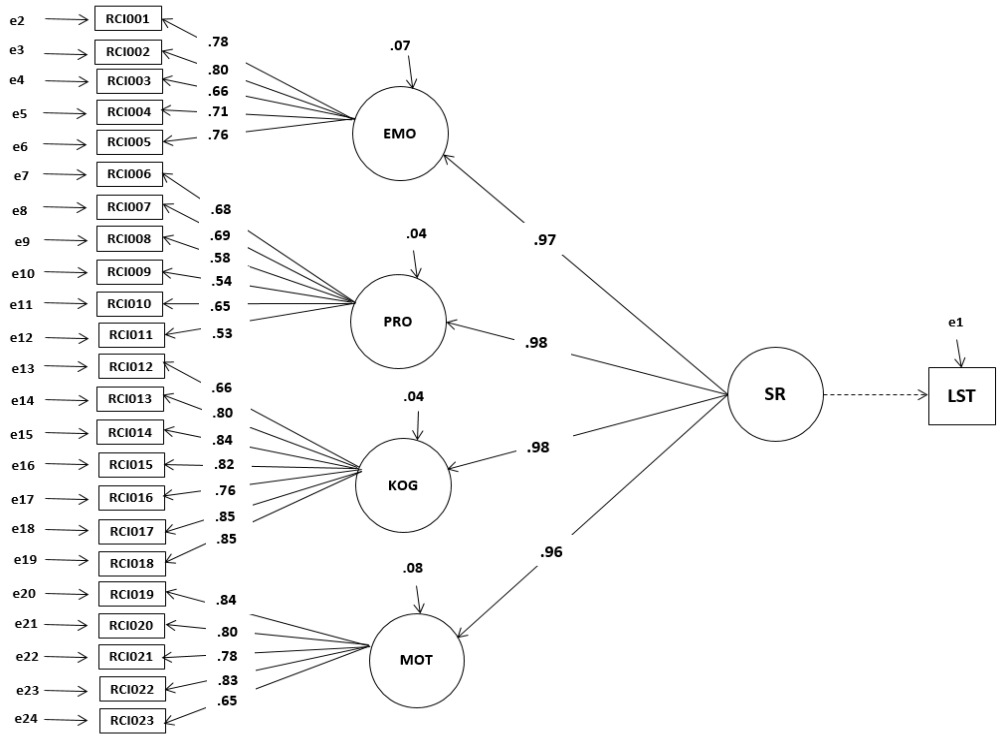

Figure 3. Structure equation model self-regulation and performance with standardized coefficients. *LST* performance, *SR* Self-Regulation, *EMO* emotional self-regulation, *PRO* prosocial self-regulation, *KOG* cognitive self-regulation, *MOT* motivational self-regulation; *RCI001-RCI0123* Items of the rating scale CHILD-Checklist.

4.1.4 Discussion

Study I pursued two essential aims: First, the aim was to develop and empirically evaluate a theoretical model of self-regulation in preschool age, which was based on research results of Bronson (2000), by using CFA in MPlus (Muthén & Muthén, 2012). Second, the study aimed at testing the model with regard to its relationship to performance by using SEM. Based on prior research (e.g., McClelland & Tominey, 2016; Ponitz et al., 2009; Von Suchodoletz et al., 2013), it was hypothesized that self-regulation in preschool age has a positive impact on performance. Therefore, performance was integrated in the measurement model of self-regulation as a manifest endogenous variable. In regard to the first aim, results speak in favor of an acceptable fit of the tested model with empirical data. The confirmation of the four-factorial structure as proposed by Bronson (2000) gives initial indication that self-regulation can be modelled by the four components motivation, emotion, prosocial behavior and cognition. Since the fit indices can be only rated as acceptable, further development or a specification of the model on a theoretical level seems to be useful. In addition, on an empirical level, these changes should also be find

expression in an adaptive way of the assessment. One possible adaption might be the integration of a metacognitive component which would make the model more compatible to established theoretical models in school and university context (e.g., Zimmerman 2000). Concerning the second aim, results could not confirm the hypothesis of a positive predictive influence of self-regulation on performance. One explanation for the non-confirmation of a predictive influence of self-regulation on performance as shown in prior research, might be due to a different conceptualization of self-regulation. While previous studies usually used measurement instruments like the Head-to-Toes-Task (see McClelland et al., 2007) that in fact assess EF, in the present study a different instrument was used that lays more focus on metacognitive processes in self-regulation. Therefore, the initial analysis was supplemented by exploratory correlation analyses. First results indicate that motivational aspects influenced the performance which were not considered within the assessment by the Train Track Task. In conclusion, the used instrument only seems to measure performance adequately, if the children show the willingness or motivation to work on the task according to the instruction in the assessment situation. If they have another intention at the point of data collection and therefore strongly deviate from the template, their results are rated as a poor achievement, also if they would theoretically possess the abilities needed to reconstruct the template exactly. Even if the present study makes a first contribution to the theoretical conception of self-regulation in preschool age, it is subjected to some restrictions. As a first point of criticism of study I, it has to be mentioned that self-regulation was assessed by only one instrument which does not meet the recommendation of a multi-methodological assessment (Spörer & Brunstein, 2006). For a future differentiated examination, further data sources (e.g., data of observations or interviews) should be considered. Another limitation of the study is the rather small sample size. Therefore, the model should be evaluated within another sample. In addition, because of temporal and personal factors of the institutions, a randomization could not be realized. A grand challenge in future will be the development of an age-appropriate assessment tool. In previous studies in Anglo-American countries, instruments for the assessment of precursor skills in mathematics and literacy were used (e.g., Blair & Razza, 2007) as indicators for performance. However, in Germany, the early educational system aims to a holistic encouragement of preschoolers instead of a concrete mediation of subject-specific competencies (Kultusministerkonferenz, 2004). Therefore, the assessment of performance with instruments as used in Anglo-American studies, does not seem to be adequate. In future, more alternatives for German or European countries have to be developed. In the

present study, we decided to use the Train Track Task to assess performance, since it has been implemented successfully in a study by Whitebread et al. (2012). This instrument seemed to be age-appropriate as the abilities need to reconstruct the template correctly are in accordance with the understanding of learning represented in the present study. Instead of focusing on subject-specific precursor skills, the Train Track Task assess observable behaviors which are related to metacognitive abilities or basic learning abilities like planning and monitoring the own action. In addition, the playful and time efficient application of the instrument can be seen as a great advantage as it considers the exploration urge as well as the restricted attention span of children in preschool age. Certainly, exploratory analyses indicate that the Train Track Task still requires optimization as motivational influences, which can have a non-negligible impact on the presented performance, are not considered. With the aim of a differentiated examination of the relationship between self-regulation and performance, the development of an instrument that assesses generic competences should be of special interest in future studies. The challenge particularly consists in creating an instrument which satisfies developmental-psychological requirements and which is compatible to performance measurements at a later age.

4.2 Study II

Venitz, L. & Perels, F. (2018). Promoting self-regulated learning of preschoolers through indirect intervention: A two-level approach. *Early Child Development and Care,* 1-14.

Abstract

To date, interventions to foster SRL processes, were nearly exclusively related to school or university contexts (Dignath, Büttner & Langfeldt, 2008). However, as SRL is defined as a substantial competence for lifelong learning (Lüftenegger et al., 2012), a promotion also seems important in the early years. This is why the present study is of special interest as it is aimed to develop and evaluate an indirect intervention to improve SRL in preschool-aged children. For the conceptualization of adequate interventions at preschool age, competent reference persons must be actively involved in the process because their support appears crucial for the development of SRL behaviors in preschoolers (see Bandura, 1977; Martinez-Pons, 1996; Bruder, 2006). To obtain a measurement of the chosen variables, a sample of 37 kindergarten teachers and 16 parents of preschool-aged children completed questionnaires before and after the intervention. In addition, the SRL of 53 preschoolers

(47.3 % female; M_{age} = 5.74 years) was recorded using a rating scale. The results of the analyses of variance and a priori contrasts indicated significant improvements in terms of the SRL behavior and supportive methods at the adult level, whereas the expected indirect effect of the training on the child level could not be confirmed.

4.2.1 Theoretical background and aims

Since preliminary findings from studies reviewing school achievement (e.g. Programme for International Student Assessment, see Klieme et al., 2010) showed that German students still have considerable deficits with regard to basic learning abilities, SRL has been established as an integral aim of the German education system. In addition, several studies (e.g., Nota et al., 2004; Blair & Razza, 2007; McClelland et al., 2007) indicate that SRL is predictive for future academic performance and therefore necessary competencies should be fostered as early as possible. In fact, an implementation of interventions promoting SRL seems to be particularly useful in the age group of preschoolers because many SRL abilities (e.g., attention-focusing) show a large growth in this time period (Bronson, 2000; Larkin, 2010). In addition, children at this point of life face many new challenges associated with the transition to primary school. In this context, parents and kindergarten teachers can be given tools to facilitate the development of an independent organization of their childrens' learning processes in a targeted promotion through an indirect intervention (Morrison et al., 2010). Nevertheless, it remains a shortage of intervention studies concerning SRL in preschool-aged children (Perels et al., 2009). Therefore, in the present study, an intervention for kindergarten teachers and parents of preschool-aged children was developed and evaluated with the aim of a further development of the participant's SRL behavior as well as the mediation of concrete strategies to support the development of SRL in preschoolers. The training conceptualization was based on the theoretical assumptions of Zimmerman (2000) and therefore mediated content knowledge was referred to the three phases of SRL (forethought phase, performance phase and self-reflection phase). In terms of the strategies that were taught as a tool to support the preschooler's SRL, we referred to the Parental Inducement of Self-Regulation-model (PIASR model) by Martinez-Pons (1996). The PIASR model is defined by four central dimensions (parental modelling, encouragement, facilitation, and rewarding), which represent methods adults can use to support the SRL of children, so it offers useful theoretical frame for SRL promotion strategies. The first dimension, *modelling*, comprises behaviors of parents who display positive examples of SRL. In reference of Bandura (1977), these demonstrated behaviors are hypothesized to be

imitated by children if they are regularly seen by them in everyday life (Martinez-Pons, 1996). By adopting these behaviors, the SRL of preschoolers can be increased. As a second dimension, *encouragement* is mentioned in the model of Martinez-Pons (1996). Encouragement means the ability to strengthen the child's efforts to adopt observed strategies to solve a task. In addition, motivation can be increased by encouragement, and thus persistence while task processing and a more frequent mastery of the task can be supported. With the help of *facilitation*, another strategy implemented in the model of Martinez-Pons (1996), parents or kindergarten teachers can support the mastery of a task by offering little encouragements like targeted steering of attention towards the essential dimensions of the task. Finally, the dimension of *rewarding* means that parents and teacher can give rewards if the children display SRL strategies. In accordance with behavioristic assumptions (e.g. Skinner, 1974), rewards can serve as a positive stimulus. Therefore, it can be assumed that behavior that is rewarded, will be shown more often. Based on these assumptions, two reference groups (parents and kindergarten teachers) were selected for the present study because of their important roles in the lives of preschoolers. Whereas parents are especially relevant in the first years of life, kindergarten teachers become more and more important with growing age (and related longer presence at kindergarten, see Bronson, 2000). Additionally, it can be assumed that the effect on the SRL of preschoolers is the greatest if both reference groups are trained. In this way, a consistent promotion at home and in kindergarten – the two most important learning contexts of children at preschool age – is ensured (El Nokali et al., 2010).

4.2.2 Methods

With the aim to investigate the effects of the intervention on the level of the kindergarten teachers and the parents, the study was based on a control group design with repeated measures, which allowed for a pre-test/post-test comparison within and between the groups (no training, single training of parents, single training of kindergarten teachers, timely parallel training of parents and kindergarten teachers) regarding the dependent variables of SRL and SRL promotion strategies. A randomized assignment to the different conditions could not be realized so that a quasi-experimental design had to be used. Following a two-level approach, improvements in SRL should be investigated on the adult level as well as on the children level. To test general effectiveness of the different training conditions, analyses of variance (ANOVA), were performed. In order to investigate within-comparisons, paired *t*-test were carried out. To additionally prove the a priori defined hypotheses which assume that the experimental groups are superior to the control group

(Hypothesis 1: $EC_{parents+kindergarten\ teacher} / EC_{kindergartenteacher} / EC_{parents} > CG$) and that the simultaneous training of parents and kindergarten teachers is superior to the single training groups (Hypothesis 2: $EC_{parents+\ kindergarten\ teacher} > EC_{parents} / EC_{kindergarten\ teacher} / CG$), contrast analyses (Abdi & Williams, 2010) were conducted. In contrast to analyses of variance, contrast analyses have the advantage of increased power.

Following the idea of a multiplier model, the preschoolers, whose kindergarten teachers and parents were participants of the training or were in the control group, were also tested before and after the training. On the level of the children, a 2 (training of kindergarten teachers yes/no) × 2 (training of parents yes/no) design was used. In order to identify any improvements in SRL on the level of the kindergarten teachers and parents as well as on the child level, a two-level analysis was conducted. The pre-test, consisting of a questionnaire for teachers and parents, was administered to the parents and kindergarten teachers one week before the beginning of the training. In order to assess the children's level of SRL behavior prior to the intervention, the parents and kindergarten teachers were also asked to complete a rating scale (CHILD-Checklist 3-5; see Whitebread et al., 2009). After the three-week training phase, the assessment procedure was repeated, meaning that they were required to complete the questionnaire as well as the rating scale again. In the control group of kindergarten teachers and parents as well as in the control group of the children, no intervention was implemented.

For the adult sample, 37 kindergarten teachers in the training groups and 10 kindergarten teachers in the control group participated in the study. All of them were female and the mean age was between 30 and 39 years (*SD* = 1.61). They had been working in their current positions for 15.05 years on average (*SD* = 12.77). Further, 16 parents in the training groups and 5 parents in the control group took part in the study. Of the parents, 95.5% were female, and the mean age was between 30 and 39 years (*SD* = .59). Participation was voluntary, and data were collected anonymously. A unique assignment of the children to the parents and the kindergarten teachers was made possible by the procurement of individual codes. For the analyses on the child level, only children who had been rated by the kindergarten teachers and the parents on both measured time points could be included into the sample. As a consequence, a large number of children had to be excluded from the analyses. In the end, the sample contained 53 preschool-aged children from several German kindergartens in a circuit of the responsible university. 44 of them were part of the experimental group ($n_{single\ training\ kindergarten\ teacher} = 25$; $n_{single\ training\ parents} = 5$ $n_{training\ parents+kindergarten\ teacher} = 13$) and 9 were part of the control group. The ages of the

children ranged from 5 to 7 years (M = 5.74, SD = .44), and 47.3% were female, 52.7% male.

The training encompassed three 90-minute sessions, and each was conducted by two skilled trainers. To ensure standardized implementation, a schedule for each session was developed. The training was structurally conceptualized in recourse of the model of self-regulation by Zimmerman (2000) as each of the sessions dealt with one of the phases of self-regulation (forethought, performance, and self-reflection phase), its central components and strategies. All the sessions were structured in a similar way. At the beginning of each training session, the participants were greeted and made familiar with the agenda for the day. After a theoretical introduction to the single phases of SRL, the participants were offered the opportunity to practice parts of the learned content based on different exercises. In order to complement the exercise portion, they were encouraged to exchange experiences and examples of appropriate situations in their everyday life. At the end of each session, a transfer assignment was given to practice either reflecting on their own SRL or teaching self-regulatory strategies at home or in kindergarten until the next session. At the next training session one week later, these experiences and related questions were renewed. During every session, participants also received a folder with materials for further exercises and an overview of the essential points of the training.

In order to evaluate intervention effects by means of a pre-post comparison, a SRL questionnaire with 146 items about SRL and methods to promote SRL was used. The questionnaire filled out by the kindergarten teachers as well as the questionnaire for the parents showed acceptable internal consistencies for all subscales and both measurement points with the exception of the subscale *rewarding* to the second measurement point of the kindergarten teacher's questionnaire and the subscale *facilitation* to the second measurement point of the parent's questionnaire (see Table 3 and Table 4).

Table 3

Questionnaire filled out by the kindergarten teachers

		Cronbach's alpha	
Scale	**Subscale**	**T1**	**T2**
Self-regulated learning	*Forethought phase*: e.g., "Before I start a task, I am setting concrete targets." (36)	.90	.91
	Performance phase: e.g., "While I am working, I am thinking of my set aims, to check if I made progress." (19)	.73	.76
	Self-reflection phase: e.g., "Errors show me, what I can do differently." (17)	.79	.75
Methods	*Modeling*: e.g., "If I am excited about something, it automatically promotes the motivation of the children." (10)	.73	.69
	Facilitation: e.g., "If the children have difficulty solving a task, I try to encourage them to find their own solutions." (15)	.77	.81
	Encouragement: e.g., **"**If the children are afraid of a task, I encourage them." (10)	.77	.82
	Rewarding: e.g., **"**I praise the children for tracing failures to changeable things." (5)	.72	.52
Self-regulated learning overall		.92	.93
Methods overall		.86	.74

Table 4

Questionnaire filled out by the parents

		Cronbach's alpha	
Scale	**Subscale**	**T1**	**T2**
Self-regulated learning	*Forethought phase*: e.g., "Before I start a task, I am setting concrete targets." (36)	.86	.87
	Performance phase: e.g., "While I am working, I am thinking of my set aims, to check if I made progress." (19)	.84	.77
	Self-reflection phase: e.g., "Errors show me, what I can do differently." (17)	.74	.71
Methods	*Modeling*: e.g., "If I am excited about something, it automatically promotes the motivation of the children." (10)	.74	.65
	Facilitation: e.g., "If the children have difficulty solving a task, I try to encourage them to find their own solutions." (15)	.72	.59
	Encouragement: e.g., **"**If the children are afraid of a task, I encourage them." (10)	.74	.71
	Rewarding: e.g., **"**I praise the children for tracing failures to changeable things." (5)	.64	.70
Self-regulated learning overall		.90	.92
Methods overall		.88	.83

4.2.3 Results

The analyses were conducted on three different levels: on the level of the kindergarten teachers, on the level of the parents and on the child level. On the level of the kindergarten teachers, a multivariate analysis of variance (MANOVA) with time as a repeated measurement factor was conducted on the SRL and the subscales as well as the methods and their subscales in order to test for significant training effects. As there have been pre-existing differences between the experimental and the control group referring to the self-reflection phase scale, analyses of covariance (MANCOVA) were computed. The results show no significant differences between the experimental group and the control group in terms of the SRL overall scale and methods as well as for their subscales. The results of MANOVA with time as a repeated measurement factor did not show any significant training effect for the SRL and its subscales on the level of the parents. In terms of the SRL

promotion strategies as well as the modelling, facilitation, and rewarding subscales, no significant improvements could be demonstrated. Only the encouragement subscale produced a significant interaction effect of group × time ($F(1, 20) = 5.94$, $p = .02$, $\eta p^2 = .23$).

To test whether there is a significant training effect within the single groups, paired *t*-tests were carried out additionally. In accordance with our theoretical assumptions, the within-group comparison for the kindergarten teachers illustrated a significant improvement in the experimental group in terms of the SRL overall scale and for the scales of performance phase, methods, modelling, and rewarding (SRL: $t(36) = -2.32$, $p = .03$, $d = .26$; performance phase: $t(36) = -2.64$, $p = .01$, $d = .32$; methods: $t(36) = -3.91$, $p < .001$, $d = .33$; modelling: $t(36) = -3.32$, $p < .001$, $d = .39$; rewarding: $t(36) = -2.51$, $p = .02$, $d = .42$). The control group did not change significantly between the two referent dates referring to the mentioned scales. A within-group comparison in the single training group of the parents revealed a significant improvement in the experimental group concerning the scales of forethought phase, methods, modelling, encouragement, and rewarding (forethought phase: $t(15) = -2.71$, $p = .02$, $d = .76$; methods: $t(15) = -3.06$, $p < .01$, $d = .93$; modelling: $t(15) = -2.30$, $p = .04$, $d = .59$; encouragement: $t(15) = -3.07$, $p < .01$, $d = .72$; rewarding: $t(15) = -3.65$, $p < .01$, $d = .93$). Thus, our theoretical assumptions could at least be confirmed for these scales. The control group did not change significantly. By the means of contrast analyses, the initially formulated assumptions regarding the superiority of the experimental groups (Hypothesis 1: $EC_{parents+kindergarten\ teacher}/EC_{kindergarten\ teacher}/EC_{parents} > CG$) as well as the superiority of the simultaneous training group (Hypothesis 2: $EC_{parents+\ kindergarten\ teacher} > EC_{parents}/EC_{kindergarten\ teacher}/CG$) were tested. For the analyses, the values of the second measurement of the dependent variable were considered. In the case of significant pre-intervention differences between the groups, difference values of the pre- and post-measurements were consulted. In terms of the SRL assessed by the kindergarten teachers' responses to the CHILD-Checklist 3-5, no significant results could be obtained. Neither a superiority of the experimental groups against the control group ($t(3, 49) = .52$, $p = .30$, $d = .19$), nor a superiority of the simultaneous training group against the single training groups and the control group ($t(3, 49) = .37$, $p = .36$, $d = .13$) could be shown. Therefore, hypothesis 1 and 2 had to be discarded. Based upon the rating scale filled out by the parents, Hypothesis 1 could also not be confirmed ($t(3, 49) = 1.37$, $p = .09$, $d = .55$), but significant results were obtained concerning Hypothesis 2 ($t(3, 49) = 1.91$, $p = .03$, $d = .71$). The results indicate that the

simultaneous training group was proven to be superior to all other training groups and the control group. On the child level, differences between the experimental and the control group were tested by the means of an analysis of variance (there were no differences prior to the intervention) based upon the data assessed through the kindergarten teachers. Results did not reveal a significant interaction effect of time × kindergarten teacher × parents ($F(3,49) = .93$, $p = .34$, $\eta p^2 = .02$). As no pre-differences concerning the SRL scale assessed by the rating scale (filled out by the parents) were found, ANOVA with time as a repeated measurement was conducted. ANOVA results prove that no significant training effects could be identified ($F(3, 49) = .36$, $p = .55$, $\eta p^2 = .01$). Because of the small sample size of the children, also nonparametric methods (Kruskall-Wallis *H*-tests) were applied. In accordance with the results of the analyses of variance, no significant differences between the experimental group and the control groups to the second measurement time point could be detected in terms of the SRL scale of the CHILD 3–5 applied to the kindergarten teachers ($H(3) = 5.44$, $p = .14$) and the parents ($H(3) = 7.74$, $p = .06$).

4.2.4 Discussion

The aim of study II was to develop and to evaluate indirect interventions to foster the SRL of preschool-aged children. Employing a two-level approach, SRL was first assessed on the level of the kindergarten teachers and the parents and second on the level of the children. Whereas any significant interaction effects of group × time could be shown by the means of the ANOVA on the level of the teachers, significant improvements were detected in terms of the scales methods and encouragement on the level of the parents. Results of the within-group comparison indicate that the training more affected knowledge concerning methods to improve SRL of preschool-aged children than the SRL behavior in both groups. This effect might be due to the fact that, in contrast to the mediation of concrete methods, the amount of meaningful change in a behavior that requires in-depth self-reflection is only possible to a limited extent in such a short intervention period. On the child level, no significant changes concerning their SRL could be revealed. One explanation for the missing effects is the short survey period which might not be long enough for a constant mediation and therefore, the assumed modelling effect (Bandura, 1977) could not yet affect the children's SRL. In addition, the training tried to illustrate different situations in which to use the learned strategies, but the contents were very complex. Following the results of a meta-analysis by Hattie, Biggs, and Purdie (1996), the best training results can be obtained if the training contents are very specific, less complex, easy to learn, and if only a little amount of transfer of the training contents to the desired

behavior is needed. The contents of the present intervention were multilayered, so that there remained a need for transfer to apply these strategies tailored to the needs of the individual children and situation. Because of the limited intervention period, a huge transfer capacity rested on the participants which might have complicated the usage of the learned strategies in every day live. The missing training effect might also be related to difficulties in the usage of the instrument. The CHILD-Checklist assesses general characteristics rather than explicit strategies. On the hand, this fact can be seen as an advantage as the ratings of the children's SRL are not only based on a single-occasion assessment but observations in several situations and settings (Matthews, Cameron, & Morrison, 2009). On the other hand, the very open formulation of the items could lead to difficulties in differentiated ratings. A more concrete formulation of the items in form of directly observable behaviors or strategies may be useful to overcome rating insecurities. Other influencing factors that have to be considered in future investigations are the non-objective relation between the kindergarten teachers or parents and the observed children as well as the missing experience with the usage of a rating scale. Using a panel of independent professional observers seems to be more likely to produce objective ratings. For a differentiated consideration of the results on the child level, contrast analyses were conducted which could not prove a superiority of the experimental groups against the control group (Hypothesis 1). Hypothesis 2 could at least be partly confirmed, as the simultaneous training of the kindergarten teachers and parents was shown to be superior to the other training groups and the control group in regard to the SRL assessed by the CHILD-Checklist 3–5 of the parents. These results indicate that the assumed importance of the inclusion of both central reference person groups (El Nokali et al., 2010) could be verified. In general, the results of the within-comparison on the level of the parents and kindergarten teachers showed that a training of kindergarten teachers and parents can contribute to an improvement in their SRL and their knowledge about SRL promotion strategies. With the aim to produce an improvement in SRL on the child level, future research is a needed to optimize the intervention (e.g., duration of the intervention and the assessment period), as well as the instrument. Although the developed intervention seems to be appropriate as a first attempt to develop a combined SRL promotion training for kindergarten teachers and parents of preschool-aged children, some limitations of the study have to be mentioned. One obvious limitation of the study is the very small sample size of the different training conditions which should be elevated in future studies through targeted incentives. As another important limitation of the study, the missing randomized

assignment of the groups must be noted. Although a randomization of the groups was planned, the recruitment phase found that many kindergarten were only willing to take part in the study under their own defined conditions (e.g., they could only realize a kindergarten teacher training but not a training of the parents). In addition, multilevel analyses would have been meaningful to evaluate the training because of the hierarchical structure of the data. By means of multilevel analyses, the assignment of individuals to natural groups (in this case matching the children to a special kindergarten group and respectively to a special kindergarten teacher), which influences the individual characteristic values, is considered (Snijders & Bosker, 2012). Consequently, in further studies, a pre-assignment, which considers these preconditions of the multilevel analysis, should be established. Additionally, a follow-up survey would have been necessary to prove whether there had been long-term effects at the adult and child level. In the present study, a follow-up survey was impossible, as the children had already entered school. Thus, in further studies, the intervention should be carried out at the beginning of the kindergarten year so that a follow-up measurement and an extension of the intervention phase could be realized. Besides, the questionnaires used to assess the SRL and the SRL promotion strategies of kindergarten teachers have some weaknesses with regard to certain subscales so future studies should improve this scales. Furthermore, according to the demands of a multi-method approach (Spörer & Brunstein, 2006), the instruments for the adults should be complemented by others, such as a standardized observation of their behavior in the interaction with children during a problem-solving task. As the questionnaire as a self-report instrument only assesses the participants' own perceptions of the SRL promotion strategy use and their own SRL behavior instead of the actual behavior, they should be complemented by instruments that directly measure the use of the learned strategies in the interaction with the children. A special need also exists for the development of reliable and valid instruments to assess preschool-aged children's SRL. Finally, the present study demonstrated that the SRL, especially the knowledge of kindergarten teachers and parents concerning SRL promotion strategies, can be improved by an indirect intervention. However, there remains a need for further research to optimize the training, particularly in terms of the facilitation of the transfer of the learned materials to the individual's need in everyday life situations. The study can be seen as a first important step towards an answer to the need for a specific adherence of learning competencies in early childhood education (Fthenakis, 2003).

4.3 Study III

Venitz, L. & Perels, F. (2019). The Promotion of Self-regulated Learning by Kindergarten Teachers: Differential Effects of an indirect intervention. *International Electronic Journal of Elementary Education*, *11*(5), 437-448.

Abstract

The early promotion of SRL has aroused increased interest in researchers and practitioners since it has been highlighted as the key competence for lifelong learning (E. U. Council, 2002). As a consequence, first approaches for SRL promotion trainings which include preschool-aged children as well as their reference persons were developed and evaluated (e.g., Perels et al., 2009, Venitz & Perels, 2018). However, it has not been investigated so far, if there are individual differences concerning the effect of the intervention. Thus, with the aim of an investigation of different SRL promotion strategy profiles of kindergarten teachers, accordingly a person-centered framework (Niemivirta, 2002), latent profile analyses with n = 134 kindergarten teachers were conducted in study III. The results display specific profiles that differ with regard to the degree of knowledge concerning strategies to promote SRL in preschool-aged children. Furthermore, differential effects of the three-weeks SRL promotion strategy training in dependence of the profiles were investigated, using a sample of n = 76 kindergarten teachers. The results indicate that an adaption of the training according to the different SRL promotion strategy profiles would be meaningful, because kindergarten teachers with a low promotion strategy profile improved significantly concerning their repertoire of strategies to support SRL in preschool-aged children as well as in terms of their own SRL behavior, whereas the teachers with moderate and especially high promotion strategy profile did not. Finally, the study investigated whether the differences discovered in the knowledge of the kindergarten teachers are related to differences in the self-regulation of the children, they teach. With the help of contrast analysis, the hypothesis was tested that children whose teachers showed greater development in terms of their knowledge about SRL promotion could improve more in their self-regulation.

4.3.1 Theoretical background and aims

As the promotion of independent, self-directed forms of learning is one of the most important aims of the early education system (Kultusministerkonferenz, 2004), kindergarten teachers are encouraged to acquire knowledge and competence concerning adequate forms of support strategies (e.g., Lindeboom, & Buiskool, 2013; Secretariat of

the Standing Conference of Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany, 2015). Empirical findings provide hints that relevant skills or methods to foster SRL of preschool-aged children can be effectively mediated by professional programs (e.g., Perels et al., 2009). Moreover, theoretical assumptions with respect to educational staff in school contexts indicate that there are individual differences in the support of SRL (Moos & Ringdal, 2012). These differences are, among other things, influenced by their knowledge about SRL promotion strategies (e.g., Dembo, 2001; Randi, 2004; Peeters et al., 2014). Taken together, the study first investigates differences in kindergarten teachers' knowledge about the SRL promotion strategies by using latent profile analysis (LPA). According to the Aptitude-Treatment-Interaction approach (Snow, 1992), study III secondly aimed to examine differential training effects for kindergarten teachers depending on the previously found profiles. The third central aim of study III is an investigation of the relation between the kindergarten teacher SRL promotion strategy profiles and changes in the self-regulation of the children they teach. Taken together, the present study adds to research, since the investigation of different SRL promotion strategy profiles as well as individual training effects in preschool context has not progressed very far. Therefore, the present study aims to prove whether results of research with regard to teachers in school can also be found within the group of kindergarten teachers.

4.3.2 Methods

With the purpose to investigate different SRL profiles in kindergarten teachers within a group of kindergarten teachers who participated on a three weeks intervention, LPA were conducted. With the help of LPA, different latent profiles, meaning groups of participants who show high similarities referring special patterns and who can be can clearly delineated by other participant groups in terms of these patterns, can be calculated. The latent variable in LPA comprises *k* numbers of cluster, and the participants values on this variable is seen as the cause of the observed values on the indicator variables (Pastor, Barron, Miller, & Davis, 2007). LPA, as one form of latent class cluster analysis (LCCA), calculates latent profiles which are based on individuals' values on continuous latent variable, whereas latent class analysis (LCA) is based on values on categorical indicators (Berlin, Williams, & Parra, 2013). LPA and LCA as forms of LCCA are defined as person-centered-approaches (Niemivirta, 2002), because in contrast to variable-centered-approaches like factor analysis which are focused on associations between variables (e.g., the increase of the experimental group in terms of the variable SRL), person-centered approaches describe associations between different persons (Lapka et al., 2011). Therefore, person-centered

approaches consider differential effects within a training evaluation, whereas variable-centered approaches can only calculate global effects of the training. LPA is characterized by a model-based cluster approach because a statistical model is proposed for the population. To estimate model parameters, MPlus uses maximum likelihood (MLR) estimator with robust standard errors. To evaluate statistical model fit, information criteria like the Bayesian information criteria (BIC), the Akaike Information Criteria (AIC) and Adjusted BIC are commonly reported, whereby the best fit is achieved by the lowest value on these fit indices (Berlin, Williams, & Parra, 2013). In addition, the accuracy with which individuals have been assigned to their most likely class is measured by entropy, whereby higher values for entropy indicate a greater accuracy (Berlin, Williams, & Parra, 2013). Another important value for the selection of the best fitting model is the *p*-value for Lo-Mendell-Rubin test (LMRT). LMRT tests whether a model with k classes has a superior fit than a model with k-1 classes. A significant *p*-value indicates that the model with k classes fits the data best. Following the recommendations of Marsh, Lüdtke, Trautwein, & Morin (2009), different solutions that means different number of groups should be investigated because the number of classes is not defined a priori. Of the tested models, the one is selected "that makes most sense in relation to theory, previous research, the nature of the groups, and interpretation of the results" (Marsh et al., 2009, p. 194). Therefore, the model selection should not solely be based on the interpretation of fit indices, but also consider prior theoretical and empirical findings, the group size as well as the interpretability of the classes. Based on the results of LPA, the relationship of the profiles with other interesting variables (e.g., own SRL behavior in the present study) can be analyzed. LPA with $n = 134$ kindergarten teachers (96.6% female) were conducted. In the present study, the data of the so-called cluster sample ($n = 134$ kindergarten teachers) derived from a questionnaire which assessed the kindergarten teacher's SRL behavior and their strategies to promote SRL in preschoolers. The questionnaire, consisting of 146 items that were rated by a 4-point Likert-type scale which ranged from 1 ("I don`t agree at all") to 4 ("I agree completely"), showed acceptable internal consistencies for all subscales and the two measurement points (see Table 5).

Table 5
Scales, item examples, and reliabilities of the questionnaire

		Cronbach's alpha	
Scale	**Subscale**	**T1**	**T2**
Self-regulated learning	*Forethought phase*: e.g., "Before I start a task, I am setting concrete targets." (36)	.90	.91
	Performance phase: e.g., "While I am working, I am thinking of my set aims, to check if I made progress." (19)	.73	.76
	Self-reflection phase: e.g., "Errors show me, what I can do differently." (17)	.79	.75
Methods	*Modeling*: e.g., "If I am excited about something, it automatically promotes the motivation of the children." (10)	.73	.69
	Facilitation: e.g., "If the children have difficulty solving a task, I try to encourage them to find their own solutions." (15)	.77	.81
	Encouragement: e.g., **"**If the children are afraid of a task, I encourage them." (10)	.77	.82
	Rewarding: e.g., **"**I praise the children for tracing failures to changeable things." (5)	.72	.52
Self-regulated learning overall		.92	.93
Methods overall		.86	.74

LPA as a person-centered-approach is often used when the aim is to evaluate differential training effects as in the present study. Furthermore, with the aim to examine differential effects repeated measurement ANOVA with the profile group as independent variable and the "training aim"-variable (e.g. SRL promotion strategies in the present study) as the dependent variable can be used. To analyze the impact of the detected profiles on the effectiveness of a training, repeated measurement ANOVA with the profile group as independent variable and the "training aim"-variable (e.g. SRL promotion strategies in the present study) as the dependent variable can be used. In the present study, differential effects within a training sample (n = 76 kindergarten teachers (100 % female)) were

investigated, using repeated measurement analyses with the profile as independent variable and overall knowledge about SRL promotion strategies as independent variable. The participants of the so-called training sample attended three weekly sessions lasting about 90 minutes each that were focused on the promotion of SRL in preschool-aged children. The SRL promotion training involved theoretical input based on the process oriented SRL model by Zimmerman (2000), as well as practical exercises to reflect and apply acquired SRL promotion strategies. The data of the training sample was obtained by the same questionnaire as the one of the cluster sample on two measurement points (t1 = one week prior to training; t2 = one week after the end of the training). With the help of dropout analyses, it could be proven that there were no significant differences concerning central variables between the cluster and the training sample. Finally, with the aim to prove whether the differences in the kindergarten teacher's SRL promotion strategy knowledge is related to improvements in the self-regulation of the children they teach, multivariate analysis of variance (MANOVA) with difference-values (t2-t1) for the subscales emotional, prosocial, cognitive, and motivational SR as dependent variables and the profile classification as independent variables was conducted. The data on the children level derived from an adapted rating scale for kindergarten teachers which originally came from the Cambridge Independent Learning Project (C.Ind.Le) (see Whitbread et al., 2009). The rating scale used in the present study includes 23 items, with which kindergarten teachers must value to which extent the observed children shows certain behaviors (e.g., "the child initiates activities by himself") related to the four components of self-regulation (emotional, prosocial, cognitive and motivational self-regulation). Cronbach's Alpha was satisfying for all subscales and the two measurement points (values ranging from $\alpha = .85$ to $\alpha = .94$). There were no differences between the groups before the intervention, so no covariates needed to be involved. To prove the a priori formulated hypothesis that children whose teachers have improved more during the training, show major enhancements in their SR than children whose teachers have improved less, contrast analyses were used additionally. For the analyses, difference values (t1-t2) for the SRL subscales (emotional, prosocial, cognitive and motivational self-regulation) were used as dependent variable and profiles of the kindergarten teachers as independent variable.

4.3.3 Results

In terms of the first research aim, 2-7 cluster solutions were tested by the means of LPA with the SRL promotion strategy subscales as indicators, in order to find the model which fits best to empirical data. The fit indices of the analyses are displayed in Table 6.

Table 6

Fit statistics for latent profile analyses (cluster sample)

Cluster	*BIC*	*E*	*LMRT*
2	365.00	.82	.00
3	**354.62**	**.80**	**.01**
4	367.26	.79	.79
5	380.93	.80	.43
6	395.46	.83	.25
7	408.32	.81	.36

In the present study, a three-cluster solution was selected, because - in accordance to the recommendations of Marsh et al. (2009) – that number of classes was selected "that makes most sense in relation to theory, previous research, the nature of the groups, and interpretation of the results" (Marsh et al., 2009, p. 194). Fit indices indicate a three-cluster solution showing the lowest BIC, a good entropy, a significant *p*-value for the LMRT and balanced distribution of the classes (profile 1 = 40; profile 2 = 51; profile 3 = 43). A three-class solution also complies with previous research by Gonzaléz-Pienda et al. (2014). Means of the SRL promotion strategy indicators (modeling, facilitation, encouragement, rewarding) are displayed in Figure 4. The differences in the means of the subscales were significantly different for all groups ($p < .00$).

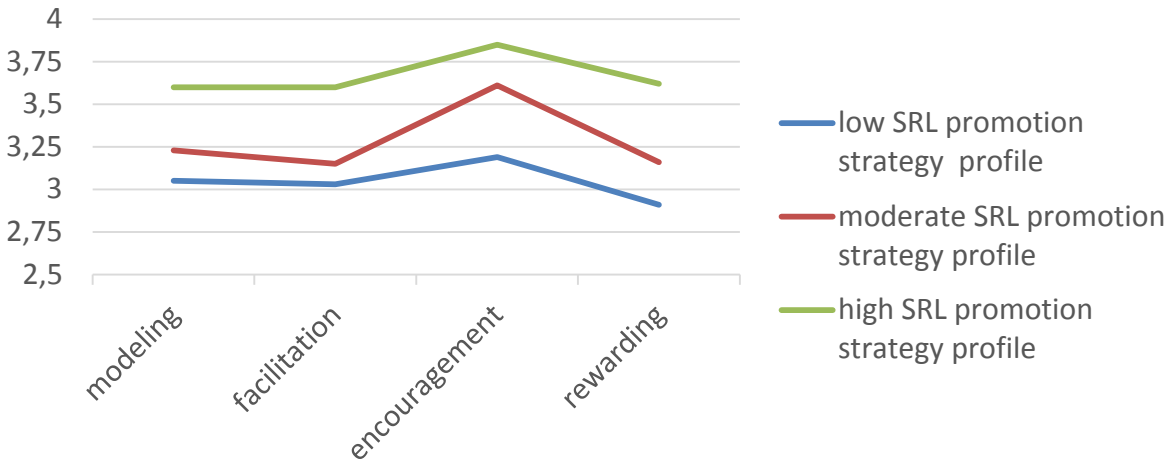

Figure 4. Profiles of SRL promotion strategies for Group 1 (low SRL profile), Group 2 (moderate SRL profile) and Group 3 (high SRL profile)

The means of the SRL promotion strategy subscales are all located in the upper third of the graph (M = 3.03 - 3.85, scale from 1 “I don’t agree at all” to 4 “I agree completely”), meaning we can conclude that all kindergarten teachers already had some knowledge of SRL prior to the intervention. In addition, all profiles show a similar distribution in terms of the subscales. They all had the highest scores for the subscale *encouragement* and lower values for the subscales *modeling, facilitation* and *rewarding*. It can be concluded that the classes do not differ obviously in terms of the distribution of the values on the subscales but rather in regard to their height. Class 1 had the lowest scores for all subscales, so it was named “low SRL promotion strategy profile” (blue line). Class 2 had moderate scores and therefore was termed the “moderate SRL promotion strategy profile” (red line), and Class 3 showed the highest scores for all subscales of the SRL promotion strategies, so we named it the “high SRL promotion strategy profile” (green line).

Following the second research aim, we first had to prove if the cluster and the training group shared the same baseline. Therefore, the distribution of the detected SRL promotion strategy profiles in the cluster and the training group was checked for uniformity. Table 7 displays the fit indices of the analyses for the 2-7 training group solution.

Table 7

Fit statistics for latent profile analyses (training sample)

Cluster	*BIC*	*E*	*LMRT*
2	143.45	.83	.00
3	**130.42**	**.85**	**.04**
4	139.49	.89	.10
5	143.20	.91	.05
6	154.79	.90	.48
7	164.24	.92	.10

Note. BIC = Bayesian information criteria, E = entropy, LRMT = *p*-value for Lo-Mendell-Rubin test. The selected cluster solution is typed in boldface.

2 x 3 (time x profile) repeated measurement ANOVAs with SRL promotion strategy and SRL behavior as the dependent variables and group membership as the independent variable revealed significant interaction (SRL promotion strategy: $F(2,73) = 3.16$, $p < .05$, $\eta_p^2 = .08$; SRL behavior: $F(2,73) = 3.20$, $p < .05$, $\eta_p^2 = .08$). In addition, theory-driven single-group comparisons by the means of contrast analyses with overall values for the

SRL promotion strategies and the SRL behavior to the second measurement point as the dependent variable were conducted. Results of the contrast analyses indicated a significant difference between the high and the low SRL promotion strategy profile in terms of the SRL promotion strategies, $t(2,73) = 4.82$, $p < .001$, $d = 1.51$ as well as in terms of the SRL behavior, $t(2,73) = 4.53$, $p < .001$, $d = 1.22$ with large effect sizes. According to the third research aim of the study, the results of the MANOVA revealed no significant differences in terms of changes in SR of the preschool-aged children with regard to SRL promotion strategy profiles ($F(2,53) = 1.91$, $p > .05$, $\eta p2 = .13$). However, a focus on the univariate results showed significant results for two of the four subscales of self-regulation, in particular the prosocial SR ($F(2, 53) = 4.32$, $p < .05$, $\eta p2 = .14$) and motivational SR ($F(2, 53) = 4.37$, $p < .05$, $\eta p2 = .14$).

Therefore, contrast analyses with difference values of two subscales of SR (prosocial SRt2 - prosocial SRt1; motivational SRt2 - motivational SRt1) were used as dependent variable and profiles as independent variable. The results of the contrast analyses are consistent with the a priori formulated hypotheses (prosocial SR: $t(2, 53) = 2.82$, $p < .01$, $d = 1.05$; motivational SR: $t(2, 53) = 2.88$, $p < .01$, $d = 1.12$), displaying significant differences between the profiles with regard to changes in prosocial and motivational SR. According to Cohen (1988), the determined effects can be interpreted as large effects.

4.3.4 Discussion

Study III entailed the investigation of the presence of SRL promotion strategy profiles in kindergarten teachers, as well as an examination of differential effects of a SRL promotion strategy training for kindergarten teachers and an investigation of the relation between the kindergarten teacher profiles and the SR of the children they teach. By means of LPA, three homogenous subgroups could be revealed that differ quantitatively with regard to their self-estimated knowledge concerning SRL promotion strategies. The presence of differential training effects in dependence of the three profiles could be shown by the results of 2 x 3 repeated measurement ANOVA. Results revealed a significant interaction effect, meaning that the three profiles differed significantly in terms of their training effect. In addition, to verify the hypothesis that kindergarten teachers who do not know that much about the promotion of SRL profit more of the intervention than kindergarten teachers who already possess a high level of knowledge, contrast analyses were used. The results speak in favor of a verification of the hypothesis, indicating a compensation effect. This result is in line with previous research showing differential effects of a SRL strategy training in dependence of different SRL baselines (González-Pienda, Fernández, Bernardo, Nuñez, &

Rosário, 2014). In accordance with Fyfe, Rittle-Johnson, and DeCaro (2012), these results indicate the need for a training with more independent learning forms that is more adapted to the needs of the kindergarten teachers who already had a high knowledge level prior to training. For the group of kindergarten teachers who do not already possess much knowledge about the promotion of SRL in preschool-aged children, the training turned out to be suitable. With regard to the investigation of differences in terms of changes in the SR of the children, multivariate results did not reveal significant results. However, when focusing on the univariate results, significant differences between the profiles with regard to prosocial and motivational SR could be identified. Additional contrast analyses were conducted to prove the hypothesis that the improvements in prosocial and motivational SR of children who were assigned to profile 1 (low SRL promotion strategy profile which has increased the most through training), are larger during the kindergarten teacher's training than children who were assigned to the high SRL promotion strategy profile (with no significant training success). The results of contrast analyses support our hypothesis at least in part. Children whose kindergarten teachers belonged to the profile that displayed the greatest training benefits show more positive changes in terms of their prosocial and motivational SR at the end of the intervention period than children whose kindergarten teachers showed no significant training benefit. This result again underlines the importance of an adaption of the intervention with regard to individual differences of the participants. A non-consideration does not only lead to the fact that the knowledge of the participants cannot be improved, but also the SR of the children cannot be better supported after the intervention, which can be seen as the ultimate goal of an indirect intervention.

As study III considered the importance of pre-differences between the participating kindergarten teachers by using a person-centered approach (Niemivirta, 2002), it adds to research because the investigation of differential effects is still rather neglected although it delivers new insights into the evaluation of an intervention and contributes to an optimal adaptation to the needs of the participants (Lapka et al., 2011). Nevertheless, there are still some limitations that should be considered in future research. First, all variables have been assessed by means of self-reports which is often criticized because research on the assessment of SRL has shown that statements of the respondents do not always correspond to their actual behavior (see Veenman, 2005). Consequently, in future studies, the self-report instruments should be complemented by other assessment instruments which can measure the actual behavior such as think-aloud protocols or systematic observations. Second, the small sample size of the study (particularly of the training sample) should be

considered as a limitation. In further studies, sample sizes should be increased to obtain valid conclusions for different training effect sizes. Furthermore, to give an insight into causal inferences, an investigation of long-term effects would be interesting. Irrespective of these limitations, the present study adds to research as it offers a more in-depth insight into the knowledge of kindergarten teachers concerning the promotion of SRL. The results are of special interest because the promotion of SRL in preschool context has been neglected for a long time, whereas the interest in fostering SRL in university and school context has arisen long before. The fact, that the evaluation only revealed a benefit of the training for kindergarten teachers who belonged to the low SRL promotion strategy profile, leads to two essential implications for future research and practice. First, the investigation of differential effects has to be extended by integrating additional variables. Since motivation can have an important impact on the effectiveness of a training (Chiaburu & Tekleab, 2005; Jaeggi, Buschkuehl, Jonides, & Shah, 2011; Scaduto, Lindsay, & Chiaburu, 2008), the consideration of motivational aspects could lead to a useful broadening. Second, the results of the differentiated training evaluation should be used for an adaption of future trainings. Since results indicate that there is a difference concerning kindergarten teacher's training profit, teaching methods and materials should be tailored to the requirements of the groups with a low, a moderate and a high knowledge level about SRL promotion strategies. Aptitude-Treatment-Interaction research indicates that "as the level of prior knowledge increases, the need for instruction decreases, and learning increases" (Jonassen & Grabowski, 2011, p. 417), so it can be assumed that for the kindergarten teachers with a poorer knowledge of SRL promotion strategies, the instructional approach followed in the present intervention is adequate, whereby for participants with higher knowledge the focus should be placed on more independent learning methods and a more practical and problem-solving oriented approach.

5 General Discussion

The following chapter will discuss the three studies which underlie the present thesis in terms of the central findings. In addition, limitations of the three studies with regard to study design, assessment methods and future research directions will be shown.

5.1 Discussion of findings

The aim of the dissertation was to develop and evaluate an adequate model of self-regulation in preschool age since prior research mainly focused on self-regulation in further age so far (study I). The developed model than formed the basis for the

development of an intervention for parents and kindergarten teachers which aimed at developing and expanding knowledge about SRL promotion strategies that can be used in everyday live to support the SRL of preschool-aged children. The present thesis also includes an evaluation of the intervention on a global level (study II) as well as on an individual level (study III) to provide information about the effectiveness of the intervention which can be used as a solid basis for the development of adaptive trainings that respond to the special needs of different subgroups within the training sample. The central findings of the thesis are discussed separately for all three studies. Furthermore, limitations of all the studies in terms of the study design and the assessment methods will be presented and future research directions will be identified in the following.

5.1.1 Model of self-regulation for preschool age

Because nowadays a targeted promotion of learning competencies like SRL is also demanded in the early years of life (Blossfeld et al., 2012; Digath, Büttner, & Langfeldt, 2008, Ftenakis et al., 2003), corresponding theoretical models become indispensable. However, conceptual knowledge about self-regulation and self-regulated learning are mainly focused on students or adults so far. Existing attempts for preschool age were only developed for subcomponents of self-regulation (e.g., emotional self-regulation) or related concepts like EF (Schmitt et al., 2015). Therefore, in the present study, a model of self-regulation in preschool age was developed and evaluated with regard to its empirical existence. Based on research findings of Bronson (2000), the tested model contained four central components of self-regulation: emotion, prosocial behavior, cognition and motivation. CFA revealed an acceptable fit, indicating that the four-factor-model proposed by Bronson (2000) can be confirmed. To test whether the model better represents data than a one-factor-model of self-regulation, a four- and a one-factor-model were compared. As results spoke in favor of a four-factor solution, this model was selected as the measurement model that was related to performance with the help of structuring equation modeling. Although results generally confirmed the structure of the model, the model fit indices also indicate need for improvement. The present theoretical concept should be adopted to increase the model fit. One useful modification might be the integration of a metacognitive component that is not part of Bronson's model of self-regulation in preschool age so far, although metacognitive abilities are an important component of several established theoretical models for higher age groups (e.g., Boekaerts, 1999; Schmitz & Wiese, 2006; Zimmerman, 2000,). The investigation of the relation between self-regulation and performance via SEM did not confirm the findings of a predictive value of self-regulation

on performance (e.g., Denham et al., 2011; McClelland & Tominey, 2016; Ponitz et al., 2009). One explanation might be due to different conceptualizations of SR and performance in the present studies and the other studies. Self-regulation in prior studies were mainly conceptualized as EF, comprising the components working memory, inhibitory control and attentional set-shifting (Schmitt et al., 2015), whereas the present concept of self-regulation comprises emotional, prosocial, cognitive and motivational self-regulation which shows many consistencies to EF but also differences. In addition, performance was differently conceptualized as it focused on monitoring and control behaviors, whereas prior studies mostly used subject-specific precursor skills as an indicator of performance (e.g. McClelland & Tominey, 2015; Ponitz et al., 2009).

5.1.2 Fostering SRL promotion strategies in essential reference persons in preschool context

As the promotion of adequate learning methods in preschool age has become more important in recent years (Fthenakis, 2003), first programs to foster SRL and related abilities like EF have been developed for the group of preschoolers (Bodrova & Leong, 2012). Evaluations of these studies revealed significant benefits of a targeted promotion in preschool age (Barnett et al., 2008; Walk et al., 2018). However, interventions for persons who essentially support the development of SRL in preschool-aged children (e.g., Martinez-Pons, 2002) are scarce. Whereas several approaches to increase teacher's knowledge of supportive methods have already been developed in the school context (e.g., Fuchs et al., 2003; Leidinger & Perels, 2012; Rosário et al., 2007), there are nearly no appropriate interventions for early childhood staff. One exception is a study by Perels et al. (2009) that combined a direct intervention for preschoolers with an indirect intervention for their kindergarten teachers. As the study revealed significant benefits of the training on the level of the preschool-aged children as well as the level of their kindergarten teachers, the present study aimed to replicate these findings in a similar intervention which additionally included parents as essential supporters of children's SRL development. By training kindergarten teachers and parents, meaning the two most important reference groups of preschool-aged children, a consistent promotion at home and kindergarten is possible (El Nokali et al., 2010). The study revealed that fostering SRL promotion strategies through an indirect intervention for kindergarten teachers and parents is generally possible. Whereas nearly no interaction effects group x time could be obtained on the adult level, inner group comparison with the help of paired *t*-tests revealed significant improvements with regard to several SRL promotion strategies through the intervention within both groups – the group of kindergarten teachers and the group of

parents. Contrast analyses, based upon the rating scale filled out by the parents, also confirmed the theoretical assumption that a simultaneous training for kindergarten teachers and parents is superior against a single training of kindergarten teachers or parents. On the child level, no significant changes in their SRL could be revealed. The missing indirect training effect might be due to the rather short survey period. Whereas the study aimed at improvements in SRL as a learning method, prior studies SRL in preschool were assessed for behavioral changes related to EF (Blair & Razza, 2007; Ponitz et al., 2009) which may take less time to change than general learning methods. Results of a meta-study of Hattie et al. (1996) indicate that the highest improvements through an intervention are obtained whenever training contents are very specific, less abstract and only need a little amount of transfer. Since the contents and learning situations within the child intervention were multi-layered, many transfer abilities were required to apply the learned methods in other learning contexts. The complexity of the construct could also have led to difficulties in the assessment. Whereas established instruments in preschool context like the Head Toes Knees Shoulder Task (HTKS) assess behavior that can be easily observed, the CHILD-Checklist used in the present study focusses on more general characteristics that are difficult to observe directly. In addition, in most of the assessment tests in preschool context, the level of SRL is assessed by professional observers who are trained in the use of the instrument, whereas the CHILD-Checklist is used by kindergarten teachers and parents who mostly do not have much experience with the use of such an assessment instrument. Although it could be shown that a simultaneous training of parents and kindergarten teachers is useful and effective, an adoption of the assessment methods on the child level, seems to be necessary to obtain an indirect training effect as found in studies concerning the promotion of EF (Walk et al., 2018).

5.1.3 Individual Differences in the promotion of SRL in preschoolers

Increasing research interest has aroused concerning individual differences in training participants and its impact on the effectiveness of educational interventions (e.g., Lapka et al., 2011). Nevertheless, approaches considering individual differences are still underrepresented (Lapka et al., 2011). Person-centered-approaches to SRL interventions have already been applied a few times (e.g., Barnard-Brak et al., 2010; Dörrenbächer & Perels, 2016b), indicating that there are individual differences within the group of students. Referring individual differences in the promotion of SRL, no studies are known so far. Therefore, study III aimed to fill this research gap by evaluating a SRL promotion strategy training for kindergarten teachers under consideration of different profiles of participants

sharing similar patterns concerning their knowledge about SRL promotion strategies. Using LPA, three different profiles were detected that differed quantitatively with regard to their knowledge about SRL promotion strategies. They were named low, moderate and high SRL promotion strategy profile. The evaluation of the training showed that the individual differences represented into the three SRL promotion strategy profiles had a significant impact on the training. In accordance with prior research on differential effects of a SRL training (Gonzalez-Pienda et al., 2014), a compensation effect was revealed, indicating the necessity for an adaption of the training to the needs of the different participant profiles. For the low SRL promotion strategy profile, the developed intervention has been proven to be effective, but in terms of the moderate and the high SRL promotion strategy profile an adaption of the training materials and methods seems to be essential. As findings of Aptitude-Treatment-Interaction research indicate that the participant's need for instruction decreases with growing knowledge (Jonassen & Grabowski, 2011), it can be assumed that participants of the high and moderate SRL promotion strategy profile require a training with independent learning methods and a greater focus on practical implementation and concrete examples of problem-solving.

5.2 Limitations

The present thesis adds to research as it provides new insights into the self-regulation of preschool-aged children by evaluating a model of self-regulation in preschool age via SEM as well as into the promotion of SRL of preschool-aged children by kindergarten teachers and parents. Nevertheless, some limitations of the thesis have to be considered. These limitations – with focus on study design and assessment methods - will be presented in the following section, each distinguishing between the child and the adult level.

5.2.1 Study Design

Child level. One first limitation on the child level concerns the sample size. As study II only included children who had been rated by parents and teachers to both measurement points, a lot of children had to be excluded for the analyses. Therefore, the remaining sample of $n = 52$ preschool-aged children must be considered rather low and was no longer equally distributed over the individual training conditions. As a result, the number of children into the training group of the parents was underrepresented ($n = 5$) in comparison to the other training groups and the control group. Hence, in further studies the sample size should be elevated and an equal distribution of children to the different groups must be adhered to. As another limitation of study II, a lack of randomized assignment of participants to intervention groups must be stated. Although it was planned before, it could

not be realized in practice because the participating institutions (and corresponding children) often had to change their associated intervention group owing to personal and temporal factors. As a result, some of the intervention groups (especially the group of the single training for parents with n = 5 children) remained underrepresented on the child level. A further limitation represents the lack of a follow-up test. By integrating a third measurement point, time-delayed effects could have been investigated. Since no indirect training effect on the child level could be found at post-test in study II, a follow-up test would have been necessary to prove possible effects after a longer period in which a mediation of SRL strategies at home and in kindergarten could have taken place. Nevertheless, a follow up could not be realized as a lot of children already left kindergarten right after the intervention period to enter school. In further studies, the intervention period should be moved forward in time, so a follow up could be realized before school entrance. Because of the missing randomization and related underrepresentation of children in some of the intervention groups, multilevel analyses could not be realized. Therefore, the hierarchical data could not be considered adequately in study II. In further studies, it would be meaningful to better structure assignment, so that the preconditions of multilevel analyses are possible.

Adult level. One general limitation on the adult level in study II and study III are rather low sample sizes which should be elevated in further studies to increase statistical power. In addition, it has to be mentioned that the participants of both studies were predominantly female. In further studies, it would be interesting to examine differences in gender concerning their prior level of SRL and knowledge about SRL promotion strategies as well as in terms of training benefits. Another limitation concerning study design on the adult level represents the missing follow-up test. Since study II revealed significant improvements with regard to SRL promotion strategies for kindergarten teachers as well as for parents, it would have been interesting to investigate if these effects are still present at a later time.

5.2.2 Assessment Methods

Child level. Despite the fact that the CHILD-Checklist, the instrument that was used to assess the preschooler's SRL has been validated in a previous study (Frank, 2010) and the fact that is has been successfully implemented in a study by Whitebread et al. (2009), the instrument shows some weaknesses that will be presented in the following. The empirical evaluation of the four factor model that forms the foundation for the CHILD Checklist only

showed an acceptable fit with empirical data. This result illustrates a further need for improvement concerning the assessment method. One possible adaption of the instrument might be the integration of a metacognitive scale, as established instruments used to assess SRL in school and university contexts (e.g., MSLQ Motivated Strategies for Learning Questionnaire; Pintrich, Smith, Garcia, & McKeachie, 1991) contain this additional component. Additionally, the instrument is geared to measure rather general characteristics than explicit strategies. Therefore, another adaption of the instrument might consist in a more concrete formulation of SRL strategies that can be observed more easily. Furthermore, CHILD-Checklist was used by kindergarten teachers and parents – two groups that do not have a great deal of experience with a professional rating using such an observation tool. Consequently, further interventions should precede a professional training for an adequate use of the instrument. As a second assessment instrument on the child level, a problem-solving task named Train Track Task (Bryce & Whitbread, 2012) was used to measure performance. An advantage of the instrument lies in the fact that it is thought for assessing monitoring and control behaviors that represent a more holistic kind view of performance than assessments of subject-specific precursor skills. Furthermore, the Train Track Task seems to be very age appropriate as it considers the increased urge to exploration in preschool age as well as a restricted attention span. Nevertheless, one important limitation of the instrument has to be mentioned. The execution of the test does not include motivational factors which might be essential for the final result of the test. If the children are not willing to follow instructions and prefer to play or building fantasy constructions, they do not show what they actually could do. Consequently, in cases when children are less motivated to follow instructions, the assessed performance might not represent their potential skill level. In further studies, this motivational impact must be included to avoid an underestimation of the childish abilities.

Adult level. One obvious limitation with regard to the assessment method on the adult level is the use of the SRL questionnaire which represents a self-report measure. Self-report measures are often criticized (e.g., Veenman et al., 2006) as they only asses the participant's own perception of their skills instead of their actual behavior. Furthermore, reliability analyses showed some weaknesses with regard to some of the subscales what means that they have to be adapted in further studies. Apart from the weaknesses of the questionnaire, it can be criticized that only one assessment instrument was used on the adult level because it does not respond to the demand of a multi-method approach (Spörer & Brunstein, 2006). In further studies, the questionnaire should be supplemented by further

assessment instruments like interviews, or video observations to increase reliability of the results (Veenman, 2011).

5.3 Future Research Directions

The aim of the present thesis was threefold: First, the factorial structure of self-regulation in preschool age was tested by empirically evaluating a model of preschool age, developed on the basis of Bronson's (2000) findings. Second, an indirect intervention for parents and kindergarten teachers was developed and training effects were investigated on the adult level as well as on the child level. Third, the presented intervention for kindergarten was evaluated by considering individual differences. LPA revealed the presence of several SRL promotion strategy profiles which were related to the SRL of the participants. The results of all three studies can be used to give first answers on research questions which remained open so far and to develop future research directions that will be presented in the following.

5.3.1 Model of self-regulation for preschool age

In study I, a model of self-regulation for preschool age, comprising four factors of self-regulation (emotion, prosocial behavior, cognition and motivation) was developed and empirically evaluated. Results of CFA revealed an acceptable fit of the tested model, indicating that the model can be seen as a first approach to a theoretical conception of self-regulation in the age group of preschoolers. In previous studies in Anglo-American context, self-regulation was mostly conceptualized as behavioral self-regulation or EF, comprising the three factors working memory, attention shifting and inhibitory control (e.g., Schmitt et al., 2015). Although several interrelations between self-regulation and EF have been found (e.g., Effeney et al., 2013; Garner, 2009), there are differences between the two constructs, so they cannot be used equally. Whereas EF focus on (volitional) abilities related to school success like "paying attention, following instructions, and inhibiting inappropriate actions" (McClelland et al., 2007), the intended concept of self-regulation in this thesis follows a more holistic approach that is not just considering the cognitive component of self-regulation. It also includes emotional, prosocial and motivational influences. Findings of Bronson's observational studies (2000) indicate that such a holistic approach is more adequate as emotional and prosocial aspects of self-regulation are essential at this point in life. In addition, in German early education system, a holistic view of children's development and learning is focused, so the model of self-regulation that was developed in study I does more correspond to the understanding of education and learning in Germany. Nevertheless, the fit indices revealed further

development potential for the model. Besides an evaluation on a larger sample, it seems necessary to think about the integration of a metacognitive factor with the aim of making the model compatible with models in adulthood (e.g., Zimmerman, 2000). In addition, the model does not take into account gender differences although several studies (e.g., Matthews et al., 2009; Weis et al., 2013) indicate significant differences in SRL in dependence of gender, favoring girls. Therefore, in future studies, it would be useful to prove if these differences can also be found into the newly developed model that is described in study I. Since only values of the first measurement time point were used for the evaluation of the model, longitudinal studies could additionally prove the model's stability over time. Furthermore, it could also be assumed that the missing effect of self-regulation on performance is due to mediation or moderation effects, meaning that self-regulation does not affect performance directly but over a mediator or moderator. Therefore, an investigation of a model which incorporates a mediator or a moderator variable would be necessary to prove if there is at least an indirect effect of self-regulation on performance that is mediated or moderated by other variables. Following the assumptions of Grolnick & Farkas (2002) or Karreman, van Tujil, van Aken, & Deković (2006), one possible mediator might be parenting style. In their review of literature on parenting and self-regulation, Grolnick and Farkas (2002) conclude that an autonomy supportive parenting style positively influences the development of self-regulation in children. In a meta-study by Karreman et al. (2006), it could be shown that positive control – understood as an encouragement of the independent usage of problem-solving strategies by their children – provided by parents was related to self-regulation with effect sizes of r = .08. Therefore, parenting style could be an important influence factor and has to be further considered in future research.

5.3.2 Training of SRL promotion strategies for kindergarten teachers and parents

In study II, a training of SRL promotion strategies for kindergarten teachers and parents of preschool-aged children was developed and evaluated. Results of the training evaluation showed that the conceptualized training could impact on kindergarten teacher's and parent's knowledge about SRL promotion strategies. Nevertheless, study II offers some issues for future improvement in further studies. Since research with regard to the impact of training duration (Hattie et al., 1996) indicates that interventions comprising more than four sessions are the most effective, an extension of the intervention could have contributed to an increase in training benefits. A lengthening of the intermissions between the single sessions could have given the participants more opportunities to apply the

learned strategies of each session in practice. Therefore, future research should investigate whether training effects can be improved by a timely expansion of the intervention. Furthermore, future interventions should include a third measurement point to prove if the effects found on the adult level weaken over time or if they even boost due to a longer time of strategy application in practice. The incorporation of a follow-up test would also be of special interest for the further investigation of training effects on the child level. In study II, no significant changes in the SRL of the preschoolers could be revealed from t1 to t2. One explanation might be the length of the survey period, being too short for a profound promotion at home or in kindergarten. An extension of the survey period integrating a third measurement point could assess possible delayed training effects. Another implication for future research must be mentioned regarding to the different training conditions. Study II investigated training effects in three different training conditions: a single training of the parents, a single training of the kindergarten teachers and a timely parallel training of both groups. Because the promotion of preschool-aged children can then be considered optimal if kindergarten teachers and parents work together in an equal partnership and regularly discuss the child's development (e.g., Roth, 2014). On the basis of such a partnership, a consistent promotion in the most important learning contexts of preschool-aged children is provided (El Nokali et al., 2010). Therefore, contrast analyses were conducted in study II to prove if the simultaneous training group is superior the single training group of parents and the single training group of kindergarten teachers. Contrary to our hypothesis, the superiority could not be confirmed for the kindergarten teachers participating at the simultaneous training group. Only contrast analyses with the information of the questionnaire for the parents indicated a superiority of the simultaneous training group. One possible explanation might be that kindergarten teachers and parents have not exchanged their experiences and knowledge concerning training contents enough, so that a real cooperation regarding the promotion of the preschooler's SRL did not take place. In order to enable a common, consistent promotion in which both groups are equally involved, kindergarten teachers and parents should be trained in one group instead of only training them timely parallel but separated. Joint training could ensure dialogue between the two reference groups and the best possible cooperation with regard to the promotion of the SRL of the preschool-aged children.

5.3.3 Adaptive Trainings

In study III, individual differences concerning knowledge about SRL promotion strategies were investigated. Latent profile analysis revealed three profiles characterized as a high, a

moderate and a low SRL promotion strategy profile which differed significantly in terms of the level of self-regulated behavior. The evaluation of the training under consideration of the detected profiles indicates that the intervention was only beneficial for participants of the low SRL promotion strategy profile. This results leads to several issues for a further adaption of the intervention. Following Aptitude-Treatment-Interaction research, individual differences have to be considered to correspond to the different needs of the learners and to provide adequate instructional environment (Jonassen & Grabowski, 2011). Current research results within the Aptitude-Treatment-Interaction framework (e.g., Fyfe et al., 2012; Jonassen & Grabowski, 2011; McManus, 2000) indicate that more skilled participants need less instructional support and more independent learning methods with a focus on problem-solving than less skilled participants. Disregarding individual differences cannot even hamper positive training effects but even lead to negative effects. As Kalyuga (2007) concludes on the basis of his research findings, for highly skilled individuals often a so-named expertise reversal effect is shown in the case of inappropriate training formats. An expertise reversal effect means that recording redundant information "induce unnecessary working memory load and may distract from the central concepts and principles yet to be learned" (Kalyuga, 2007, p. 210) and therefore is manifested in a deteriorated performance. Thus, the task for future research will be to outline ways in which participants with high SRL promotion strategy profiles can still benefit from training. First research results indicate that tasks with a high proportion of problem-solving strategies and exploratory learning possibilities seem to be particularly suitable (Kalygua, 2007). One possibility in this context might be the integration of joint creation and analysis of video vignettes of kindergarten teacher-child-interactions in kindergarten. Joint video analyses has been shown to be effective in continuing education in school context (e.g., Borko, Koellner, Jacobs, & Seago, 2011; Santagata & Guarino, 2011; Seidel, Stürmer, Blomberg, Kobarg, & Schwindt, 2011). Through common thinking and discussing one's one support behaviors in recorded situations in kindergarten life, new impulses for concrete options for actions can be generated. In this way, an integration of theory and practice is facilitated which seems to be an important issue for participants with higher knowledge about the learning content to avoid the expertise reversal effect (Lohman, 1986). Vice versa, it seems to be conducive to novices to create learning environments that provide considerable external support and instruction in order to avoid cognitive overload and thus prevent the processing of new knowledge (Kalygua, 2007). Nevertheless, more research has to be done to reveal different needs of high and less skilled participants in the

first step and, in the second step, to develop adaptive interventions which consider these differences through the provision of many different (instructional) learning formats.

5.3.4 Assessment methods

The selection for the adequate survey instrument should be mainly shaped according to the conceptualization of the construct SRL. Winne and Perry (2000) have gathered various instruments for the acquisition of SRL. Thus, one fundamental decision-making feature is whether SRL is conceptualized as an aptitude or an event. While for the assessment of SRL as an aptitude, meaning a relatively stable construct, commonly self-report questionnaires are used. For the assessment of SRL as an event, other measurement instruments like think aloud protocols or objective observations while task performing are better suited (Winne & Perry, 2000). With regard to the promotion of SRL, there is also a distinction between instruments that assess aptitudes of teachers and instruments that assess their behavior in the classroom. Teacher questionnaires (as a self-report instrument) are often used because they can easily be used with larger samples and have the advantage of greater economy. Certainly, self-reports run of teachers not talking about their actual support behavior, but about practices they consider appropriate (Dignath-van Ewijk, Dickhäuser, & Büttner, 2013). Another measurement instrument that is often used in the context of the SRL promotion are student ratings of their teachers' behavior which, however, pose the danger that the subjective perception of the students not correspond adequately to the objective facts (Dignath et al., 2013). To assess the behavior of teachers with regard to the promotion of SRL in the classroom, video analyses are commonly used. Although these measurements have the advantage of being able to grasp actual behavior and not just self-ratings of behavior, they carry the risk that teachers adapt their behavior to what they think is expected of them (Dignath et al., 2013). Additionally, assessment with video observations lead to the accumulation of huge data masses which must be managed appropriately, so that clear selection criteria are indispensable (Derry et al., 2010). Overall, it can be recorded that future studies should combine instruments which assess subjective assessments (questionnaires/ratings) and instruments which assess actual behavior (observational tools) (Patrick & Middleton, 2002). In the present study, kindergarten teachers' and parents' SRL as well as their knowledge about the promotion of SRL was assessed by questionnaires. Since the overall objective of the study was to gather their knowledge of SRL promotion strategies, the instrument used seems to be appropriate, but in further studies it would also be interesting to examine which strategies they actually apply in practice, too. Because the actual implementation of strategies in kindergarten (or

at home) can only be fixed on observations, it would be necessary to supplement the methods used so far with online measurements. One useful alternative might be video and audio records of interactions in kindergarten or at home which then are commented on by the kindergarten teachers and parents after watching by verbalizing what they are doing and when, why or how they are supporting SRL (Moos & Ringdal, 2012, Dempsey, 2010). This method, called video stimulated recall interview, seems to be an adequate extension to classical self-report instruments like questionnaire as used strategies are related to concrete situations and therefore a reflected awareness about the actual use of promotion strategies is facilitated. In addition to the instrument adaption for the assessment of SRL promotion strategies, also the survey methods in terms of the SRL behavior of the kindergarten teachers and parents should be supplemented by measurements which can document the actual use of strategies for the regulation of the own learning processes like think aloud protocol, to meet the demand of using multiple data sources (Azevedo, 2009). Furthermore, the survey tools should also be further developed on the child level. Because the objectivity of judging by kindergarten teachers and parents can at least be viewed critically, the rating scale CHILD-Checklist used in the present study, should be supplemented by further instruments. Survey methods must take into account developmental-psychological requirements and related cognitive (e.g., restricted attention span) and language skills of children in preschool age, so the decision for adequate measurements should be well considered. One possibility might be the additional use of rating instruments that are only used by trained independent observers (instead of the kindergarten teachers and parents) in order to keep personal influences in the assessment as low as possible. Another possibility to assess SRL might be the use of think aloud protocols, whereby again the restricted language skills have to be considered. The use of an age-appropriate interview (e.g., Perels et al., 2009) would also be conceivable to gain deeper insight into the reasons for using specific strategies and factors that hinder or facilitate the implementation. Nevertheless, it can be recorded that “methods relying on self-reports and interviews with children have similar limitations as young children are still developing the ability to reflect on and verbally describe their own activities” (Kurki, 2017, p. 43), so that a focus on nonverbal strategies in the assessment seems to be more suitable (Whitbread et al., 2009). One example that could be groundbreaking for further studies is the research by Robson (2016), who explored metacognitive and self-regulation behavior among three to four year old children by using video observations of adult- and child-initiated play situations. Research findings by Flewitt (2006) could also provide

suitable approaches for using video observations in preschool contexts. Conclusively, the previous section showed that there are still methodological challenges that must be addressed in future studies in order to adequately assess the complex construct SRL. Overall, it can be said that a multi-methodological approach seems reasonable. With the help of the self-report measures and the rating scales used in the present study, a first insight into the SRL of the children and their reference persons as well as the promotion of SRL could be given. In order to gain further insight into the usage of these strategies, qualitative approaches like differentiated observations of interaction processes seem to be promising.

5.3.5 Practical Implications

In addition to the indicated future directions, several practical implications have to be mentioned that could contribute to an optimization of future postgraduate professional development for kindergarten teachers and parents with regard to the promotion of SRL in preschool-aged children. The theoretical conceptualization of self-regulation in preschool age as developed and evaluated in study I is of interest for parents and early caregivers who aim to support the SRL of their children systematically. It offers a deepened understanding of the abilities and processes that underlie self-regulation in this special age group. In comparison to conceptions of self-regulation in preschool age mostly used in the Anglo-American area, the model does not only comprise abilities related to EF, but offers a more holistic understanding that is more compatible to aims in German early education system by considering four components of self-regulation. Besides cognitive and motivational components of self-regulation which are commonly used in definitions of self-regulation for older age groups, the newly developed model also comprises emotional and prosocial aspects of self-regulation. Therefore, the model can be used in practice as a theoretical basis for the targeted use of SRL promotion strategies in kindergarten and at home. Conclusively, with regard to practical implications, it can be noted that the support of childish cognitive and motivational strategies is of particular importance, but that emotional and prosocial aspects must also be considered when it comes to the comprehensive support of children in preschool age. Implications derived from study II can be used for further development in practice, too. As the evaluation of the indirect training for kindergarten teachers and parents proved to be beneficial (at least in part), a similar training could also be implemented in further early childhood educational institutions. Since literature in school context indicates that teachers are unsure of how such a promotion can actually be implemented in practice (e.g., Dignath-van Ewijk & Van

der Werf, 2012; Serratore, 2015), it can be assumed that kindergarten teachers are also interested in getting to know ways in which they can support children in preschool education and therefore there is a great need for such interventions in practice. As the promotion of independent learning methods is considered a mandatory task of an early childhood educator (Fthenakis, 2007), it could be considered whether elements of the training could also be included in the kindergarten teachers' education. Because a training in terms of the promotion of SRL is required in the context of professional development in school (Peeters et al., 2014), this claim could also be transferred to preschool context. Regardless of the general effectiveness of the intervention, study II showed that there are individual differences in terms of the level of knowledge about SRL promotion strategies which lead to differences in training benefit. This result is of special interest for practitioners who will conduct future interventions in kindergarten. To ensure the same training success for all participants, adaptive trainings have to be developed and empirically evaluated under increased consideration of the needs of highly skilled kindergarten teachers. As mentioned in section 5.3.3, especially a focus on more independent learning formats and the integration of concrete application examples seem to be a reasonable approach (Kalygua, 2007). Taken together, the present thesis adds to research and practice as it provides new insights into the theoretical conceptualization of self-regulation in preschool age. Based on the evaluation of the developed intervention, the studies also offer important starting points for the use of a SRL promotion training in practice, which in future can contribute to increasing the promotion of SRL in preschoolers.

6 References

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7 Appendix

7.1 Publication I

Venitz, L. & Perels, F. (2017). Empirische Überprüfung eines Modells der Selbstregulation für das Vorschulalter [Empirical review of a model of self-regulation for preschoolers]. *Zeitschrift für Grundschulforschung, 10(2),* 110-121.

7.2 Publication II

Venitz, L. & Perels, F. (2018). Promoting self-regulated learning of preschoolers through indirect intervention: a two level approach. *Early Child Development and Care*, 1-14. doi:10.1080/03004430.2018.1434518

7.3 Publication III

Venitz, L. & Perels, F. (2019). The Promotion of Self-regulated Learning by Kindergarten Teachers: Differential Effects of an indirect intervention. *International Electronic Journal of Elementary Education, 11*(5), 437-448.

Laura Venitz & Franziska Perels

Empirische Überprüfung eines Modells selbstregulierten Lernens für das Vorschulalter

Mit dem Ziel einer differenzierten Betrachtung selbstregulierten Lernens im Elementarbereich, wurde im Rahmen der vorliegenden Studie ein Modell selbstregulierten Lernens für das Vorschulalter (vgl. Bronson 2000) mit Hilfe einer CFA in MPlus anhand von 198 Vorschülern (45.9 % weiblich, M_{Alter} = 5.60, SD_{Alter} = .50) empirisch überprüft und hinsichtlich seines Zusammenhangs mit Leistung untersucht. Die zufriedenstellenden Modellgüteindizes sprechen für eine vorläufige Annahme des Modells. Eine prädiktive Wirkung selbstregulierten Lernens für Leistung konnte in dieser Zielgruppe nicht nachgewiesen werden.

Schlüsselwörter: Selbstreguliertes Lernen, Vorschulalter, Zusammenhang Selbstreguliertes Lernen und Leistung, Strukturgleichungsmodellierung

With the aim of a differentiated approach to self-regulated learning at the elementary level, the study contains an empirical testing of a model of self-regulated learning for pre-school age by Bronson (2000) by means of a CFA in MPlus based on the data of 198 preschoolers (45.9 % female, M_{Age} = 5.60, SD_{Age} = 0.50) as well as an examination of its connection to academic performance. The satisfactory model fit indices speak in favor of a preliminary assumption of the model, but a predictive effect self-regulated learning for performance could not be detected.

Keywords: self-regulated learning, preschool-age, links between self-regulated learning and academic performance, structural equation modeling

1. Einleitung

Vor dem Hintergrund gesellschaftlicher Wandlungsprozesse, die zu einer steigenden Relevanz lebenslanger Lernprozesse führen, gewinnt selbstreguliertes Lernen zunehmend an Bedeutung (vgl. Fthenakis et al. 2007; Lüftenegger, Schober, van de Schoot, Wagner, Finsterwald & Spiel 2012). Erkenntnisse aus Schulleistungsstudien wie z. B. PISA (vgl. Klieme et al. 2010) haben dazu beigetragen, selbstreguliertes Lernen als integrales Ziel des deutschen Bildungssystems zu etablieren. Zudem haben

Untersuchungen zur Bedeutung und Qualität vorschulischer Bildung wie z. B. die OECD-Studie Starting Strong (vgl. OECD 2004) in den vergangenen Jahrzehnten dazu geführt, die Bedeutung frühkindlicher Bildungsprozesse stärker in den Fokus zu rücken. Obwohl Studien wie beispielsweise von Nota, Soresi und Zimmerman (2004) oder Blair und Razza (2007) nachweisen konnten, dass selbstreguliertes Lernen prädiktiv für zukünftige schulische Leistungen und somit möglichst frühzeitig dafür notwendige Kompetenzen vermittelt werden sollten, mangelt es bislang an systematischen Befunden zu Zusammenhängen zwischen frühkindlichen Bildungsprozesse und selbstreguliertem Lernen. Ein erster Ansatz zur Verbindung von Inhalten des selbstregulierten Lernens und Bildungsprozessen von Kindern im Vorschulalter bildet das Modell selbstregulierten Lernens nach Bronson (2000), das die Grundlage der Untersuchung bildet. Zielsetzung der Studie ist es, mit Hilfe einer konfirmatorischen Faktorenanalyse zu überprüfen, ob sich das Modell selbstregulierten Lernens empirisch abbilden lässt. Mittels Strukturgleichungsmodellierung wird zudem getestet, ob ein Zusammenhang zwischen selbstreguliertem Lernen und Leistung besteht. Die vorliegende Studie verfolgt damit das Ziel, zu einem differenzierten theoretischen Verständnis von Komponenten selbstregulierten Lernens im Vorschulalter – unter besonderer Berücksichtigung entwicklungspsychologischer Voraussetzungen – beizutragen, da diese Altersklasse in vorangegangen Untersuchungen zum selbstregulierten Lernen nur unzureichend berücksichtigt wurde.

2. Theoretischer Rahmen

2.1 Selbstreguliertes Lernen

Eine einheitliche Definition selbstregulierten Lernens wird durch die Vielfalt von Kontexten und theoretischen Traditionen, sowie die Komplexität des Konstruktes erschwert. Einigen Definitionen liegt ein wechselseitiges Interaktionsverhältnis der Komponenten der Kognition, Metakognition und Motivation zugrunde (vgl. Boekaerts 1999; Dinsmore, Alexander & Loughlin 2008; Landmann, Perels, Otto, Schnick-Vollmer & Schmitz 2009). Die kognitive Komponente umfasst dabei „konzeptionelles und strategisches Wissen ebenso wie die Fähigkeit, entsprechende Strategien (z. B. kognitive Lernstrategien) anzuwenden“ (Landmann et al., 50). Der metakognitiven Komponente sind Fähigkeiten zuzuordnen, die der Beobachtung und Beurteilung des eigenen Handelns und Denkens dienen. Die motivationale Komponente hingegen wird bestimmt durch Kompetenzen, die notwendig sind, um Lernhandlungen zu initiieren (Selbstmotivation) und gezielt aufrecht zu erhalten (volitionale Strategien) (ebd.).

Martha Bronson, deren Modell selbstregulierten Lernens im Rahmen der vorliegenden Studie empirisch überprüft werden soll, differenziert ebenfalls zwischen verschiedenen Komponenten. Selbstreguliertes Lernen im frühen Kindesalter stellt für sie die zunehmende Fähigkeit dar, Verhalten sowie innerliche Denkprozesse zu steuern und dabei erfolgreich die soziale und physische Umwelt zu beeinflussen (vgl. Bronson 2000). Selbstreguliertes Lernen ist eng an die Interaktion mit der Umwelt gebunden, sodass neben der motivationalen und kognitiven nach Bronson auch eine emotionale und

eine prosoziale Komponente in ein Theoriemodell selbstregulierten Lernens zu integrieren ist.

2.2 Modell der Selbstregulation für das Vorschulalter nach Bronson (2000)

Im Rahmen von Beobachtungsstudien hat Martha Bronson (2000) Merkmale selbstregulierter Lernprozesse von Kindern zwischen null und acht Jahren untersucht. Die daraus abgeleiteten Erkenntnisse, die im Modell des selbstregulierten Lernens für das Vorschulalter zusammengeführt werden, bieten eine fundierte Grundlage zur Analyse von Lernprozessen im Vorschulalter. Das Modell differenziert zwischen den Komponenten der emotionalen, kognitiven, prosozialen und motivationalen Selbstregulation, die in einem engen wechselseitigen Verhältnis zueinander stehen. Selbstregulation wird demnach verstanden als ein Zusammenspiel emotionaler, kognitiver und prosozialer Kontrollfähigkeiten, welche zentral durch die individuelle Motivation bestimmt werden (vgl. Bronson 2000).

2.2.1 Motivation

Die Motivation stellt nach Bronson (2000) eine entscheidende Komponente dar, da sie zentral die Entscheidung zur Initiierung von Lernhandlungen beeinflusst. Zudem ist die Motivation grundlegend für die konzentrierte Hinwendung zu einer Aufgabe. In Bezug auf die Motivation stellt das Vorschulalter eine besondere Entwicklungsphase dar, da in dieser Altersspanne eine hohe intrinsische Motivation vorausgesetzt wird, die sich in einer erhöhten Lernbereitschaft niederschlägt. Während die ersten Lernerfahrungen durch einen generellen Explorationsdrang bestimmt sind, wird das Handeln von Vorschulkindern zunehmend durch konkrete Ziele geleitet (vgl. Büttner, Perels & Whitebread 2011). Zudem sind Vorschulkinder immer mehr zur Abschirmung von ablenkenden Reizen in der Lage und lernen, auch bei Schwierigkeiten eine Aufgabe zu Ende zu führen.

2.2.2 Emotion

Emotionale Selbstregulation umfasst nach Bronson die Fähigkeit, soziale Interaktionsregeln zu internalisieren und emotionale Kontrolle unabhängig von direkten Maßgaben der Umwelt zu ermöglichen, das heißt den Ausdruck von Gefühlen und damit verbundene Verhaltensweisen dem sozialen Kontext entsprechend anzupassen. Emotionale Selbstregulation beinhaltet auch, Bedürfnisse zeitweise aufzuschieben oder zu unterdrücken, wenn diese der Zielsetzung entgegenstehen (vgl. Bronson 2000). Während die Regulation von Emotionen von Erwachsenen durch die Internalisierung von sozialen Verhaltensregeln automatisiert verläuft, müssen Kinder diese Fähigkeit erst im sozialen Miteinander erlernen. Nach Holodynski & Upmann (2003) findet im Alter zwischen drei und sechs Jahren zunehmend eine intrapsychische Regulation von Emotionen statt, wodurch eine eigenständige Anpassung der Emotionen im Verhalten zur Zielerreichung möglich wird. Ein wichtiger Entwicklungsschritt stellt die Entwicklung der Theory of Mind, das heißt des „Verständnis für das Funktionieren des

menschlichen Bewusstseins“ (Lohaus & Vierhaus 2013, 201) im Alter zwischen drei und fünf Jahren dar. Dadurch wird eine grundlegende Voraussetzung geschaffen, um die Affekte anderer bei der Ausrichtung des eigenen Handelns zu berücksichtigen (vgl. Kasten 2015).

2.2.3 Prosoziales Verhalten

Unter dem Begriff des prosozialen Verhaltens als weitere Komponente der Selbstregulation nach Bronson (2000) werden freiwillige Verhaltensweisen zusammengefasst, welche darauf abzielen, andere zu unterstützen und zu helfen. Ein Abgleich äußerer Vorgaben und interner Bewertungen tragen zur Entwicklung sozialer Verhaltensstandards und somit zur Kontrolle des Verhaltens bei (vgl. Büttner et al. 2011). Prosoziale Verhaltensweisen entwickeln sich im Vorschulalter rasant weiter, sodass die Kinder nach Bronson (2000) lernen, das Erleben anderer als Bewertungsmaßstäbe bei der Ausrichtung ihres Handelns mit einzubeziehen und somit ihr Verhalten zu regulieren. Im Alter zwischen drei und fünf Jahren entwickeln sich zudem erste prosoziale Fähigkeiten, die es Kindern ermöglichen, über mentale Zustände zu sprechen und Gedanken anderer nachzuvollziehen (vgl. Bronson 2000). Erst im Alter zwischen sechs und acht Jahren gelingt es ihnen aber, ihre eigenen Gefühle und Gedanken klar von denen anderer abzugrenzen. Durch wachsende metakognitive Fähigkeiten, die zunehmend eine Reflexion des eigenen Handelns ermöglichen, lernen Kinder im Vorschulalter soziale Verhaltensregeln nachzuvollziehen, diese anzunehmen und bei der Ausrichtung ihres Handelns mit einzubeziehen.

2.2.4 Kognition

Kognitive Selbstregulation umfasst nach Bronson (2000) die Fähigkeit, eigene Ziele zu formulieren, Verhaltensstandards zu entwickeln und diese zu nutzen, um Verhalten zu kontrollieren und zu evaluieren. Bronson geht davon aus, dass Kinder im Vorschulalter bereits in der Lage sind, Aufgaben und Ziele mit ihren (kognitiven) Fähigkeiten abzugleichen und dementsprechend auszuwählen (ebd.; Büttner et al. 2011; Hasselhorn & Gold 2013). Lohaus und Vierhaus (2013) stellen heraus, dass Vorschüler wichtige Merkmale einer Aufgabe erkennen und Rückschlüsse auf ihren Schwierigkeitsgrad ziehen können, dass eine ausgereifte Fähigkeit zur Einschätzung der eigenen Kompetenzen und das Wissen über einsetzbare kognitive Strategien (deklarative Kompetenzen) allerdings erst im Grundschulalter entsteht. Denkprozesse werden im Vorschulalter zudem immer organisierter und zielgerichteter (vgl. Bronson 2000). Im Alter von vier Jahren kann zudem „ein markanter Entwicklungszuwachs“ (Kasten 2015, 4) bezüglich der Fähigkeit zur Aufmerksamkeitsfokussierung verzeichnet werden, welche eine wichtige kognitive Kontrollstrategie darstellt.

2.3 Selbstreguliertes Lernen und der Zusammenhang mit Leistung

Die Fähigkeit zum selbstregulierten Lernen wird heute als Schlüsselqualifikation für erfolgreiche lebenslange Bildung angesehen (vgl. Baumert et al. 2001; Fthenakis 2003),

da sie einen wichtigen Prädiktor für erfolgreiches Lernen darstellt (vgl. Veenmann & Spaans 2005). Während eine prädiktive Wirkung selbstregulierten Lernens für akademischen Erfolg bereits vielfach im schulischen und universitären Kontext nachgewiesen werden konnte (z. B. De Corte, Mason, Depaepe & Verschaffel 2011; Hidi & Ainley 2008), wurde der Elementarbereich diesbezüglich lange Zeit vernachlässigt, da die zum selbstregulierten Lernen notwendigen entwicklungspsychologischen Voraussetzungen unterschätzt wurden und die Erfassung aufgrund des fehlenden Schriftspracherwerbs eine besondere Herausforderung in dieser Altersklasse darstellt (vgl. Whitebread et al. 2009). Erste Studien zum Zusammenhang zwischen selbstreguliertem Lernen und Leistung im Vorschulalter liefern Hinweise dafür, dass relevante Lernfähigkeiten wie das selbstregulierte Lernen essentiell zu frühem Schulerfolg beitragen (vgl. De la Riva & Ryan 2015). Blair und Razza (2007) konnten im Rahmen ihrer Studie darlegen, dass eine hohe inhibitorische Kontrolle als Bestandteil der Selbstregulation positiv mit Vorläuferfähigkeiten des mathematischen Wissens und dem Buchstabenwissen in Verbindung stand. Auch McClelland und Tominey (2016) kamen im Rahmen der Evaluation einer Intervention zur Förderung der verhaltensbezogenen Selbstregulation (z. B. Aufmerksamkeitsfokussierung, Arbeitsgedächtnis und inhibitorische Kontrolle) im Vorschulalter zu dem Ergebnis, dass die eigenständige Regulation des Verhaltens durch die Intervention signifikant verbessert werden konnte und diese insbesondere bei Kindern, die schon früh von Risikofaktoren wie z. B. Armut betroffen waren, positiv mit Vorläuferfähigkeiten in Mathematik und der frühen Lese- und Schreibfähigkeit zusammen hing.

2.4 Zielsetzung der Studie

Ziel der vorliegenden Arbeit ist es, das Modell selbstregulierten Lernens im Vorschulalter nach Bronson (2000) strukturanalytisch zu überprüfen. Damit soll eine Aussage darüber getroffen werden, ob sich das Modell mit der postulierten vier-faktoriellen Struktur empirisch abbilden lässt. Ein weiteres Ziel stellt die Überprüfung des Zusammenhangs des Konstruktes selbstregulierten Lernens mit Leistung dar. Es wird zunächst dabei aktueller Befunde (z. B. Blair & Razza 2007; McClelland & Tominey 2016; Tominey & McClelland 2011) davon ausgegangen, dass selbstreguliertes Lernen im Vorschulalter als ein bedeutsamer Prädiktor von Leistung anzusehen ist.

3. Methode

3.1 Stichprobe

Die Daten der vorliegenden Studie wurden im Rahmen einer von der Deutschen Forschungsgemeinschaft geförderten Interventionsstudie zum Thema selbstregulierten Lernen im Vorschulalter erhoben. Für die folgenden Analysen wurden die Kinder berücksichtigt, für die sowohl ein Leistungsmaß, als auch eine Beurteilung des selbstregulierten Lernens durch die ErzieherInnen vor Beginn der Intervention vorlagen. Somit ergibt sich ein von N = 198 Vorschülern (45.9 % weiblich) als

Untersuchungsstichprobe. Das Durchschnittsalter der Kinder beträgt M_{Alter} = 5.60 Jahre (SD_{Alter}= .50 Jahre).

3.2 Instrumente

3.2.1 Erfassung selbstregulierten Lernens (CHILD-Checklist)

Die eingesetzten Ratingskalen entstammen einem im Rahmen des Cambridge Independent Learning Project (C.Ind.Le) entwickelten Beurteilungsinstrument für ErzieherInnen (vgl. Whitebread et al. 2009), welches inhaltlich auf dem Modell selbstregulierten Lernens von Bronson (2000) basiert. In der vorliegenden Studie wurde das Instrument adaptiert und selbstreguliertes Lernen anhand von 23 Items in vier Skalen in Anlehnung an Bronsons Bereiche selbstregulierten Lernens erfasst. Die adaptierte CHILD-Checklist ermöglicht somit eine Einschätzung des selbstregulierten Lernens der Kinder durch ErzieherInnen in den Skalen der emotionalen Selbstregulation (5 Items, z. B. „Das Kind hält Schwierigkeiten stand“, α = .86), der motivationalen Selbstregulation (5 Items, z. B. „Das Kind initiiert Aktivitäten“, α = .90), der prosozialen Selbstregulation (6 Items, z. B. „Das Kind ist sich den Gefühlen anderer bewusst, hilft ihnen und tröstet sie“, α = .78) und der kognitiven Selbstregulation (7 Items, z. B. „Das Kind kann über geplante Aktivitäten sprechen“, α = .93).

3.2.2 Erfassung des Leistungsmaßes (Train Track Task)

Als Leistungsmaß diente das Ergebnis einer bereits in vorangegangenen Studien verwendeten Problemlöseaufgabe, der sogenannten Train Track Task (vgl. Bryce & Whitebread 2012; Whitebread et al. 2009), in deren Rahmen die Kinder mit Hilfe von Brio-Eisenbahnschienen eine Bildvorlage möglichst korrekt nachbauen sollten. Die Konstruktionen wurden jeweils fotografisch festgehalten und mit Hilfe eines standardisierten Auswertungssystems beurteilt. Ausschlaggebend für die Qualität der Konstruktion ist die Passung mit der Bildvorlage als korrekter Lösung. Das Auswertungsmaß zur Leistungsindikatorbestimmung umfasste neun Items (z. B. „Form ist geschlossen“; „Form hat einen geraden Rand“), für die je ein Punkt vergeben wurde, wenn das definierte Merkmal identifiziert werden konnte. Somit konnten maximal neun Punkte (bei korrekter Passung mit der Bildvorlage) erreicht werden. Die Ergebnisse der Train Track Task wurden von zwei unabhängigen Ratern erfasst. Um reliable Ergebnisse zu erhalten, war eine ausreichend hohe Übereinstimmung der Ergebnisbewertungen zu gewährleisten (vgl. Wirtz & Caspar 2002). Aus diesem Grund fanden mehrere Beobachterschulungen statt, in deren Rahmen die Beobachter anhand von Beispielfotos die Beurteilung der Leistungsdaten einüben und in einem iterativen Austauschprozess entsprechend weiterentwickeln konnten. Anschließend wurden weitere Fotografien anhand des entwickelten Kodierschemas in einem ersten Schritt getrennt voneinander beurteilt und in einem zweiten Schritt abgeglichen sowie bei unterschiedlichen Ergebnissen diskutiert und angepasst. Die korrigierten Kappa-Werte liegen zwischen .72 und 1.00. Die durchschnittliche Übereinstimmung beträgt 93% (κ_n = .93), was nach Fleiss und Cohen (1973) als sehr gute Übereinstimmung angesehen werden kann.

3.3 Datenanalyse

Um zu überprüfen, ob den erhobenen Daten die von Bronson (2000) postulierte vier-faktorielle Struktur – das heißt eine Differenzierung in die Bereiche emotionale, prosoziale, kognitive und motivationale Selbstregulation – zugrunde liegt, wurde im Rahmen der Datenanalyse in einem ersten Schritt eine konfirmatorische Faktorenanalyse (CFA) anhand der adaptierten CHILD-Checklist für ErzieherInnen zum ersten Messzeitpunkt (t1) mit MPlus durchgeführt (vgl. Muthén & Muthén 2012). In einem zweiten Schritt wurde im Rahmen einer Strukturgleichungsmodellierung (SEM) das getestete Messmodell selbstregulierten Lernens mit Leistung in Zusammenhang gesetzt.

4. Ergebnisse

Vor der Durchführung der konfirmatorischen Faktorenanalyse wurden die Daten hinsichtlich der Identifikation von Ausreißerwerten, sowie fehlender Werte untersucht und es fand eine Prüfung der Linearitäts- und Normalverteilungsannahme statt. Die Ergebnisse des Little`s MCAR Test (Little & Rubin 2002) weisen darauf hin, dass die fehlenden Werte für die Variablen der CHILD-Checklist, sowie das Leistungsmaß zufällig aufgetreten sind (χ^2 (342) = 373.878, p = .113), sodass diese unter Einsatz des FIML-Schätzers in Mplus nicht imputiert werden mussten. Um Abweichungen von der multivariaten Normalverteilungsannahme angemessen zu berücksichtigen, wurde der MLR-Schätzer in Mplus eingesetzt.
Im Rahmen der CFA wurde – entsprechend der theoretischen Vorannahmen – ein Modell selbstregulierten Lernens mit vier Faktoren erster Ordnung (emotionale, kognitive, motivationale und prosoziale Selbstregulation) und einem Faktor zweiter Ordnung (selbstreguliertes Lernen) mit den Items der emotionalen, der prosozialen, der kognitiven und der motivationalen Skala der angepassten CHILD-Checklist getestet. Der Modelltest, welcher mit insgesamt 23 Items als Indikatoren für selbstreguliertes Lernen durchgeführt wurde, ist signifikant, die Modellgüteindices sprechen aber für einen zufriedenstellenden Fit (vgl. Kline 2005; Weiber & Mühlhaus 2014) ($\chi^2(221) = 456.04$, $p < .001$, $\chi^2/df = 2.06$, RMSEA = .08, SRMR = .06, CFI = .92), was für eine Annahme eines Vier-Faktoren-Modells spricht.
Anschließend wurde mittels Strukturgleichungsmodellierung der Zusammenhang zwischen selbstreguliertem Lernen und Leistung überprüft, wobei – entsprechend der dargelegten Forschungsbefunde – davon ausgegangen wurde, dass selbstreguliertes Lernen als Prädiktor von Leistung anzusehen ist. Leistung wurde dabei als manifeste endogene Variable in das Strukturgleichungsmodell integriert. Die ermittelten Modellgüteindices sprechen für einen zufriedenstellenden Fit des Modells ($\chi^2(243) = 475.78$, $p < .001$, $\chi^2/df = 1.96$, RMSEA = .07, SRMR = .06, CFI = .92). In Abbildung 1 ist das getestete Strukturgleichungsmodell dargestellt.

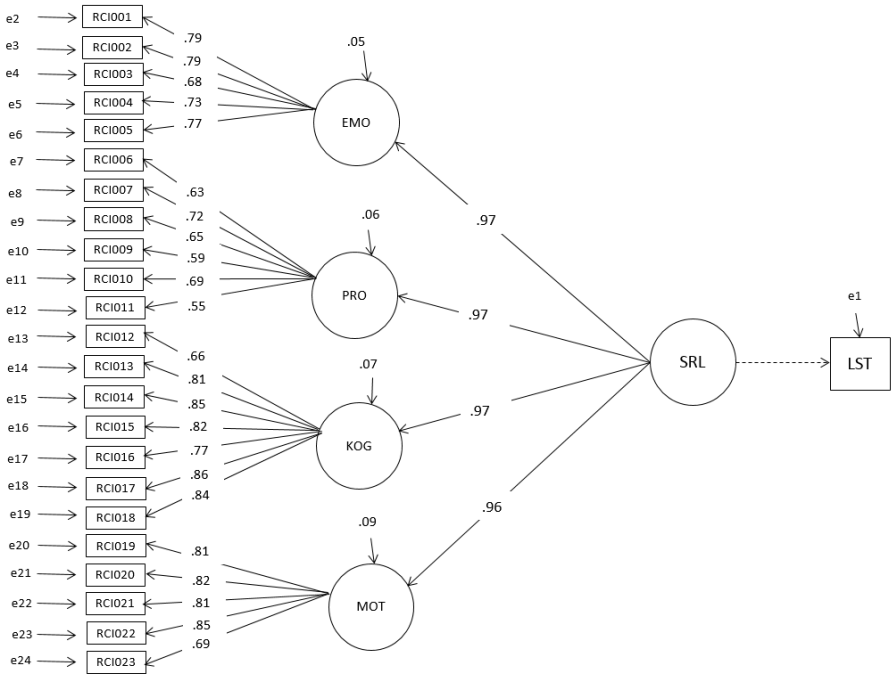

Abb. 1 Strukturgleichungsmodell selbstregulierten Lernens und Leistung mit standardisierten Koeffizienten. *LST* Leistung, *SRL* selbstreguliertes Lernen, *EMO* emotionale Selbstregulation, *PRO* prosoziale Selbstregulation, *KOG* kognitive Selbstregulation, *MOT* motivationale Selbstregulation; *RCI001-RCI0123* Items der CHILD-Checklist zum selbstregulierten Lernen.

Alle standardisierten Faktorladungen des Messmodells sind signifikant ($p < .001$). Der Pfad von SRL auf LST ist nicht signifikant, sodass kein Zusammenhang zwischen selbstreguliertem Lernen und Leistung identifiziert werden konnte. Das heißt anhand der Untersuchungsstichprobe konnte kein prädiktiver Einfluss von selbstreguliertem Lernen auf Leistung im Vorschulalter nachgewiesen werden, was den theoretischen Vorannahmen widerspricht.

5. Zusammenfassung und Diskussion

Das Ziel der Studie lag darin, das theoretische Modell selbstregulierten Lernens für das Vorschulalter nach Bronson (2000), welches mittels der adaptierten CHILD-Checklist erfasst wurde, empirisch zu überprüfen und auf seinen Zusammenhang mit Leistung zu testen. Zur empirischen Überprüfung des Modells wurde eine konfirmatorische Faktorenanalyse (CFA) mit MPlus durchgeführt, deren Ergebnisse auf eine hinreichende Passung des Modells mit den empirischen Daten sprechen. Die Bestätigung des Modells in der vorliegenden Stichprobe kann als erster Hinweise dafür gedeutet werden, dass sich das selbstregulierte Lernen der Kinder bereits durch verschiedene Teilbereiche in den

Komponenten Kognition, Motivation, Emotion und Prosoziales Verhalten modellieren lässt. Die teilweise lediglich als akzeptabel zu bewertenden Modellgüteindizes, lassen darüber hinaus allerdings erkennen, dass eine Weiterentwicklung bzw. Spezifizierung des Modells auf einer theoretischen Ebene sinnvoll wäre, die sich dann auch empirisch in einer adaptierten Form der Erfassung des Konstruktes widerspiegeln sollte. Eine mögliche Adaption des Modells stellt die Integration einer metakognitiven Komponente dar, die – wie die vorangegangen Erläuterungen zum Begriff selbstregulierten Lernens veranschaulicht haben – in gängigen Theoriemodellen (vgl. Landmann et al. 2009) neben einer kognitiven und motivationalen Komponente Bestandteil selbstregulierten Lernens ist, im Modell nach Bronson aber nicht berücksichtigt wird.

Da in der vorliegenden Studie die postulierte prädiktive Wirkung selbstreguliertem Lernens für Leistung nicht nachgewiesen werden konnte, wurden zusätzlich exploratorische Zusammenhangsanalysen mit den Items des Kodierschmas und dem Leistungsmaß durchgeführt, die Aufschluss über mögliche Gründe für den mangelnden Zusammenhang liefern sollten. Die Analysen ergaben eine signifikante positive Korrelation zwischen der Leistung und dem Item „Häufigkeit Vorlage überprüfen“ (r = .25) und eine signifikante negative Korrelation zwischen der Leistung und dem Item „Kind spielt mit der Schiene, anstatt sie an die Vorlage anzupassen“ (r = -.56) (Tab. 1).

	1.	2.	3.
1. Leistungsmaß	-		
2. Item „Häufigkeit Vorlage überprüfen“	.25**	-	
3. Item „Kind spielt mit der Schiene anstatt sie an die Vorlage anzupassen”	-.56**	-.41**	-

** Die Korrelation ist auf dem Niveau von .01 (2-seitig) signifikant
* Die Korrelation ist auf dem Niveau von .05 (2-seitig) signifikant

Tab. 1: Ergebnisse der explorativen Korrelationsanalyse

Die Ergebnisse liefern erste Hinweise dafür, dass das Instrument nur dann Leistung angemessen erfassen zu scheint, wenn die Kinder die Bereitschaft bzw. Motivation zeigen, die Aufgabe gemäß der Anleitung zu bearbeiten, das heißt ihre Konstruktion möglichst exakt der Bildvorlage anzupassen. Haben die Kinder zum Erhebungszeitpunkt aber eine andere Intention (wollen sie lieber „spielen“ bzw. eine Fantasiestrecke bauen) und weichen somit in ihrer Konstruktion stark von der Vorlage ab, so wird dies als schlechte Leistung erfasst, auch wenn sie theoretisch über die Fähigkeiten zu einem exakten Nachbau verfügen würden. Die motivationale Komponente, die grundlegend für die Initiierung von Lernhandlungen und somit für beobachtbare Leistung ist, wird

folglich mit dem Leistungsgütemaß nicht angemessen berücksichtigt und sollte demnach in folgenden Untersuchungen zur Erfassung von Leistung im Vorschulalter mit einbezogen werden.

6. Fazit und Ausblick

Auch wenn die vorliegende Untersuchung einen ersten Beitrag zur theoretischen Konzeption von selbstreguliertem Lernen im Vorschulalter anhand einer Überprüfung bestehender Konzepte leistet, unterliegt sie einigen Limitationen, welche es in weiteren Forschungsarbeiten zu berücksichtigen gilt. Kritisch zu betrachten ist, dass das selbstregulierte Lernen in der vorliegenden Studie lediglich anhand eines einzigen Erhebungsinstrumentes erfasst wurde, was nicht den Empfehlungen einer multimethodalen Erfassung (vgl. Spörer & Brunstein 2006; Veenmann 2005) entspricht. Zur differenzierten Betrachtung selbstregulierter Lernprozesse im Vorschulalter sollten zukünftig weitere Datenquellen, wie beispielsweise Interviewdaten oder weitere Beobachtungsdaten mit einbezogen werden. Zudem könnte die eher geringe Stichprobengröße eine Limitation der Untersuchung darstellen, sodass das Modell an einer weiteren Stichprobe überprüft werden sollte.
Die Ergebnisse der vorliegenden Untersuchung weisen darauf hin, dass das Modell nach Bronson (2000) bereits eine solide Grundlage bildet, um selbstreguliertes Lernen von Kindern im Vorschulalter darzustellen, dass es allerdings auch noch Entwicklungspotential aufweist. Durch die Integration einer metakognitiven Komponente als mögliche Erweiterung des Modells könnte dieses anschlussfähiger an bereits etablierte Theoriemodelle im schulischen, universitären und Weiterbildungskontext (z. B. Schmitz, Landmann & Perels 2007; Zimmerman 2000) gestaltet werden, wobei es die dargelegten entwicklungspsychologischen Voraussetzungen der Altersklasse in besonderer Weise zu berücksichtigen gilt, was auch zukünftig eine große Herausforderung darstellen wird. Eine weitere Aufgabe wird – wie die vorangegangenen Erläuterungen verdeutlicht haben – darin bestehen, ein altersgemäßes Leistungsmaß zu entwickeln. In vorangegangen Studien zum Zusammenhang von selbstreguliertem Lernen und Leistung im angloamerikanischen Raum wurden meist Tests zu Vorläuferfähigkeiten des mathematischen Wissens und der Lese- und Schreibfähigkeit eingesetzt (z. B. Blair & Razza 2007). Da dem deutschen vorschulischen Bildungssystem aber vielmehr eine ganzheitliche Förderung als eine konkrete Vermittlung fächerbezogener Kompetenzen zugrunde liegt (vgl. Kultusministerkonferenz 2004), ist auch die Erfassung eines solchen Leistungsmaßes nicht ohne weiteres auf zukünftige Untersuchungen im deutschsprachigen Raum übertragbar. Zur differenzierten Betrachtung selbstregulierten Lernens im Vorschulalter scheint hier eher ein überfachliches Leistungsmaß (wie es in der vorliegenden Studie realisiert werden sollte) geeignet, welches der Herausforderung unterliegt, den entwicklungspsychologischen Voraussetzungen zu entsprechen und gleichzeitig anschlussfähig an Leistungsmessungen im späteren Alter zu sein.

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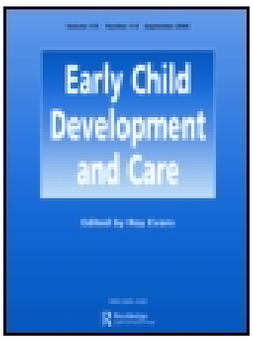

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Early Child Development and Care

ISSN: 0300-4430 (Print) 1476-8275 (Online) Journal homepage: http://www.tandfonline.com/loi/gecd20

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To cite this article: Laura Venitz & Franziska Perels (2018): Promoting self-regulated learning of preschoolers through indirect intervention: a two-level approach, Early Child Development and Care, DOI: 10.1080/03004430.2018.1434518

To link to this article: https://doi.org/10.1080/03004430.2018.1434518

Published online: 06 Feb 2018.

EARLY CHILD DEVELOPMENT AND CARE, 2018
https://doi.org/10.1080/03004430.2018.1434518

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Promoting self-regulated learning of preschoolers through indirect intervention: a two-level approach

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ABSTRACT

Self-regulated learning (SRL) is defined as a substantial competence for lifelong learning, meaning that its promotion seems important in the early years. The present study is of special interest as it aimed to develop and evaluate an intervention to improve SRL in preschool-aged children. Because the support of essential reference persons is crucial for the development of SRL in childhood [Martinez-Pons, M. (2002). Parental influences on children's academic self-regulatory development. *Theory Into Practice*, *41*(2), 126–131], parents and preschool teachers were involved in the intervention presented below. To asess the chosen variables, a sample of 37 preschool teachers and 16 parents completed questionnaires. In addition, the SRL of 53 preschoolers (47.3% female; $M_{age} = 5.74$ years) was recorded using a rating scale. The results of the analyses indicated significant improvements in terms of supportive methods for the adult level, whereas the expected indirect effect of the training on the child level could not be confirmed.

ARTICLE HISTORY
Received 12 December 2017
Accepted 26 January 2018

KEYWORDS
Self-regulated learning; preschool age; training of essential reference persons; two-level approach; analyses of variance

Preliminary findings from studies reviewing school achievement (e.g. Programme for International Student Assessment, see Klieme et al., 2010) have contributed to the establishment of self-regulated learning (hereinafter SRL) as an integral aim of the German education system. Although studies from Nota, Soresi, and Zimmerman (2004), Blair and Razza (2007), and McClelland et al. (2007) show that SRL is predictive for future academic achievement and therefore necessary competencies should be fostered as early as possible, there remain a shortage of intervention studies concerning SRL in preschool-age children (Perels, Merget-Kullmann, Wende, Schmitz, & Buchbinder, 2009). In fact, an implementation of interventions promoting SRL seems to be particulary useful in this age group because in this period many SRL abilities (e.g. attention-focusing) develop quickly (Bronson, 2000; Larkin, 2010). At this point in life, children face many new challenges associated with the transition to primary school which can be better facilitated if the children are equipped with the ability to organize their learning processes independently (Morrison, Ponitz, & McClelland, 2010). Based on developmental-psychological findings (e.g. Bronson, 2000; Zhang & Whitebread, 2017) and the theoretical assumptions of Bandura (1977), Vygotsky (1978), and Pramling (1988), the support of important reference persons plays a decisive role in the development of SRL behaviour. For this reason, indirect interventions for preschool teachers and parents were developed and their effectiveness was investigated on two levels. On the first level, it was hypothesized that the intervention of the preschool teacher as well as the training of parents and the simultaneous training of both groups would lead to significant improvement of their SRL behaviour and their methods to support the SRL of the children. On the second level, an indirect training effect on the SRL of the preschool children,

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whose parents or caregivers took part in the intervention, was expected. Thus, the present study contributes to the research literature because it offers a rare opportunity to lead both – preschool teachers and parents – in supporting preschool children to develop their SRL.

Self-regulated learning

Attempts to define self-regulation are hampered by the diversity of contexts and theoretical traditions in which the term has been used, as well as by the complexity of the construct (Landmann, Perels, Otto, & Schmitz, 2009). According to Zimmerman (2000), the term describes the ability to initiate action processes autonomously, to adapt them continuously on the basis of self-observations and to reflect upon them. Transferred to the academic context, SRL is described as 'self-generated thoughts, feelings and actions that are planned and cyclically adapted to the attainment of personal goals' (Zimmerman, 2000, p. 14). The social-cognitive process model of Zimmerman (2000) was chosen as the theoretical foundation of this study because it describes several processes that are subjected to continuous adaptation and, therefore, an optimization of the learning behaviour, so it offers suitable points of references for an intervention study. With its distinction of three central learning phases (forethought phase, performance phase, and self-reflection phase) and related strategies, it offers a useful frame to better structure unconscious learning processes. In this way, it contributes to a greater control of the single learning processes which can be a useful help for younger children, so it seems to be suitable as the theoretical foundation of an intervention for preschool children and their reference persons. In the forethought phase, the planning of the action is the focus, which is determined by the analysis of the task, meaning clarification of the challenges of the task and motivational processes. Zimmerman (2000) indicate that, during stage of the analysis of the task, adequate goal setting as well as the planning of expedient strategies takes place. Additionally, in this phase, motivational and emotional learning requirements, such as self-efficacy (Bandura, 1977), individual goal orientations, the expectation of results and personal interests must be considered because they determine the initiation and the maintenance of the action (Zimmerman, 2000). The performance phase places pivotal importance on competencies like self-control and self-monitoring, meaning the conscious perception and analysis of inner experience and behaviour. Maintaining a focus on the planned aims, the learning action is implemented. Progress should be monitored by means of continuous self-observation (self-monitoring) to recognize difficulties as soon as possible, to analyse them effectively, and to resolve them efficiently (Schunk & Ertmer, 2000). To work on a specific task, the application of strategies for self-control is necessary. Such strategies contribute to keeping attention focused on the task handling and adequately dealing with distractions (Zimmerman, 2000). Central elements of the self-reflection phase are self-evaluation and self-reaction. Within the framework of self-reflection, the result of the task that was completed is compared with the aims set forth at the beginning of the task, evaluated it in terms of its success (self-evaluation). As a consequence of the self-evaluation, a self-reaction takes place. If learners are displeased with the result of their work, they should adapt their original aim or the strategies used in future learning actions. In addition to the theoretical assumptions, for the conceptualization of an intervention to promote SRL in preschoolers, clarification should be provided as to, which abilities necessary for self-regulation are present at this age.

Self-regulated learning in preschool-age children

To foster lifelong learning processes, support should begin in the early stages of childhood to encourage appropriate learning behaviours and the forms of SRL as soon as possible (Perels & Otto, 2009). However, it is still unclear if and how many (meta-)cognitive conditions for SRL have already been developed by preschool age. While some authors like Veenman, Van Hout-Wolters, and Afflerbach (2006) postulate that metacognitive abilities required for SRL are not developed until school age (about age eight), others assume that basic abilities for the control and the regulation of one's own cognitive processes already exist by preschool age (Larkin, 2010; Whitebread et al., 2009).

Results of extensive observational studies by Bronson (2000) indicate that children of preschool age increasingly acquire a capacity for information processing that enables them to adequately understand task demands. Furthermore, by preschool age, intrinsic motivation is still highly developed, which facilitates the initiation and maintenance of learning action (Carlton & Winsler, 1998). Based on her observations, Bronson (2000) showed that there already is significant development until preschool age in terms of the control of attention, monitoring behaviours and the adaption of strategies in comparison with infants and toddlers. In addition, it was shown that 5–6-year-old children already possess the basic abilities to monitor and execute volitional control over their learning actions, which are necessary to finish a task in accordance with the initially established aims (Zimmerman, 2000). These results indicate that since at least the basic developmental-psychological abilities needed to learn self-regulated are already present, a targeted promotion of SRL by preschool age is possible and meaningful. Certainly, children in this age period still often need the help of interaction partners (Bruder, 2006; Vygotsky, 1978), so the importance of essential reference persons has to be considered further in more detail.

Importance of essential reference persons

The previous assumptions show that the SRL in preschool-age children is still reliant on the underlying developmental-psychological conditions, so that some abilities continue to depend on additional support. Thus, essential reference persons like parents or caregivers have an important role in terms of the development of SRL in children (Perels & Otto, 2009; Pino-Pasternak & Whitebread, 2010). The hypothesized importance of competent models was highlighted by Bandura (1977), who assumed that the learning processes of children are based on the observation and the imitation of behaviour of competent models. Vygotsky (1978) also assumed that children initially require an 'other-regulation' (Vygotsky, 1978), meaning the regulation of the behaviour by competent others before they can reach the level of self-regulation. Through other-regulation, social standards are mediated and children learn to comprehend and internalize these standards successively until they finally begin to use them to evaluate their own behaviour – in other words, to switch to self-regulation. By a (verbal) exchange between children and competent interaction partners (adults or older children), children can reach the 'zone of proximal development' (Vygotsky, 1978). In this zone, they acquire 'higher mental functions' (Bodrova & Leong, 2006), which enable them to organize and upgrade their knowledge more independently, regulating learning processes on their own. Also in the metacognitive promotion-concept of Pramling (1988), the interaction between children and adults is of prior importance. In what Pramling (1988) terms a 'metacognitive dialogue', meaning an intensive talk about the learning processes of the child, preschool teachers, or parents can focus the attention of children on special aspects of learning through targeted questions. These theoretical assumptions influenced the Parental Inducement of Self-Regulation-model (PIASR model) by Martinez-Pons (1996). This model formed the theoretical basis of the trainings concerning the methods to promote SRL, because it had been already successfully implemented in previous studies concerning the promotion of children`s SRL by parents and teachers (González-Pienda, Núñez, Álvarez, & Bernardo, 2002; Martinez-Pons, 2002; Perels et al., 2009). The PIASR model is defined by four central dimensions (parental modelling, encouragement, facilitation, and rewarding), which represent methods adults can use to support the SRL of children and which were mediated and practiced in the present indirect interventions. Based on the assumptions of Bandura (1977), the dimension of modelling comprises behaviours of parents who display positive examples of SRL and are hypothesized to be imitated by children if they are regularly seen by them in everyday life (Martinez-Pons, 1996). Encouragement means ability to strengthen the child's efforts to imitate the observed behaviours adequately. An ongoing encouragement in this assumption leads to higher motivation and thus an improved persistence while task processing and a more frequent mastery of the task. The dimension facilitation in Martinez-Pons (1996) model represents parental behaviours that contribute to the mastery of a task by offering little encouragements like targeted

steering of attention towards the essential dimensions of the task. Finally, the dimension of rewarding contains parental behaviours that are aligned to influence the children's behaviour by providing rewards if the children display SRL strategies. In accordance with behaviouristic assumptions (e.g. Skinner, 1974), it is likely that behaviour that is rewarded will be shown more often. Based on these assumptions, two reference groups (parents and preschool teachers) were selected for the present study because of their important roles in the lives of preschoolers. Whereas parents are especially relevant in the first years of life, kindergarten teachers become more and more important with growing age (and related longer presence at kindergarten, see Bronson, 2000). Additionally, it can be assumed that the effect on the SRL of preschoolers is the greatest if both reference groups are trained. In this way, a consistent promotion at home and in kindergarten – the two most important learning contexts of preschool children – is ensured (El Nokali, Bachmann, & Votruba-Drzal, 2010).

Interventions to promote SRL

There is a wide range of studies that support the effectiveness of direct interventions (e.g. Glaser & Brunstein, 2007; Perels, Gürtler, & Schmitz, 2005) as well as indirect interventions (Souvignier & Mokhlesgerami, 2006) in different target groups, but almost none for the age of preschool children (Perels et al., 2009). The present study is one example of an indirect intervention, meaning an intervention that focuses on the environment of the target group. The advantage of an indirect intervention is increased efficiency, because the training participants can operate as multipliers of the mediation of SRL skills, but also because reference persons have a formative influence on the behaviour of the target age group (Bruder, 2006). Following Otto (2007), this influence mainly contributes to the promotion of SRL by preparing favourable learning conditions through the mediation of appropriated strategies of SRL and by acting as a good role model. Consequently, these assignments were also integrated as the main targets of the present conception of the intervention.

Methods

Sample

For the adult sample, 37 preschool teachers in the training groups and 10 preschool teachers in the control group participated in the study. All of them were female and the mean age was between 30 and 39 years ($SD = 1.61$). They had been working in their current positions for 15.05 years on average ($SD = 12.77$). Further, 16 parents in the training groups and 6 parents in the control group took part in the study. Of the parents, 95.5% were female, and the mean age was also between 30 and 39 years ($SD = .59$). Participation was voluntary, and data were collected anonymously. A unique assignment of the children to the parents and the preschool teachers was made possible by the procurement of individual codes.

For the analyses on the child level, the participating children could only be included if their SRL had been rated by the kindergarten teachers and the parents on both measured time points, so a large number of children had to be excluded from the analyses. In the end, the sample contained 53 preschool children from several German kindergartens in a circuit of the responsible university. 44 of them were part of the experimental group ($n_{single\ training\ preschool\ teacher} = 25$; $n_{single\ training\ parents} = 5$ $n_{training\ parents+kindergarten\ teacher} = 13$) and 9 were part of the control group. The ages of the children ranged from 5 to 7 years ($M = 5.74$, $SD = .44$), and 47.3% were female, 52.7% male.

Present study

The basis of the indirect promotion programme to foster SRL in preschool-age children is a model that combines the theoretical assumptions of the model of SRL by Zimmerman (2000) in

consideration of developmental-psychological requirements of the age group in reference to Bronson (2000) and Whitebread et al. (2009). The integrated model is determined by two fundamental aims: First, parents and preschool teachers should be sensitized to a profound understanding of learning processes of children during preschool age by a theoretical input concerning strategies and components of SRL. This understanding should lead to the reflection and the adaption of the learning behaviour. The knowledge of strategies lays the foundation for acting as positive models for the children regarding SRL (Bandura, 1977). Second, the aim was to provide them with a set of concrete strategies and skills that they can use to promote SRL of the children in their everyday interactions (in reference to Martinez-Pons' PIASR-model, 1996) and which are practiced via exercises during the training sessions as well as transfer-assignments for home or kindergarten. The exchange about the experiences with the exercises was also a very important part of the intervention, as it contributes to a deepened comprehension of their own SRL process as well as the learning processes of the children, creating a concrete reference to their own everyday situations. The theoretical contents of the interventions propose a cyclical process, which can be divided into forethought, performance, and self-reflection phase (Zimmerman, 2000). In each of the three 90-minute sessions, one phase and its central components and strategies were elaborated upon and heightened by exercises. All the sessions were structured in the same way. At the beginning of each training session the participants were greeted and made familiar with the agenda for the day. After a theoretical introduction to the single phases of SRL, the participants were offered the opportunity to practice parts of the learned content based on different exercises. After the exercise portion, they were encouraged to exchange experiences and examples of appropriate situations in their everyday life. At the end of each session, a transfer assignment was given to practice either reflecting on their own SRL or teaching self-regulatory strategies at home or in kindergarten until the next session. These experiences and related questions were renewed at the next training session. During every session, participants also received a folder with materials for further exercises and an overview of the essential points of the training. The contents of the single sessions are presented in the following sections.

First training session

The aim of the first training session was to build rapport and to provide an overview of the training units by means of a short theoretical input. In addition, the first phase of the model of SRL was presented by the trainers, and the participants were encouraged to reflect on the importance of adequate goal formulation by means of an interactive group exercise. Subsequently, a theoretical concept for systematical goal setting (SMART-model following Doran, 1981) was presented and discussed. Furthermore, a role-playing exercise was performed to introduce the relevance of parental supporting behaviour. Based on these experiences, the trainers gave theoretical input concerning supportive methods in reference to Martinez-Pons' PIASR-model (Martinez-Pons, 1996). At the end of the session, the participants filled out a training evaluation. They also received a transfer assignment to practice the learned strategies in a concrete situation in their family life (parents) or in kindergarten (caregivers), as well as a folder with materials for further exercises and an overview of the essential points of the training.

Second training session

The second training session dealt with the performance phase. At the beginning, the participants were encouraged to discuss their experiences with the transfer assignment, and a short summary of the contents of the previous session was made. The focus of the second session was on supporting behaviour while task processing, especially in terms of handling distractions. Therefore, participants were first invited to identifiy distractions for their own working processes as well as possibile ways to handle them adequately. Subsequently, they were asked to list ideas concerning the facilitation of their children's handling of distractions, and these ideas were enhanced by the trainers. In addition,

the importance of children's self-talk while task managing and the method of metacognitive dialog (Pramling, 1988) as a main strategy to encourage self-talk and connected self-instruction of the children were presented and discussed. At the end of the training session, the participants again filled out a training evaluation. They received a transfer assignment as well as a summary of the essential contents and further exercises.

Third training session

The topic of the third training session was the self-reflection phase. At the beginning, an interactive group exercise requiring the participants to assess their own attribution patterns, was implemented. Subsequently, several types of attributing were presented by the trainers and the parents or kindergarten teachers then had to categorize their own attribution styles. Potential negative effects of non-beneficial attribution styles on the learning behaviour of children were discussed through the lens of the theory of learned helplessness (Seligman, 1975), and the importance of parental encouragement of beneficial attributing styles for the development of children`s attitudes towards learning was explained. In the second part of the session, several reference standards were explained and again reflected in terms of their effects on the children's learning processes. In addition, the trainers offered strategies to encourage the establishment of a beneficial reference standard (e.g. informative feedback). At the end of the training session, open issues were clarified and the complete training sessions were reflected upon and evaluated by all participants. For an anonymous evaluation of the training, the participants again filled out a training evaluation and were then given the summarized contents of the training session and suggestions for further practice.

Design and procedure

On the level of the preschool teachers and parents the study was based on a control group design with repeated measures, which allowed for a pre-test/post-test comparison within and between the groups regarding the dependent variables of SRL and methods fostering SRL. Based on the idea of a multiplier model, the preschoolers, whose caregivers and parents took part in the training or were in the control group, were also tested before and after the training. On the level of the preschool children, a 2 (training of preschool teachers yes/no) × 2 (training of parents yes/no) design was used. A two-level analysis was conducted to identify any improvements in SRL at the level of the preschool teachers and parents as well as at the child level.

A pre-test consisting of a questionnaire for teachers and parents with 146 items about SRL and methods to promote SRL was administered to the adults one week before the beginning of the training. At the same time, they were asked to complete a rating scale (CHILD-Checklist 3-5; see Whitebread et al., 2009) to assess their children's level of SRL behaviour. After the 3-week training phase, the teachers and the parents were required to complete the questionnaire again, and they were also asked to assess their children's SRL by means of the rating scale once more. In the control group of preschool teachers and parents as well as in the control group of the children, no intervention was implemented.

Hypotheses

Derived from the presented theoretical and methodological assumptions, significant effects of the training in terms of the scale of SRL as well as its subscales and the scale of methods and its subscales were expected on the level of the adults. Additionaly, two directed hypotheses were tested with the help of a priori contrasts.

Hypothesis 1. The participants in the training groups (preschool teachers, parents and the timely parallel training of parents and preschool teachers) are superior to the participants into the control group in regard to their SRL ($EC_{parents+preschool\ teacher}/EC_{preschool\ teacher}/EC_{parents} > CG$).

Hypothesis 2. The participants in the simultaneous training group are superior to the participants in the single trainings and the control group in terms of their SRL ($EC_{parents+preschoolteacher} > EC_{preschool\ teacher}/EC_{parents}/CG$).

In addition, on the child level, an improvement in the SRL of the children whose parents and/or preschool teachers attended the intervention was expected due to the positive model function (Bandura, 1977) and the methods the adults used to support SRL (Martinez-Pons, 1996).

Measures

Questionnaire for kindergarten teachers and parents

The questionnaire administered to the preschool teachers and the parents was distributed before and after the intervention to investigate changes in terms of their SRL behaviour as well as their methods to promote the SRL of their children. It consists of 146 items that were either drawn from several established scales (e.g. Bruder, 2005; Bruder, 2006; Martinez-Pons, 1996; Otto, 2007; Perels et al., 2005) or were developed by the researchers (for a more detailed description see Appendix). The questionnaire contains the same items for both target groups. They only differ in the instructions and the initializing demographic data. Repeated measures were carried out with the overall scale of SRL ($\alpha_{preschool\ teachers} = .94$; $\alpha_{parents} = .88$), which contains the subscales forethought phase (36 Items, e.g. 'Before I start a task, I am setting concrete targets'; $\alpha_{preschool\ teachers} = .90$; $\alpha_{parents} = .86$), performance phase (19 items, 'While I am working, I am thinking of my set aims, to check if I made progress'; $\alpha_{preschool\ teachers} = .79$; $\alpha_{parents} = .77$), and self-reflection phase (17 items, e.g. 'Errors show me what I can do differently'; $\alpha_{preschool\ teachers} = .79$; $\alpha_{parents} = .76$), and the overall scale of methods ($\alpha_{preschool\ teachers} = .84$; $\alpha_{parents} = .88$) that comprises the subscales of modelling (10 items; e.g. 'If I am excited about something, it automatically enhances the motivation of the children'; $\alpha_{preschool\ teachers} = .81$; $\alpha_{parents} = .74$), facilitation (15 items; e.g. 'If I notice that the children have problems concentrating on a task, I utilize concentration techniques'; $\alpha_{preschool\ teachers} = .83$; $\alpha_{parents} = .72$), encouragement (11 items; e.g. 'If the children are afraid of a task, I encourage them'; $\alpha_{preschool\ teachers} = .72$; $\alpha_{parents} = .74$), rewarding (5 items; e.g. 'I praise the children, if they are thinking about problem-solving approaches on their own'; $\alpha_{preschool\ teachers} = .63$; $\alpha_{parents} = .64$). Responses were coded using a four-point Likert scale (1 = 'I don't agree at all'; 2 = 'I don't agree'; 3 = 'I agree'; 4 = 'I agree completely'). The reliability of the scales was checked using Cronbach's alpha. All Cronbach's alphas in terms of the SRL ranged from .77 to .94 for the kindergarten teachers and .76 to .88 for the parents. In terms of the methods, they ranged from .63 to .82 for the kindergarten teachers and .64 to .84 for the parents, which is an acceptable to good result (all Cronbach's alphas > .60). In addition, a six-item test of knowledge about SRL was administered to assess if the adults knew any methods to support SRL, using questions such as 'I know methods to encourage the children's self-control of their behaviour' ($\alpha_{preschool\ teachers} = .65$; $\alpha_{parents} = .68$).

Rating scale SRL of the preschool children

To assess the children's SRL before and after the training, the Children's Independent Learning Development 3-5 Checklist (CHILD-Checklist, see Whitebread et al., 2009) was used. This instrument was developed and applied to preschool teachers in the Cambridge Independent Learning Project (C.Ind.Le) in his original version. For the current study, the instrument was adapted to the target group of parents, particularly in its linguistic aspects. The rating scale originally consisted of 24 items. With the help of the CHILD-Checklist, preschool teachers as well as parents separately had to estimate if their children displayed certain behaviours belonging to SRL never, sometimes, usually, or always. The reliability of the scales was checked with Cronbach's alpha. The results were positive for the estimations of the preschool teachers ($\alpha = .97$) as well as the estimations of the parents ($\alpha = .85$).

Data analysis

Following a two-level approach, the effects of the interventions on the SRL behaviour were investigated first on the level of the preschool teachers and the parents and secondly on the level of the preschool children. In the first step, the general effectiveness of the training was investigated by analyses of variance. In the second step, the directed hypotheses in terms of the different training conditions were tested by a priori contrasts (Abdi & Williams, 2010). As a measurement for the effect size of the a priori comparisons Cohen's *d* (Cohen, 1988) was used. In addition, paired *t*-tests were applied to determine, whether there were significant improvements concerning the SRL and the methods of the adults within the different single experimental groups.

Results

Pre- and post-test comparison: preschool teachers

To test whether there was a significant training effect, a multivariate analysis of variance (MANOVA) with time as a repeated measurement factor was conducted on the SRL and the subscales as well as the methods and their subscales. Because of pre-existing differences between the experimental and the control group, referring to the self-reflection phase scale, analyses of covariance (MANCOVA) were computed. The results, as well as the means and the standard deviations, are displayed in Table 1.

The results show no significant differences between the experimental group and the control group in terms of the SRL overall scale and methods as well as for their subscales.

Pre- and post-test comparison: parents

The parents' responses to the questionnaire were evaluated by means of an MANOVA with time as a repeated measurement factor (there were no differences between the groups before the intervention). The results as well as the means and the standard deviations are displayed in Table 2.

Contrary to the theoretical assumptions, no significant training effect could be detected for the SRL and its subscales. In terms of the methods as well as the modelling, facilitation, and rewarding

Table 1. Results for preschool teachers: group × time interaction.

DV		*M (SD)*				
	Group	Pre-test	Post-test	*df*	*F*	η_p^2
SRL	CG	3.03 (.25)	3.02 (.28)	1, 45	1.33	.06
	EC	2.96 (.31)	3.14 (.31)			
Forethought phase	CG	3.02 (.27)	3.03 (.30)	1, 45	.35	.01
	EC	3.13 (.29)	3.19 (.31)			
Performance phase	CG	3.03 (.23)	3.01 (.25)	1, 45	2.65	.06
	EG	2.98 (.32)	3.08 (.30)			
Self-reflection phase[1]	CG	2.71 (.24)	2.85 (.22)	1, 45	.52	.01
	EG	2.95 (.32)	3.03 (.28)			
Methods	CG	3.19 (.36)	3.24 (.32)	1, 45	1.08	.09
	EG	3.24 (.37)	3.35 (.37)			
Modelling	CG	3.17 (.37)	3.15 (.40)	1, 45	2.55	.05
	EC	3.22 (.37)	3.37 (.39)			
Facilitation	CG	3.21 (.32)	3.32 (.28)	1, 45	.61	.01
	EG	3.28 (.32)	3.34 (.36)			
Encouragement	CG	3.28 (.27)	3.24 (.27)	1, 45	.64	.01
	EC	3.23 (.28)	3.28 (.30)			
Rewarding	CG	3.11 (.47)	3.41 (.34)	1, 45	.07	.00
	EG	3.21 (.52).3	3.42 (.48)			

Note: CG (Control Group, $n = 10$) EC (Experimental Group, $n = 37$); because of significant pre-existing differences concerning the dependent variables, a MANCOVA with pre-test values was conducted.
*$p < .05$, **$p < .01$.

subscales, no significant improvements could be demonstrated. Only the encouragement subscale produced a significant interaction effect of group × time ($F(1, 20) = 5.94$, $p = .02$, $\eta_p^2 = .23$). Referring to Cohen (1988), who differentiated small ($\eta p^2 < .01$), medium ($\eta_p^2 < .06$), and large effects ($\eta_p^2 < .14$), the found effect can be identified as a large effect.

A priori contrasts (testing hypotheses 1 and 2)

By the means of contrast analyses, the initially formulated assumptions regarding the superiority of the experimental groups (Hypothesis 1: $EC_{parents+preschool\ teacher}/EC_{preschoolteacher}/EC_{parents} > CG$) as well as the superiority of the simultaneous training group (Hypothesis 2: $EC_{parents+\ preschool\ teacher} > EC_{parents}/EC_{preschool\ teacher}/CG$) were tested. For the analyses, the values of the second measurement of the dependent variable were considered. In the case of significant pre-intervention differences between the groups, difference values of the pre- and post-measurements were consulted. As a measure of the effect size, Cohen's *d* was used. Following Cohen (1988), effect sizes of $d \geq .25$ are considered a small, $d \geq .50$ a medium, and $d \geq .80$ a large effect.

The results of the contrast analyses in terms of the SRL assessed by the preschool teachers' responses to the CHILD-Checklist 3–5 were not significant, so the hypotheses had to be discarded. Neither a superiority of the experimental groups against the control group ($t(3, 49) = .52$, $p = .30$, $d = .19$), nor a superiority of the simultaneous training group against the single training groups and the control group ($t(3, 49) = .37$, $p = .36$, $d = .13$) could be shown. Based upon the rating scale filled out by the parents, Hypothesis 1 could not be confirmed ($t(3, 49) = 1.37$, $p = .09$, $d = .55$). Concerning Hypothesis 2, significant results could be obtained ($t(3, 49) = 1.91$, $p = .03$, $d = .71$), so that the simultaneous training group was proven to be superior to all other training groups and the control group. Referring to the conventions of Cohen (1988), the determined effect can be interpreted as a medium effect.

Within-group comparison: preschool teachers and parents level

To test whether there is a significant training effect within the single groups, paired *t*-tests were carried out. In accordance with our theoretical assumptions, the within-group comparison for the preschool teachers illustrated a significant improvement in the experimental group in terms of the SRL

Table 2. Results for parents: group × time interaction.

DV		*M (SD)*				
	Group	Pre-test	Post-test	*df*	*F*	η_p^2
SRL	CG	2.80 (.32)	2.76 (.32)	1, 20	1.89	.24
	EC	2.87 (.29)	2.92 (.32)			
Forethought phase	CG	2.90 (.34)	2.90 (.40)	1, 20	2.42	.11
	EC	2.87 (.27)	3.05 (.20)			
Performance phase	CG	2.84 (.33)	2.78 (.37)	1, 20	.02	.00
	EG	2.96 (.28)	2.93 (.22)			
Self-reflection phase	CG	2.67 (.29)	2.60 (.20)	1, 20	.39	.02
	EG	2.78 (.33)	2.79 (.27)			
Methods	CG	2.86 (.39)	2.84 (.38)	1, 20	1.30	.23
	EG	2.96 (.35)	3.19 (.38)			
Modelling	CG	2.93 (.29)	2.90 (.19)	1, 20	2.56	.11
	EC	2.83 (.40)	3.03 (.27)			
Facilitation	CG	2.96 (.33)	2.88 (.39)	1, 20	2.24	.10
	EG	2.94 (.30)	3.09 (.19)			
Encouragement	CG	2.92 (.30)	2.83 (.41)	1, 20	5.94*	.23
	EC	3.03 (.32)	3.24 (.26)			
Rewarding	CG	2.63 (.54)	2.76 (.52)	1, 20	1.74	.08
	EG	3.04 (.36)	3.38 (.37)			

Note: CG (control group, $n = 6$), EC (experimental group, $n = 16$).
*$p < .05$, **$p < .01$.

overall scale and for the scales of performance phase, methods, modelling, and rewarding (SRL: $t(36) = -2.32$, $p = .03$, $d = .26$; performance phase: $t(36) = -2.64$, $p = .01$, $d = .32$; methods: $t(36) = -3.91$, $p < .001$, $d = .33$; modelling: $t(36) = -3.32$, $p < .001$, $d = .39$; rewarding: $t(36) = -2.51$, $p = .02$, $d = .42$). Referring to Cohen (1988), the determined effect sizes can all be interpreted as medium effects. The control group did not change significantly between the two referent dates referring to the mentioned scales. An within-group comparison in the single training group of the parents revealed a significant improvement in the experimental group concerning the scales of forethought phase, methods, modelling, encouragement, and rewarding (forethought phase: $t(15) = -2.71$, $p = .02$, $d = .76$; methods: $t(15) = -3.06$, $p < .01$, $d = .93$; modelling: $t(15) = -2.30$, $p = .04$, $d = .59$; encouragement: $t(15) = -3.07$, $p < .01$, $d = .72$; rewarding: $t(15) = -3.65$, $p < .01$, $d = .93$) with medium to large effect sizes. Thus, our theoretical assumptions could at least be confirmed for these scales. The control group did not change significantly.

Pre- and post-test comparison: child level

Concerning the SRL scale of the CHILD 3–5 (Whitebread et al., 2009) applied to the preschool teachers, differences between the experimental and the control group were tested by the means of an analysis of variance (there were no differences prior to the intervention). For the SRL of the children, no significant interaction effect of time × preschool teacher × parents could be revealed ($F(3, 49) = .93$, $p = .34$, $\eta_p^2 = .02$). In terms of the rating scale filled out by the parents, no pre-differences concerning scale SRL were found, so that also an ANOVA with time as a repeated measurement was conducted. The results prove that no significant training effects could be identified ($F(3, 49) = .36$, $p = .55$, $\eta_p^2 = .01$). Because of the small sample size of the children, also nonparametric methods (Kruskall–Wallis H tests) were applied. In accordance with the results of the analyses of variance, no significant differences between the experimental group and the control groups to the second measurement time point could be detected in terms of the SRL scale of the CHILD 3–5 applied to the preschool teachers ($H(3) = 5.44$, $p = .14$) and the parents ($H(3) = 7.74$, $p = .06$).

Discussion

The aim of the study was to develop and to evaluate indirect interventions to foster the SRL of preschool children. Employing a two-level approach, SRL was first assessed on the level of the preschool teachers and the parents and second on the level of the preschool children. On the level of the teachers, any significant interaction effects of group × time could be shown by the means of the analyses of variance, whereas on the level of the parents, significant improvements were detected in terms of the scales methods and encouragement. The results of the within-group comparison clarify that the training had more of an impact on using methods to improve SRL of preschool children than on their own SRL behaviour in both groups. One reason for this result might be that, in contrast to the mediation of concrete methods, the amount of meaningful change in a behaviour that requires in-depth self-reflection is only possible to a limited extent in such a short intervention period. At the level of the children, no significant changes concerning their SRL could be detected. One reason might be that the assumed modelling effect (Bandura, 1977) could not yet affect the children's SRL because the survey period was too short for a constant mediation. Therefore, the children did not have an opportunity to internalize the shown strategies until the second measured time point. A meta-analysis by Hattie, Biggs, and Purdie (1996) showed that the best training results can be obtained if the training contents are very specific, less complex, easy to learn, and if only a little amount of transfer of the training contents to the desired behaviour is needed. Although the training tried to illustrate different situations in which to use the learned strategies, the contents were complex and multilayered, so the need remained for a huge transfer to apply these strategies tailored to the needs of the individual children and situation. The missing training effect might also be related to difficulties in the usage of the instrument. The CHILD-Checklist asseses general characteristics

rather than explicit strategies, which are more easily observed. Thus, in future research a more concrete formulation of strategies may be useful. Additionally, because of the personal relation of the preschool teachers and the parents to the children as well as the lack of experience with such an instrument, using a panel of independent professional observers, seems to be more likely to produce objective ratings. For a differentiated consideration of the results on the child level, a priori contrasts were conducted. They could not prove a superiority of the experimental groups against the control group (Hypothesis 1). Nevertheless, the second hypothesis could at least be partly confirmed, as the simultaneous training of the preschool teachers and parents was shown to be superior to the other training groups and the control group in regard to the SRL assessed by the CHILD-Checklist 3–5 of the parents. These results provide hints, that the assumed importance of the inclusion of both central reference person groups (El Nokali et al., 2010) could be verified. In general, the results of the evaluation indicate, that a training of preschool teachers and parents can contribute to an improvement in their SRL and their knowledge of methods to promote SRL. However, the results also demonstrate that in future research there is a need of an adaption of the intervention (e.g. duration of the intervention and the assessment period), as well as an adaption of the instrument, to produce an improvement in SRL at the child level through the indirect training.

Limitations and future research directions

One obvious limitation of the study is the very small sample size of the different training conditions. In this regard, the recruitment of parents proved to be difficult because the training was an additional meeting that many parents found difficult to incorporate into their business day. As a result, much of the data regarding the parents had to be removed from the analyses. That issue aside, the other conditions also indicate that the sample size should be elevated in future studies through targeted incentives. Another important limitation of the study, the missing randomized assignment of the groups must be noted. Although a randomization of the groups was planned, the recruitment phase found that many kindergarten were only willing to take part in the study under their own defined conditions (e.g. they could only realize a preschool teacher training but not a training of the parents). In addition, because of the hierarchical structure of the data, multilevel analyses would have been meaningful to evaluate the training. By means of multilevel analyses, the assignment of individuals to natural groups (in this case matching the children to a special kindergarten group and respectively to a special preschool teacher), which influences the individual characteristic values, is considered (Snijders & Bosker, 2012). Consequently, to verify a carry-over effect of the changed behaviour of the preschool teachers caused by the intervention on the SRL of the children, at least four children would have been needed to have been assigned to one preschool teacher in the present sample. Due to organization and time conflicts with the participating institutions, it was impossible to recruit a sufficient number of preschool teachers for such an assignment. In further studies, a pre-assignment, which considers these preconditions of the multilevel analysis, should be established. Additionally, a follow-up survey was impossible, as the children had already entered school. A follow-up survey would have been necessary to prove whether there had been long-term effects at the adult and child level. Thus, in further studies, the intervention should be carried out at the beginning of the kindergarten year so that a follow-up measurement and an extension of the intervention phase could be realized.

The results from the evaluation of the adults' intervention suggested that, in accordance with previous findings (Bruder, 2006), the training can significantly impact their methods to promote SRL. In future studies, the focus should be placed on strategies and methods to support SRL. According to the demands of a multimethod approach (Spörer & Brunstein, 2006), the instruments for the adults should be complemented by others, such as a standardized observation of their behaviour in the interaction with children during a problem-solving task. In further studies, it should also be ensured, that the actual use of the learned strategies in the interaction between teachers, parents, and the preschool children in everyday life after the intervention is directly measured, not simply

their perception of the use. A special need also exists for the development of reliable and valid instruments to assess preschool children's SRL. Finally, the present study demonstrated that the SRL, especially the knowledge of preschool teachers and parents, can be improved by an intervention. However, there remains a need for further research to optimize the training, particulary in terms of the facilitation of the transfer of the learned materials to the individual's need in everyday life situations. The study can be seen as a first important step towards an answer to the need for a specific adherence of learning competencies in early childhood education (Fthenakis, 2003).

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by German Research Foundation (Deutsche Forschungsgemeinschaft (DFG)).

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Appendix

Scale documentation: Questionnaire for Kindergarten Teachers and Parents

I Personality

1. Values (3 items)

e.g. "I know what's important to me in life." (Schmidt, 2009)

"I am aware of my values." (Schmidt, 2009)

2. Calling (6 items)

e.g. "My work gives me the feeling to make something meaningful." (Schmidt, 2009)

"I also grow personally in my job." (Schmidt, 2009)

3. Life satisfaction (3 items)

e.g. "My life could hardly be happier than it is." (Dalbert, 1992)

"I am satisfied with my life situation." (Dalbert, 1992)

4. Fit of requirements (6 items)

e.g. "My job fits in well with my own strengths and weaknesses."
(self developed based on Schmidt, 2009)

"I bring along the necessary skills for my job." (self developed based on Schmidt, 2009)

II self-regulated learning

1. Forethought phase (36 items)

e.g. "At the beginning of an activity, it is important to set goals." (Bruder, 2005)

"If I have a lot of plans, I get an overview of what to do." (Bruder, 2005)

2. Performance phase (19 items)

e.g. "While working, I find a way to focus on the task even if there are distractions."
(Schunk & Ertmer, 2000)

"As I work, I make sure that I do not lose sight of my goal." (Bruder, 2005)

3. Self-reflection phase (17 items)

e.g. "If I finish a task, I compare the result to my previous results." (Perels et al., 2009)

"When I finish a task and find my goals unrealistic, I change them." (Perels et al., 2009)

III SRL promotion strategies

1. Modeling (10 items)

e.g. "It helps children to set goals when they see that I set goals, too."
(self developed based on Martinez-Pons, 1996)

"When I show children how to deal with problems in the execution of a task, they also accomplish their own tasks better." (Bruder, 2005)

2. Facilitation (15 items)

e.g. "If a child does not know what to do, I can help him with tips without giving too much away." (Bruder, 2005)

"When I see that a child has problems concentrating on a task, I use concentration techniques." (Perels et al., 2009)

3. Encouragement (13 items)

e.g. "If the child has difficulty with his motivation at the beginning of a task, I encourage him to keep trying." (Perels et al., 2009)

"If the child does not succeed in a difficult task, then together we think about how to proceed differently." (self developed based on Bruder, 2005)

4. Rewarding (12 items)

e.g. "I praise the children when considering different approaches to solving a task."
(Perels et al., 2009)

"I praise the children when they detect connections between different topics."
(Perels, et al., 2009)

IV test of knowledge about self-regulation

e.g. "In my opinion, it has a positive effect on concentration when children talk to themselves about a task" (Perels et al., 2009)

"I often talk to the children about their learning progress that they make."
(Perels et al., 2009)

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June 2019, Volume **11**, Issue **5**, **437-448**

The Promotion of Self-regulated Learning by Kindergarten Teachers: Differential Effects of an Indirect Intervention

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Received: 12 February 2019
Revised: 11 June 2019
Accepted: 14 June 2019
ISSN: 1307-9298

www.iejee.com

DOI: **10.26822/iejee.2019553340**

Abstract

The early promotion of self-regulated learning (SRL) has aroused increased interest since it has been highlighted as the key competence for lifelong learning (E.U. Council, 2002). To meet the demand for early support, an intervention for kindergarten teachers to foster SRL in five to six-year-old children was developed (Venitz & Perels, 2018). In the present study, different SRL promotion strategy profiles of kindergarten teachers were investigated by using latent profile analyses and the effectiveness of the developed intervention was evaluated under consideration of the found profiles. The results of latent profile analysis (n= 134 kindergarten teachers) displayed specific profiles that differ regarding the degree of self-reported knowledge concerning strategies to promote SRL in children. Using a sample of n= 76 kindergarten teachers who participated on a three-week training which was focused on the reflection of the own SRL as well as the promotion of SRL, differential effects of the found profiles were investigated. The results indicate that an adaption of the intervention according to the different SRL promotion strategy profiles would be meaningful, because kindergarten teachers with high and low SRL promotion strategy profiles differed significantly concerning their repertoire of supportive strategies and their SRL behavior.

Keywords: Differential Effects, Self-Regulated Learning, Kindergarten Teachers, Training, Latent Profile Analysis

Introduction

Against the background of social change processes that contribute to a growing relevance of lifelong learning processes, self-regulated learning (SRL) is increasing in importance (see Fthenakis et al., 2007; Lüftenegger et al., 2012). Therefore, the promotion of independent, self-directed forms of learning is one of the most important aims of the German early education system (KMK, 2004) and should begin as soon as possible (Secretariat of the Standing Conference of Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany, 2015). An early promotion of SRL has an advantage over later support as learning behaviors are still malleable, increasing the positive influence of the SRL processes (Dignath, Büttner, & Langfeldt, 2008; Perels & Otto, 2009). In addition, "relatively small self-regulatory differences in early childhood can be magnified to progressively larger differences over time" (Baron, Evangelou, Malmberg, & Melendez-Torres, 2015, p. 1). Thus, early promotion of SRL can play a preventive role. In this context, kindergarten teachers are encouraged to continuously develop their knowledge and competence concerning the promotion of children (e.g., Lindeboom, & Buiskool, 2013; Secretariat of the Standing Conference of Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany, 2015), so SRL is also a highly relevant competence for early childhood educators. In addition, the demand on teachers to "be familiar with the factors that influence a learner's ability to self-regulate and the strategies they can use to identify and promote self-regulated learning (SRL) in their classrooms" (Zumbrunn, Tadlock, & Roberts, 2011, p. 4) can also be transferred to the kindergarten context. Empirical findings provide hints that relevant skills or methods to foster SRL of kindergarten children can be effectively mediated by professional programs (e.g., Perels, et al., 2009). Hence, an intervention to promote the SRL behavior of kindergarten teachers as well as their knowledge about strategies to foster SRL in children, appears useful. Therefore, in a further study by Venitz & Perels (2018), an indirect intervention for kindergarten teachers which focuses on the SRL promotion of five to six-year-old children, was developed. As research on SRL of educational staff in school contexts indicates that there are individual differences in the support of SRL (Moos & Ringdal, 2014), an investigation of differences with regard to early childhood educators' knowledge about SRL promotion strategies seems to be of special importance. That is why the present study seeks to investigate different profiles with regard to knowledge about SRL promotion strategies within a sample of 134 German kindergarten teachers, following a person-centered approach (Niemivirta, 2002). According to the Aptitude-Treatment-Interaction approach (Snow, Corno, & Jackson, 1996), differential effects of SRL profiles on an indirect SRL promotion strategy training were investigated via repeated measurement analyses.

SRL and its Relevance for Kindergarten Teachers

After the E.U.-Council (2002) report was issued, "self-regulated learning has been highly praised as the key competence to initiate and maintain lifelong learning" (Dignath et al., 2008, p. 102). Because of an increasingly faster alteration of knowledge in a highly technically developed society, an independent acquisition and continuous extension of knowledge is required, which can be facilitated through recourse to SRL strategies. Therefore, SRL, or the ability to initiate (learning) action processes autonomously, to adapt them continuously on the basis of self-observations and to reflect upon them (Zimmerman, 2000), has become one of the most important aims of the German education system and is of growing interest for researchers (e.g., Dignath, Büttner, & Langfeldt, 2008; Wigfield, Klauda, & Cambria, 2011; Perry et al., 2010). As the theoretical foundation of the intervention that was used as the database for the investigation of differential training effects, the social-cognitive process model of Zimmerman (2000) was chosen, which distinguishes three central learning phases (forethought phase, performance

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phase, and self-reflection phase). The model offers an indept explanation of SRL processes and related strategies, so it offers a solid knowledge base for kindergarten teachers and can be used for the (further) development of knowledge concerning strategies to foster SRL in children. In the first phase of the model (forethought phase), the focus is on planning the action, including analysis of the task, clarification of the challenges of the task and motivational processes. The second phase (performance phase) places pivotal importance on competencies like self-control and self-monitoring, meaning the conscious perception and analysis of inner experience and behavior. Here, the learning action is implemented while maintaining a focus on the planned aims. Central elements of the third phase (self-reflection phase) are self-evaluation and self-reaction, meaning that the task that was completed is compared with the aims set forth at the beginning of the task and evaluated in terms of its success (self-evaluation). As a consequence of the self-evaluation, a self-reaction takes place. If learners are displeased with the result of their work, they should adapt either their original aim or the strategies used in future learning actions. Zimmerman (2000) described a model consisting of several processes that are subjected to continuous adaptation and, therefore, an optimization of the learning behavior, so it offers suitable points of reference for an intervention study. However, abilities linked to the monitoring and the evaluation of one's own behavior in children of kindergarten age are doubted by some authors (e.g., Veenman, Van Hout-Wolters, & Afflerbach, 2006). Certainly, results by other researchers like Bronson (2000), Whitebread et al. (2009) or Hoyle & Dent (2018) assume that there already is a notable difference in metacognitive abilities, such as monitoring behaviors, the control of attention, and the adaption of strategies on the basis of self-evaluation, in comparison with infants and toddlers.

Thus, SRL is seen as an ability that can already be promoted in children kindergarten age by an increased number of researchers. These findings suggest that children seem to possess basic abilities to learn self-regulation, which can be further developed by additional support through interactions with competent educational staff and a structured learning environment (see Bruder, 2006). As it describes single learning processes, in which kindergarten teachers can orient themselves in their support of SRL, the social-cognitive process model by Zimmerman (2000) offers a suitable theoretical foundation for an intervention for children of kindergarten age and their reference persons. To date, SRL and its promotion has been mainly investigated in a school context (e.g., Cleary, Platten, & Nelson, 2008; Fuchs et al., 2003; Leidinger & Perels, 2016; Perels, Gürtler, & Schmitz, 2005; Rosário et al., 2007), but not often in a kindergarten context, so there is a lack of research concerning the SRL of kindergarten teachers and its promotion, although it can be expected to have significant implications for their daily work (e.g., Chatzistimatiou et al., 2014). Research in a school context suggests, "that if teachers become self-regulated in their own learning, their experience in self-regulatory processes can help them to develop strategies for teaching self-regulation to their students" (Senler & Sungur-Vural, 2014, p. 552). Because the work of kindergarten teachers is marked by a "rapidly changing environment" (Peeters et al., 2014, p. 1964), an ongoing adaption and extension of their knowledge of how to support children is required (Lindenboom & Buiskool, 2013). Thus, it can be stated that SRL also holds importance for early education staff. In a school context, it is stated that teacher first "need to be self-regulated learners themselves due to ever-changing curricular revisions, which require innovation and adaptability" (Moos & Ringdaal, 2012, p. 3) to continuously regulate their own learning and that they have to support the development of SRL behavior of the children they teach. This assumption should also be transferable to the early education context. Although the theoretical assumptions demonstrate the importance of a teachers' knowledge of SRL promotion strategies, findings from Perry, VandeKamp, Mercer and Nordby (2002) in a school context indicate that teachers recognize the importance of SRL and are willing to help students build beneficial SRL behavior. However, they are "unsure of the tasks and practices that support it" (Serratore, 2015, p. 8). Transferring the findings to a kindergarten context, a reinforcement of kindergarten teachers' knowledge of strategies to promote SRL in children and a reflection on their own SRL seem to be of particular importance. Therefore, the presented training (Venitz & Perels, 2018) pursued two essential key goals: First, the reflection of the own SRL behavior as a basis to get able to act as a positive role model who demonstrates SRL behavior (Bandura, 1977), and second the development of knowledge concerning the support of SRL in kindergarten children.

Promotion of SRL

To conceptualize an adequate training for kindergarten teachers to improve SRL in children of kindergarten age, psychological-developmental requirements have to be considered. It is still unclear if and how many (meta-)cognitive conditions for SRL have already been developed by five to six-year-old children. While some authors like Veenmann, Van Hout-Wolters and Afflerbach (2006) postulate that metacognitive abilities that are necessary for SRL are not developed until school age (about eight years), others assume that basic abilities for controlling and regulating one's own cognitive processes already exist by preschool age (see Bronson, 2000; Hoyle & Dent, 2018; Larkin, 2010; Whitebread et al., 2009). By the means of extensive observational studies, Bronson (2000) could show that children of preschool age increasingly acquire capacity for information processing that enables them to adequately understand task demands. In addition, the capacity of working memory which facilitates the remembrance of instructions and therefore serves as a useful help to pursue defined goals, already increases in childhood (Hoyle & Dent 2018). Furthermore, at kindergarten age, intrinsic motivation is still highly developed, which contributes to a facilitation of the maintenance of learning-action (Carlton & Winsler, 1998). In addition, five to six-year-old children already possess the basic abilities to monitor and execute volitional control over their learning actions, which are necessary to finish a task in accordance with the initially established aims (Zimmerman, 2000). Furthermore, the ability to inhibit impulsive responses in favor of goal-directed responses, named effortful control, has already been developed at the age of three (Hoyle & Dent, 2018). These results indicate that at least basic developmental-psychological abilities to learn self-regulation already exist, making a targeted promotion of SRL at the end of kindergarten possible and meaningful. Certainly, essential reference persons such as parents or early childhood educators can mainly support the learning processes of children in this age group and therefore have an important role in terms of the development of SRL (see Hoyle & Dent, 2018; Pino-Pasternak & Whitebread, 2010). Concrete strategies to promote SRL in children were formulated within the parental Inducement of Self-Regulation-model (PIASR) by Martinez-Pons (1996), which formed the theoretical basis of the intervention concerning strategies to promote SRL. This model seemed suitable as it had already been successfully implemented in a previous study concerning the promotion of SRL in younger children through an intervention for kindergarten teachers (Perels et al., 2009). The model was originally conceptualized with regard to supporting behaviors of parents, but in the study of Perels et al. (2009), it was assumed that the model can also be transferred to kindergarten teachers because they take on the education-

al task while also acting as a positive role model. Therefore, it is to be expected that the SRL promotion strategies based on the PIASR model of Martinez-Pons (1996) can be used by kindergarten teachers, too. The model is defined by four central dimensions (modeling, encouragement, facilitation and rewarding). These dimensions represent strategies that adults can use to support the SRL of children and were mediated and practiced in the present indirect intervention. Based on the assumptions of Bandura (1977), the dimension of modeling comprises behaviors of adults who display positive examples of SRL and which are hypothesized to be imitated by children if they witness them regularly in everyday life (see Martinez-Pons, 1996). Encouragement means the ability to strengthen the child's efforts to imitate the observed behaviors adequately. Ongoing encouragement is assumed to lead to higher motivation and thus an improved persistence while task processing as well as more frequent mastery of the task. The dimension of facilitation in Martinez-Pons' model represents parental behaviors that contribute to mastery of a task by offering little encouragement such as targeted steering of attention to the essential dimensions of the task (Martinez-Pons, 1996). Finally, the dimension of rewarding contains parental behaviors that are intended to influence the children's behavior by providing rewards if the children show SRL strategies. In behavioristic terms (e.g., Skinner, 1974), it is likely that a behavior which is rewarded will be displayed more often. The model provides a basis for the procurement of knowledge of strategies that early childhood educators can use in their everyday working life to foster SRL in children.

Interventions to Promote SRL and SRL Promotion Strategies

Several studies confirm the effectiveness of direct interventions, meaning interventions that are directly attached to the target group, (e.g. Glaser & Brunstein, 2007; Perels, Gürtler, & Schmitz, 2005) as well as indirect interventions (De Jager, Jansen, & Reezigt, 2005; Perels et al., 2009; Souvignier & Mokhlesgerami, 2006), meaning interventions that focus on the environment of the target group. In their meta-analyses, Dignath, Buettner and Langfeldt (2008) examined 48 SRL programs in the primary school context in regard to their effectiveness. The results showed positive effects on academic performance (d= .62; $S.E$= .05), cognitive and metacognitive strategy use (d= .73; $S.E$= .04) and motivation (d= .76; $S.E$= .09). Therefore, especially the promotion of strategy use and motivation seems to be fruitful in primary school age (Dignath, Buettner, & Langfeldt, 2008). Studies in a school context were often developed with the aim to offer teachers material that they can use in their classes to support the SRL of their students (e.g., DeCorte, Verschaffel, & Van de Ven, 2001; Fuchs et al., 2003; Perels, Dignath, & Schmitz, 2009). Some interventions are conceptualized as professional development programs for teachers on the subject of SRL and revealed positive effects for the students (e.g., De Jager, Jansen, & Reetzig, 2005; Rozendaal, Mineart, & Boekaerts, 2006). In combination with an intervention for children of primary school age, Otto (2007) developed an indirect intervention concerning the promotion of SRL by teachers and parents. As part of the indirect intervention, knowledge about SRL processes and strategies concerning the promotion of SRL in class and in homework situations were mediated. The results of the study revealed significant improvements in terms of SRL on the level of the children, particularly in the training conditions where children took part in the intervention instead of only the teachers and/or parents. In elementary context, direct as well as indirect interventions are still rare (Perels et al., 2009), but first approaches have been launched in the recent years that have proven to be effective. One example of a direct intervention in a preschool context was developed by Perels and colleagues (2009). The intervention aimed to support the development of SRL strategies in preschoolers by practicing them together on the basis of various playful and creative tasks.

In kindergarten context, indirect interventions, meaning interventions that are aligned to the environment of the target group (e.g. parents or educators of children) seem to be of special interest because essential reference persons like parents or kindergarten teachers still have a formative influence on the behavior of the target age group (Bruder, 2006). Indirect interventions also offer the advantage of increased efficiency because kindergarten teachers in particular can operate as multipliers of the mediation of SRL skills (Bruder, 2006). Despite these obvious benefits of training essential reference persons in a kindergarten context, there is still a lack of research concerning SRL promotion interventions that are explicitly aimed at essential reference persons of children at the end of kindergarten time. One of the rare indirect intervention studies concerning the promotion of SRL in a preschool context was developed by Perels et al. (2009). Besides promotion of the preschoolers' SRL within the direct intervention (described above), the study aimed at imparting opportunities for the targeted promotion of SRL by preschoolers and a self-reflective conceptualization of SRL in a three-weekly training. Results were obtained for the preschool teachers as well as the children. On the level of the preschool teachers, significant improvements concerning their own SRL were revealed. The children showed significant benefits of the training in terms of their SRL.

The EMIL-project represents another example of a successfully evaluated study with the subject of an indirect promotion of executive functions in preschoolers (a construct nearly related to SRL) by providing a further education program for early childhood educators (Walk, Evers, Quante, & Hille, 2018). The training program includes a total of eight sessions in which knowledge about executive functions is mediated and ways to support it in preschoolers in the daily routines of the preschools are developed and discussed. The evaluation of the intervention yielded significant benefits of the training on the level of the preschool children with regard to three of seven executive function tests, namely behavioral inhibition, visual-spatial working memory, and combined executive function (working memory, inhibitory control, and cognitive flexibility). Results of the evaluation of the training on the level of the educators are not known so far.

Although it is becoming apparent that the promotion of self-regulation in kindergarten is gaining importance in both contexts, research and practice, there is a lack of interventions that include kindergarten teachers and parents together although the highest effect on the SRL of preschoolers can be expected if both reference groups are trained. By training parents and early childhood educator together, a consistent promotion at home and in kindergarten – the two most important learning contexts of kindergarten-age children – is ensured (El Nokali, Bachmann, & Votruba-Drzal, 2010).

SRL Promotion Strategies and Teachers' SRL Behavior

In terms of the importance of the SRL behavior of teachers for the implementation of SRL promotion strategies, empirical research seems to provide consistent results. In his study, Randi (2004) concluded that "teachers advance their knowledge and are enabled to recognize more opportunities to foster self-regulation in a diversity of settings" (Randi, 2004, p. 1966), if they are given opportunities to improve their own SRL. Following this assumption, teach-

ers first need to be conscious of their own SRL behavior before they can transfer adequate strategies to children. On the basis of their research, Peeters et al. (2014) also highlighted the "teacher's own self-regulatory competencies as a critical determinant of SRL implementation in primary school" (Peeters et al., 2014, p. 1963). In accordance with the assumptions of Peeters et al. (2014), Kramarski (2018) also supposes a dual teacher role in the context of SRL in his theoretical model, namely the learner's role and the teacher's role. Considering this dual role of teachers, the kindergarten teacher training that built the empirical basis for the investigation of differential effects, followed a two-level approach. In each session, methods to reflect and optimize the SRL behavior of the kindergarten teachers themselves were mediated while at the same time strategies to support the development of SRL in kindergarten children were presented and discussed within the training. Due to these conceptual thoughts and empirical findings, the present study also wanted to examine differential effects in terms of the SRL behavior of the participants.

Differential Effects When Fostering SRL Promotion Strategies

When evaluating interventions in real-life settings, the consideration of differential effects plays an important role because "the evaluator cannot influence the general set-up" (Lapka, Wagner, Schober, Gradinger, & Spiel, 2011), meaning that often a natural heterogeneity of the training group is given that is beyond the control of the evaluator. Therefore, within a training sample, it can be assumed that there are individual differences, such as regarding different starting levels concerning the main teaching subject, which can lead to different benefits of a training (Lapka et al., 2011). By using a variable-oriented approach, these individual differences are neglected, and only global effects of the training can be revealed. However, with the help of a person-centered approach, as implemented in the present study, changes through the training in relation to special subgroups can be analyzed. In this way, one can identify the need for the development of adaptive trainings that consider claims and needs of different subgroups. Thus, research on differential training effects can contribute to a profound foundation of individual trainings. In a study by Dörrenbächer and Perels (2016), SRL profiles of college students that differed qualitatively with regard to motivational subcomponents were examined to determine the effectiveness of a training to improve SRL skills. The results revealed that students within the profile with moderate SRL benefited from the intervention, whereas students with low SRL and moderate motivation as well as students with high SRL and high motivation did not show significant change. Another example of an investigation of differential effects of a training concerning the knowledge and usage of SRL strategies is a study by González-Pienda, Fernández, Bernardo, Núñez and Rosário (2014) that considered different pre-training SRL levels within the evaluation of their training. The results of their study illustrated that students with low baseline levels profited, whereas students with moderate and high baseline levels did not benefit noticeably. One explanation for this compensation effect is that students who already possess a high level of SRL skills have little room for improvement, whereas students with low levels of SRL skills can take the opportunity to expand their knowledge and practice the newly learned strategies through training. Results from other studies (e.g., Alexander, Carr, & Schwanenfluegel, 1995) indicate a contrary effect, named the Matthew effect (Walberg & Tsai, 1983), meaning that participants who already start with a high level of knowledge profit more from an intervention. This increased gain is explained by their superiority in controlling cognitions, which leads to a facilitated learning and application process. In a meta-analysis by Donker, Boer, Kostons, Dignath van Ewijk and van der Werf (2014), a total of 58 studies on learning strategy instructions in primary and secondary education with a focus on improving SRL were examined with the aim to reveal the strategies that can best contribute to an improvement in academic achievement. They also investigated differential effects of learning strategy instructions in reference to different types of students (regular students, children from low SES background, children with learning disabilities and needs and gifted children from higher SES backgrounds). In contrast to the studies described above, which suggested either a compensation effect or Matthew effect, the results of the analysis by Donker et al. (2014) did not reveal any significant differences between the individual types of students in regard to their gains from strategy instruction.

To summarize, the current research literature offers inconsistent findings concerning the benefit of a SRL (strategy) training for different groups of participants. In addition, analyses of the differential effects of interventions with the focus on SRL promotion strategies in a kindergarten context are very rare, so the present study can provide new insights into this field of research. Considering the preceding theoretical and empirical findings, a suitable training can only be provided, if different competencies and prior levels of knowledge are taken into consideration. This is why the present study aimed to evaluate a SRL training for kindergarten teachers, using different promotion strategy profiles. Given that the present study is most similar to the González-Pienda et al. (2014) study, it was hypothesized that kindergarten teachers with a low SRL promotion strategy profile would benefit more from the intervention than kindergarten teachers with a high SRL promotion strategy profile, indicating a compensation effect.

The Current Study

The preceding explanations show gaps in the research, the present study hopes to fill. First, there is a large amount of research concerning the promotion of SRL in a school context, referring to teachers, but the extent of knowledge and the usage of concrete strategies to foster SRL of educational staff in kindergarten have been largely neglected thus far. As a consequence of the increased recognition of early education processes and their support by kindergarten teachers, the conceptualization and evaluation of a specific SRL promotion training for this professional group, is of great significance. This was the starting point for the development and evaluation of a study for kindergarten teachers which aimed to improve their knowledge and competencies in regard to the promotion of SRL in children of kindergarten age (Venitz & Perels, 2018; further described in section 2.2). The results of the quasi-experimental control-group study with repeated measures showed a significant increasement in terms of the strategies that were used by the participants to promote the SRL in children of kindergarten age (Venitz & Perels, 2018). However, an investigation of differential effects is still pending, although it has been shown that the analysis of effects in dependence of different participant groups, offers a deeper insight into the evaluation of an intervention (Lapka, et al., 2011). In conclusion, this is why the present study now aims to investigate whether kindergarten teachers with specific SRL promotion strategy profiles displayed differential training effects. Consequently, the first aim of the present study was to investigate different profiles concerning SRL promotion strategies within the group of kindergarten teachers (Research question 1). Second, the training effects of a previously developed intervention for kindergarten teachers on the subject of promoting SRL in children of kindergarten age (Venitz & Perels, 2018) in relation to the different SRL promotion strategy outbound profiles were investigated (Research question 2).

Methods

Sample

Data from the present study were collected as part of a study supported by the German Research Foundation in the period from September 2014 to August 2015.

Sample for Research Question 1

In all, 134 German kindergarten teachers (96.6% female) took part in the test consisting of a questionnaire to assess SRL and strategies to promote SRL. This data formed the basis for the conduction of latent profile analyses on SRL promotion strategies. Of the kindergarten teachers, 11.5% were under 25 years, 17.5% were 25-29 years old, 13.5% were 30-39 years, 18.8% were 40-49 years, 33.3% were 50-59 years and 5.2% were over 60 years old. They had been employed in their roles for 17.5 years on average (SD = 13.76). Because we used this sample to conduct latent profile analysis, it was named the cluster sample.

Sample for Research Question 2 (Differential Training Effects)

For the analysis of differential training effects, n = 76 kindergarten teachers (100% female) were recruited. They participated in a SRL promotion training for children at the age of five to six years (see below) and had completed both a pretest and posttest. Of the kindergarten teachers, 13.5% were under 25 years, 21.2% were aged 25-29 years, 11.5% were 30-39 years, 19.2% were 40-49 years, 28.8% were 50-59 years and 5.8% were over 60 years old. They have been teaching for an average of 16.01 years (SD = 12.84 years). This sample was used to analyze individual effects of the SRL promotion strategy profiles with regard to the SRL intervention and thus termed the training sample.

Intervention to Promote SRL and SRL Promotion Strategies of Kindergarten Teachers

As a special feature of the training for kindergarten teachers, which was analyzed concerning differential effects in the present study, we used a two-level-approach that has been shown to be effective in previous indirect trainings in a school context (e.g., Bruder, Perels, & Schmitz, 2004). In order to transfer teachers' knowledge to children in kindergarten parallel to the intervention, the training pursued two essential aims: First, kindergarten teachers should be sensitized to the process of SRL in order to optimize their own SRL and therefore, to act as a positive role model (Bandura, 1977) for the children. Second, they should learn which methods they can use to support the development of SRL in kindergarten-age children (in reference to Martinez-Pons' PIASR-model, 1996). The data of the intervention study were collected in the period between September 2014 and August 2015 in several German kindergartens in a circuit of the responsible university. For the adult sample, 37 kindergarten teachers in the training groups and 10 kindergarten teachers in the control group participated in the study. Participation was voluntary, and data were collected anonymously. A unique assignment of the children to the parents and the kindergarten teachers was made possible by the procurement of individual codes. For the analyses on the child level, 53 children between five and six years were included. The training was comprised of three weekly sessions lasting about 90 minutes each and was conducted by two skilled trainers (see Venitz & Perels, 2018 for extended training description). To ensure standardized implementation, a schedule for each session was developed. All the sessions were structured in a similar way. At the beginning of each training session, the participants were greeted and made familiar with the contents of the day's training. After a theoretical lecture, the participants were offered the opportunity to practice parts of the learned content based on different exercises. After the exercises, they were encouraged to exchange experiences and examples of appropriate situations in their everyday life. At the end of each session, a transfer assignment was given to gain (further) experience either on the reflection of their own SRL or the teaching of self-regulatory strategies in their kindergarten classes until the next session. These experiences and related questions were renewed at the next training session. During every session, they also received a folder with materials for further exercises and an overview of the essential points of the training. The theoretical contents of the interventions propose a cyclical process, which can be divided into forethought, performance, and self-reflection phase (Zimmerman, 2000). In each of the three sessions, one phase and its central components and strategies were elaborated upon and heightened by exercises. Specific contents of the single sessions are displayed in Table 1.

Table 1. *Contents of the first, the second and the third training session*

First Training Session	Overview of the training units by means of a short theoretical input (the model of self-regulation by Zimmerman (2000) and PI-ASR-model by Martinez-Pons (1996) Forethought Phase Relevance of adequate goal formulation (theoretical input, interactive group exercise
Second Training Session	Performance Phase Strategies to support task processing, e.g. support in handling distractions (theoretical input, self-reflection exercise) Importance of children's self-talk while task managing and the method of metacognitive dialog (Pramling, 1988)
Third Training Session	Self-reflection Phase Relevance of attributing styles for the development of children's attitudes towards learning (theoretical input, self-reflection exercise) Importance of supporting beneficial reference standard (theoretical input, group exercise) Mistakes as an opportunity for the further development of learning processes (theoretical input)

Measures

To assess kindergarten teachers' self-reported knowledge about SRL promotion strategies and their perception of their own SRL behavior, a questionnaire was used, consisting of 146 items. The 4-point Likert-type scale ranged from 1 ("I don't agree at all") to 4 ("I agree completely"). In terms of the knowledge about SRL promotion strategies, the questionnaire comprises four subscales (modeling, facilitation, encouragement and rewarding) based on the PI-ASR-model (Martinez-Pons, 1996). They all showed acceptable internal consistency values for the two measurement points (see Table 1). To assess the kindergarten teachers' perceptions of their own SRL, three subscales (forethought phase, performance phase and self-reflection phase) in reference to Zimmerman's model of self-regulated learning (2000) were used, which showed satisfying Cronbach's alpha values (see Table 1). The scores Self-regulated learning behavior overall and SRL promotion strategies overall were used for the investigation of differential training effects and revealed good internal consistencies for both measurement points (see Table 2).

Table 2. *Scales, item examples, and reliabilities of the questionnaire*

		Cronbach's alpha	
Scale	Subscale	T1	T2
SRL behavior	Forethought phase: e.g., "Before I start a task, I am setting concrete targets." (36)	.90	.91
	Performance phase: e.g., "While I am working, I am thinking of my set aims, to check if I made progress." (19)	.73	.76
	Self-reflection phase: e.g., "Errors show me, what I can do differently." (17)	.79	.75
SRL promotion strategies	Modeling: e.g., "If I am excited about something, it automatically promotes the motivation of the children." (10)	.73	.69
	Facilitation: e.g., "If the children have difficulty solving a task, I try to encourage them to find their own solutions." (15)	.77	.81
	Encouragement: e.g., "If the children are afraid of a task, I encourage them." (10)	.77	.82
	Rewarding: e.g., "I praise the children for tracing failures to changeable things." (5)	.72	.52
Self-regulated learning behavior overall		.92	.93
SRL promotion strategies overall		.86	.74

Data Analysis

To answer Research Question 1, we wanted to analyze individual differences in the self-reported knowledge about SRL promotion strategies of kindergarten teachers. With the help of latent profile analyses (see Vermunt & Magidson, 2002) of the cluster sample of 134 kindergarten teachers using the SRL promotion strategy subscales (see Martinez-Pons, 1996) as indicators, we grouped them into homogenous classes. We choose latent profile analyses because they can be used with continuous variables and they contribute to the identification of latent classes on the basis of the relationships of the indicator variables. Thus, participants with similar characteristics in terms of the indicator variable are grouped together and are defined by the other groups from which they differ in regard to the variable of interest. As the research suggests that teachers differ in terms of the level of strategies they use to promote SRL in children, we could expect different SRL promotion strategy profiles for kindergarten teachers but did not know how many profiles existed. Therefore, we conducted an exploratory analysis by investigating models from 1 to 7 classes in MPlus7 (Muthén & Muthén, 2012), which uses the robust maximum-likelihood estimation approach (MLR). The number of initial stage random starts was set to 500 with a maximum of 50 iterations of the stages of the optimization. To handle missing data, MPlus uses the Full Information Maximum Likelihood algorithm. In order to determine the number of classes that best conformed to the data, several model fit criteria were considered. Following the recommendations by Marsh, Lüdtke, Trautwein and Morin (2009), Bayesian Information Criterion (BIC), entropy and the Lo-Mendel-Rubin Likelihood Ratio Test (LMRT) were used for model selection. A low BIC can be interpreted as an indication for a good model fit, whereas high entropy values suggest a better model fit. A significant p-value for the LMRT indicates that the estimated model with k-classes fits the data better than the model with k – 1 classes. In addition to goodness of fit indices, theory or previous research should be considered to help decide upon the best model (see Marsh, Lüdtke, Trautwein, & Morin, 2009).

To answer Research Question 2, the kindergarten teachers who took part in the SRL promotion strategy training were selected as the training sample. Based on this data, the aim was to identify differential training effects in dependence of SRL promotion strategy profiles. In accordance with the central aims of the intervention, repeated measurement analyses were conducted using overall SRL promotion strategy (mean of all item scores) and overall SRL behavior as dependent variables and the profile classification as the independent variable. We did not have to replace missing values, since for the cluster sample as well as for the training sample, they were completely random (Little's MCAR test revealed no significant results). In accordance with previous research (González-Pienda et al., 2014), we predicted that kindergarten teachers would differ in how their mean scores changed from pre- to posttest, namely that teachers with low SRL promotion strategy profiles would have a greater benefit from the SRL intervention than teachers with moderate or high SRL promotion strategy profiles. To test this hypothesis, additional theory-driven single group comparisons were conducted using contrast analyses.

Results

Research Question 1: Latent Profile Analyses

With the aim of grouping homogenous classes, we conducted latent profile analyses (LPA) with the SRL promotion strategy subscales as indicators using the cluster sample (n= 134).

The fit indices of the analyses for the 2-7 cluster group solutions are displayed in Table 3.

The latent profile analyses for kindergarten teachers' perceptions of their SRL promotion strategy knowledge resulted in a three-cluster solution, which is consistent with the results of the study by González-Pienda et al. (2014). The three-cluster shows the lowest BIC, good entropy and a significant p-value for the LMRT. In addition, the distribution of the classes is balanced (profile 1= 40; profile 2= 51; profile 3= 43). Although a two-class solution showed higher entropy and a significant p-value for the LMRT, it has a much higher BIC and the distribution of the teachers to the classes is less balanced, making a three-class solution preferable. Following the recommendations of Marsh et al. (2009), we investigated solutions using different numbers of groups, deciding to use the one "that makes most sense in relation to theory, previous research, the nature of the groups, and interpretation of the results" (Marsh et

al., 2009, p. 194). We considered these points in addition to goodness of fit indices. The fit indices, as shown above, support a three-class solution. In addition, the same number of classes was used in the study of González-Pienda et al. (2014), again supporting a three-class solution. Means and standard deviations of the SRL promotion strategy indicators (modeling, facilitation, encouragement, rewarding) as well as of the overall variable SRL promotion strategies are displayed in Table 4.

Table 3. *Fit statistics for latent profile analyses*

Cluster	*BIC*	*E*	*LMRT*
2	365.00	.82	.00
3	354.62	.80	.01
4	367.26	.79	.79
5	380.93	.80	.43
6	395.46	.83	.25
7	408.32	.81	.36

Note. *BIC*= Bayesian information criteria, *E*= entropy, *LRMT*= p-value for Lo-Mendell-Rubin test. The selected cluster solution is typed in boldface.

Table 4. *Means and standard deviations of the tested variables in dependence of the SRL promotion strategy profile*

Groups	*n*	*M (SD) MDL*	*M (SD) FCL*	*M (SD) ENC*	*M (SD) REW*	*M (SD) SRL_PS*
Low SRL promotion strategy Profile	40	3.06 (.28)	3.04 (.18)	3.18 (.14)	3.00 (.37)	3.07 (.12)
Moderate SRL promotion strategy profile	51	3.21 (.39)	3.14 (.23)	3.62 (.14)	3.14 (.44)	3.31 (.14)
High SRL promotion strategy profile	43	3.61 (.31)	3.61 (.17)	3.85 (.12)	3.63 (.37)	3.70 (.10)

The profile plot (Figure 1) illustrates specific characteristics of the SRL promotion strategy profiles. The differences in the means of the subscales were significantly different for all groups (p< .00).

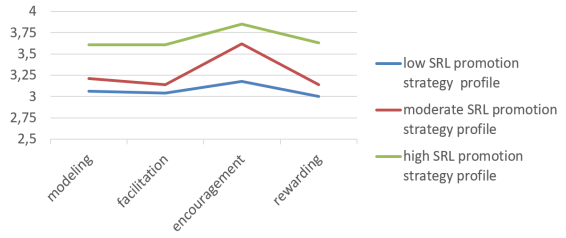

Figure 1. Profiles of SRL promotion strategies for Group 1 (low SRL profile), Group 2 (moderate SRL profile) and Group 3 (high SRL profile)

The means of the SRL promotion strategy subscales are all located in the upper third of the graph (M= 3.03-3.85, scale from 1 "I don't agree at all" to 4 "I agree completely"), meaning we can conclude that all kindergarten teachers already had some knowledge of SRL prior to the intervention. In addition, all profiles show a similar distribution in terms of the subscales, indicating they all had the highest scores for the subscale encouragement and lower values for the subscales modeling, facilitation and rewarding. It can be concluded that the classes do not differ obviously in terms of the distribution of the values on the subscales but rather in regard to their height. Class 1 had the lowest scores for all subscales, so it was named "low SRL promotion strategy profile" (blue line). Class 2 had moderate scores and therefore was termed the "moderate SRL promotion strategy profile" (orange line), and Class 3 showed the highest scores for all subscales of the SRL promotion strategies, so we named it the "high SRL promotion strategy profile" (grey line).

Research Question 2: Differential Training Effects

To ensure that the cluster and the training group shared the same baseline, the distribution of the detected SRL promotion strategy profiles in the cluster and the training group was checked for uniformity. Next, we again conducted a latent profile analysis with Mplus (Muthén & Muthén, 2012) within the training group (n= 76 kindergarten teachers). Table 5 displays the fit indices of the analyses for the 2-7 training group solution.

Table 5. *Fit statistics for latent profile analyses*

Cluster	*BIC*	*E*	*LMRT*
2	143.45	.83	.00
3	**130.42**	**.85**	**.04**
4	139.49	.89	.10
5	143.20	.91	.05
6	154.79	.90	.48
7	164.24	.92	.10

Note. *BIC*= Bayesian information criteria, *E*= entropy, *LRMT*= p-value for Lo-Mendell-Rubin test. The selected cluster solution is typed in boldface.

In this case, the LPA for the training group also resulted in a three-cluster solution showing the lowest BIC, good entropy and a significant p-value for the LMRT. Participants were distributed into the classes as follows: Profile 1= 31; Profile 2= 27; Profile 3= 18.

To investigate how the different profile groups' knowledge concerning SRL promotion strategies changed through the intervention, a repeated-measurement ANOVA with overall SRL promotion strategies (mean of all item scores) as dependent variable (pretest/posttest) and profile groups as independent variable was performed. We wanted to detect interaction effects of profile groups with time. Due to the small sample size, we conducted Kolmogorov-Smirnov-tests for overall SRL strategy profiles (T1, T2) of all three groups. The results showed no significant deviation from normal distributions that would prohibit conducting an ANOVA. With the help of a 2 x 3 (time x SRL promotion strategy profile) repeated-measurement ANOVA, we found a significant interaction (F(2,73)= 3.16, p< .05, η_p^2= .08), indicating differential effects in terms of the SRL promotion strategies with regard to SRL promotion strategy profiles. The changes in terms of the SRL promotion strategies between the two measured time points are displayed in Fig 2.

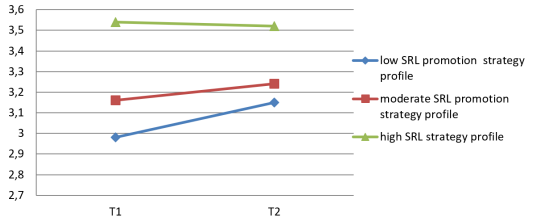

Figure 2. Differential training effects in terms of teacher self-regulated learning behavior in dependence on SRL promotion strategy profile group. Scale from 1 [not true at all] to 4 [totally true]

Differential Effects in terms of SRL behavior

We also ran a repeated-measurement ANOVA with overall SRL behavior (mean of all item scores) as the dependent variable (pretest/posttest) and profile groups as the independent variable to investigate whether there were significant interaction effects of profile groups with time.

Additionally, we again conducted Kolmogorov-Smirnov tests for overall SRL behavior profiles (T1, T2) of all three groups to account for the small sample size. The results showed no significant deviation from normal distributions that would contraindicate the use of ANOVA. The results of the 2 x 3 (time x SRL behavior) repeated measurement ANOVA showed a significant interaction, $F(2,73)= 3.20$, $p< .05$, $\eta_p^2= .08$, indicating differential effects in terms of teacher SRL behavior with regard to SRL promotion strategy profiles. The changes in terms of the teacher SRL behavior between T1 and T2 are displayed in Fig 3.

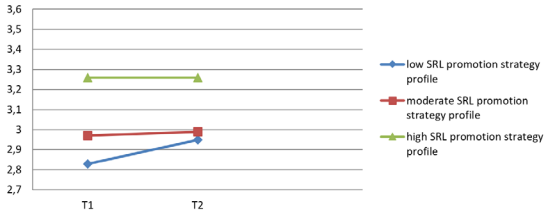

Figure 3. Differential training effects in terms of teacher self-regulated learning behavior in dependence on SRL promotion strategy profile group. Scale from 1 [not true at all] to 4 [totally true]

Low versus high SRL promotion strategy profile

To test the hypothesis that kindergarten teachers with a low SRL promotion strategy profile benefit more from training than teachers with a high SRL promotion strategy profile (high SRL promotion strategy profile > low SRL promotion strategy profile), we ran theory-driven single-group comparisons by the means of contrast analyses. The values of the second measurement of the dependent variable were considered for the analyses. As a measure of the effect size, Cohen's *d* was used. Following Cohen (1988), effect sizes of $d\geq .25$ are considered small, $d\geq .50$ medium, and $d\geq .80$ a large effect.

The results of the contrast analyses in terms of the SRL promotion strategies (overall value) were significant ($t(2,73) = 4.82$, $p< .001$, $d= 1.51$). In terms of the teachers' SRL behavior, contrast analyses also revealed significant results ($t(2,73)= 4.53$, $p< .001$, $d= 1.22$).

According to Cohen (1988), the determined effects can be interpreted as large effects.

Discussion

Following a person-centered approach, we had two essential aims: First, we wanted to examine whether there are different profiles among kindergarten teachers in regard to their self-reported knowledge of SRL promotion strategies. Secondly, we investigated differential training effects by testing the hypothesis that kindergarten teachers who possess only a low knowledge level of SRL promotion strategies benefit more from a SRL training than kindergarten teachers who already have greater knowledge about SRL promotion strategies before the intervention. The latent profile analyses revealed the presence of three profiles of SRL promotion strategies, characterized as low, moderate and high level. The first profile, "low SRL promotion strategy profile" (29.85%) represented the smallest group of the three. Most kindergarten teachers in this study belonged to the second profile: "moderate SRL promotion strategy profile" (38.81%). 31.34 % of the participants were assigned to the "high SRL promotion strategy profile". Overall, all groups showed rather high values on the subscale encouragement, indicating that they already had a sense of the importance of positive reinforcement for child learning and already used this strategy in their daily work in kindergarten. However, the recognition of the importance of rewarding and facilitation was rated rather low by the participants. One explanation for the poor recognition of rewarding as a strategy to improve SRL in children might be that it has a somewhat negative connotation in society because it is often stated that rewarding leads to spoiling. Nevertheless, rewarding, in form of the recognition of successful learning actions and behaviors by adults, is an essential motivational factor for children and therefore can help to improve SRL. This assumption is supported by several empirical findings (e.g., Henderlong & Lepper, 2002). In Henderlong and Lepper's 2002 review of the effects of praise on children's motivation, they showed that praise can have different effects on intrinsic motivation depending on a series of variables. In their synthesis, they conclude that, when praise is insincere, related to ability or perceived as controlling, it diminishes children's intrinsic motivation. In contrast, sincere praise contributes to positive performance attributions and therefore increased intrinsic motivation and effort. Concerning the lower scores for facilitation, it can be assumed that the kindergarten teachers did not recognize the importance of this strategy as much as with regard to encouragement. However, facilitation is probably one of the most effective strategies for promoting children's SRL as it is an integral aim of theoretical approaches like for example the model of Martinez-Pons (1996), the metacognitive dialogue of Pramling (1988) or the sustained shared thinking by Siraj-Blatchford et al. (2002). With regard to research aim 1, the results revealed that kindergarten teacher significantly differ in terms of their knowledge about SRL promotion strategies. In reference of the aptitude-treatment-interaction approach (Snow, Corno, & Jackson, 1996), it can be assumed that the detected subgroups of participants have different needs and wishes in regards to the training. Therefore, the intervention might not be equally fruitful for all participants which was tested by Research Question 2.

In terms of this second Research Question, the present study revealed that kindergarten teachers with low SRL promotion strategy profiles benefited significantly of the indirect intervention, whereas kindergarten teachers with high SRL promotion strategy profiles did not. The findings suggest a compensation effect, which was also found in the study by González-Pienda et al. (2014). The fact that only kindergarten teachers with a low SRL promotion strategy benefited from the intervention indicates that a SRL promotion strategy training may not be equally effective for all kindergarten teachers. Prior knowledge has to be considered because they can influence the effects of instructional designs (Lapka et al., 2011). Consequently, adaptive trainings that are tailored to the different needs of the detected classes are required. Considering the high SRL promotion strategy profile, the training should be revised. The results illustrate that the teachers already possess a high level of knowledge of SRL promotion strategies, so it would be useful to shift the focus from a mediation of basic knowledge to a more practical approach which focusses on minimally guided problem-solving (Kalyuga, 2007). Building on Fyfe, Rittle-Johnson and DeCaro (2012) who investigated effects of different levels of guidance during exploratory mathematical problem solving for children, it can be assumed that the participants with a high SRL level prior to the intervention benefit more from independent learning methods that they can adapt

to their unique learning needs. However, participants with less knowledge need more intensive instructional support in order to improve (Kalyuga, 2007).

Limitations and Implications for Future Research and Practice

Although the study offers differential insight into the promotion of SRL from the perspective of kindergarten teachers, several aspects should be optimized in future studies. One obvious limitation of the study is that all variables have been assessed by means of self-report even though research on the assessment of SRL has shown that what people report doing or thinking does not always correspond to their actual behavior (see Veenmann, 2005). In our study, this means that participants may indicate that already know many SRL promotion strategies (e.g., because of social desirability) although they do not use them in daily practice, thus distorting the results of our analyses. Therefore, in future studies, questionnaires based on self-report should be complemented by online measures such as think-aloud protocols or systematic observation. A suitable possibility for supplementing self-reports seems to be the observation instrument ATES (Assessing How Teachers Enhance Self-regulated Learning; Dignath-van Ewijk, Dickhäuser, & Büttner, 2013) which assesses teachers' promotion of SRL in capturing their instruction of SRL strategies.

Another limitation of the study is the small sample size, particularly of the training sample. To obtain valid conclusions for different training effect sizes, further studies with larger sample sizes would be meaningful. In addition, an investigation of the long-term effects would be interesting to make causal inferences possible.

Generally, the study contributed to a more in-depth insight into the knowledge of kindergarten teachers concerning the promotion of SRL, a theme which has been neglected for some time despite the increasing interest in the SRL of students (Dignath-van Ewijk, 2016). The evaluation of the training through a person-oriented approach showed that kindergarten teachers who belonged to the high SRL promotion strategy profile did not benefit from the intervention, leading to two essential implications for future research and practice. First, differential effects have to be further investigated by integrating additional variables. Here, the consideration of motivational aspects seems to be useful since motivation can impact the effectiveness of a training (Chiaburu & Tekleab, 2005; Jaeggi et al., 2011; Scaduto, Lindsay, & Chiaburu, 2008). Therefore, it could be assumed that the high SRL promotion strategy group benefits less because they already possess much of the knowledge shared during the intervention and therefore were less motivated to pay attention. A decrease in motivation and related attention to presented material could have hampered the absorption of new knowledge. Second, based on the findings referring to differential effects of the intervention, an adaption of future trainings is required. The results indicate that kindergarten teachers with high and with low prior knowledge concerning SRL promotion strategies do not benefit equally from the training. Taking these differences into account, trainers will be able to adapt their teaching methods and to select materials that are tailored to the requirements of the subgroups. Whereas kindergarten teachers with a poorer knowledge of SRL promotion strategies seem to need more instructional support, for participants with higher knowledge the focus should be placed on more independent learning methods and a more practical and problem-solving oriented approach.

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