Combining instructional programs: How does the combination affect the efficiency of the programs?

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ABSTRACT In the construction of cognitive instructional programs motivational influences are underemphasised. The objective of the present work was to show that a cognitive intervention profits from a restructuring based on motivational principles. In the training studies to be reported, it was investigated how such a motivational optimisation of a cognitive training program influences the effectiveness of the program in terms of both cognitive and motivational measures. The Cognitive Training for Children program (Klauer, 1991) was combined with motive modification exercises (Rheinberg & Krug, in press). These exercises lead children toward realistic goal setting, an assertive style of attribution and a positive evaluation of themselves. Within the resulting "Integrated Training" the exercises are applied to the cognitive material. An explorative study showed the Integrated Training's potential of cognitive improvement. In a second study a total of 102 children (aged 11-13) were trained under four different conditions: Integrated Training, original cognitive training of Klauer (1991), pure motive modification (Rheinberg & Krug, in press), and a control group. The Integrated Training was clearly superior to the other conditions with respect to IQ-scores. Furthermore, only the Integrated Training showed the predicted effects on the achievement motive of the children. The results indicated that cognitive training can be optimised by consideration of motivational principles.

Keywords: Cognitive training, inductive reasoning, motive modification.

Introduction

There are many different procedures for training cognitive skills in different areas (for an overview see Hamers & Overtoom, 1997). These procedures can be divided into two major groups (Hamers & Overtoom, 1997). First there are programs that follow a "specific aims approach". Such programs are characterised by the assumption that cognitive intervention should be situated within some specific school subject. An example for this approach is the CASE-program by Adey, Shayer, and Yates (1989). Strong effects of this program on the cognitive development of most pupils have already been shown (e.g., Adey & Shayer, 1993). Second, there are programs that follow a "general aims approach". In contrast to the first group these programs do not restrict the teaching of cognitive skills to specific school subjects. One of the most

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ambitious of these programs is the Cognitive Training for Children developed by Klauer (1989, 1991). This program was originally introduced in the German language, but by now there are also versions in English (Klauer & Phye, 1994) and Dutch (Klauer, Resing, & Slenders, 1995). There are many studies showing the effectiveness of this program (e.g., Klauer, 1996, 1998), but there is discussion as to the mechanisms that mediate the effectiveness of the program (see Hager & Hasselhorn, 1998).

Understandably, researchers have focused on what are the best programs for training, but motivational influences have been underemphasised. This is particularly true when the target group for training are children; effects of training seem to be influenced by more than just the material used. A large part of the variance in the effects could be due to motivational factors. Leo and Galloway (1996) argue that motivational orientation (Nicholls, 1984) can explain why some children do not profit from cognitive training. They assume that only task-oriented students benefit from cognitive interventions like the CASE-program. Currently this assumption is being tested by McLellan (1998). If the assumption holds, cognitive interventions like the CASE-program should be restructured in such a way that they elicit task orientation in the students.

Hasselhorn and Maehler (1993) claim that the learning motivation of the participating children is a crucial condition for the success of a cognitive training program. Thus they recommend that relevant motive structures are modified before applying the program. The existence of an interaction between motivational and cognitive variables in cognitive training was shown by Moeller and Koeller (1997). In their study the training groups were formed based on the children's pretest scores in the Culture Fair Intelligence Test (CFT, Cattell, 1960). They found that the cognitive training for children (Klauer, 1991) leads in the case of homogeneous groups (i.e., CFT-scores are similar) both to an increase of hope for success and of fear of failure scores whereas in heterogeneous groups (i.e., CFT-scores discriminate between the children) these scores remain stable. Furthermore only the heterogeneous groups profited substantially from the cognitive training.

If such interactions do exist, then they can be used in order to develop motivationally optimal forms of presentation and design for cognitive training programs. The optimisation could be based on the introduction of elements from motive modification research into the cognitive training. These elements should have two positive effects: First, they can transform the underlying motive structure of the students towards success-orientation. Second, the embedding of cognitive tasks in a motivational setting, in which children can experience the increase of their abilities, raises the attractiveness of the tasks. Such an optimised procedure should result in even higher effects than the original cognitive training programs. Positive effects of motivational optimisation have already been found in the area of training skills in orthography (Rheinberg & Schliep, 1985).

A combination of programs seems reasonable also from the perspective of motive modification. Rheinberg and Fries (1998) pointed out that the cognitive competencies of learners influence their expectations of success and consequently their efforts shown in learning. Hence, if motive modification does not coincide with actual improvement in cognitive competencies, the motivational effects might only be of transient nature, because the additional efforts of the learner do not lead to an actual success in learning. Therefore motive modification should be especially successful if such cognitive skills are fostered in parallel that lead to a greater success in learning.

In the following an attempt to develop and to test a training program that integrates achievement motive modification with inductive reasoning training, will be described (for a more detailed description of the studies see Fries, Lund, & Rheinberg, in press; see also Fries, 1999).

Description of the program

The original programs

The newly developed instructional program combined material taken from a cognitive training program and from a motive modification program. The aim of this combination was to lead to a twofold optimisation: First, the addition of elements from motive modification to cognitive training should result in better effects in the cognitive domain. Second, the relating of motive modification to cognitive skills relevant to learning should result in an even better development of the addressed motive structure, than what would occur through the application of a pure motive modification program.

For *cognitive development* the new program was based on the Cognitive Training for Children program by Klauer (1991). This program fosters the inductive reasoning skills of children. Klauer's program is built on two major theoretical assumptions. The first assumption is Klauer's semi-formalised definition of inductive reasoning. According to Klauer all inductive reasoning refers either to attributes or to relationships. For these attributes or relationships one can establish similarity or difference. This definition allows one to distinguish six different types of inductive reasoning tasks. As regards attributes there are three types of process that can be applied: generalisation (establishing similarity), discrimination (establishing difference) and cross-classification (establishing similarity and difference). The remaining three types of processes all involve relationships: recognising relationships (establishing similarity), differentiating relationships (establishing difference) and system construction (establishing similarity and difference). For example, for a given set of even numbers a child has to realise that an odd number does not belong to the set (i.e., discrimination). Another task might be to order a set of numbers (recognising relationships). Examples of tasks used in the Cognitive Training for Children program can be found in Klauer (1996). In Table 1 an overview of the system of the different types is given.

The second theoretical assumption involves Klauer's prescriptive theory of inductive reasoning. This theory does not explain how people solve inductive reasoning tasks but describes how such tasks can be solved in an efficient and reliable way. The proposed procedure is mainly characterised by systematic comparisons.

The version of the program developed for 10-13 years old children consists of 120 tasks. These tasks are used for teaching children the systematisation of the inductive reasoning tasks and the systematic procedure for solving the tasks. Each of the program's ten lessons consists of twelve tasks. The effectiveness of the training was shown in several evaluation studies (e.g., Klauer, 1996, 1998), although some variation in effect size can be found.

For the *domain of motivation* the new program was related to programs of motive modification, as they are described in Rheinberg and Krug (in press). These programs are partly based on Heckhausen's model of the achievement motive as a self-evaluation system (Heckhausen, 1991). This model assumes that the three process-variables of goal setting, style of attribution and self-evaluation reciprocally

Table 1
Systematisation of tasks of inductive reasoning

	Similarity	Difference	Similarity and Difference
Attributes	*Generalisation*	*Discrimination*	*Cross classification*
Relationships	*Recognising relationships*	*Differentiating relationships*	*System construction*

influence each other and lead to stable individual differences between success- and failure-motivated people. The interventions were also related to Rheinberg's (1980) distinction between individual- and social-reference norm orientations. Rheinberg (1980) was able to show that a feedback strategy of comparing a pupil's actual results with former achievements of the same pupil (i.e., individual reference norm) leads to more success-motivation and less failure-motivation than a feedback strategy comparing the pupil's actual results with the results of other pupils in the class (i.e., social reference norm).

The goal of the exercises used in motive modification is to lead children to realistic goal setting, assertive style of attribution (failure is attributed to transient causes and success to internal causes) and positive evaluation of themselves (more happiness about their own success than anger about their own failure). In the first lessons of such programs non-academic material is used in order to get the children interested in the program. In succeeding lessons the material becomes more school-relevant, since the transfer from the training to the classroom situation has to be ensured. Evaluation studies showed positive effects on the achievement motive of the children (for an overview see Heckhausen & Krug, 1982). The strongest effects were obtained in those cases, in which the teachers of the children eagerly participated in the training (Rheinberg & Krug, in press).

The Integrated Training program

The newly developed program combined material from the Cognitive Training for Children program (Klauer, 1991) with motive modification exercises (Rheinberg & Krug, in press). Beside this quasi-additive combination of material there were also integrated modules, in which the principles of motive modification programs were directly applied to tasks of inductive reasoning. The new program was called ***Integrated Training.*** Figure 1 shows the structure of the Integrated Training.

The Integrated Training consisted of 14 lessons each of them containing two modules. Each lesson could be taught within a session of 45 minutes. The modules of a lesson came either from the original programs or were integrated modules. The 28 modules of the Integrated Training were divided into three different groups: eight motive modification modules, ten modules for cognitive training and ten integrated modules.

The *cognitive training modules* consisted of 60 of Klauer's 120 tasks. The sixty tasks were taken from Klauer's original lessons; they were the ones related to the explicit goal of the lesson. The remaining sixty tasks were used in the integrated modules. Each of the ten cognitive training modules consisted of six tasks. The goals of the single modules were analogous to the goals of the original program. Like Klauer's program, the new program had a bipartite structure: In modules two to four the classification of tasks was in the centre of the program; in modules five to nine the focus was on the teaching of a strategy for solving inductive reasoning tasks (see Figure 1).

The *motive modification modules* are based on Heckhausen's theory of the achievement motive as a self-evaluation system (see Heckhausen, 1991). Parts of the material were taken from Rheinberg and Krug (in press) other parts were newly constructed. The basic idea underlying this material was that the children either choose a task from a set of tasks ordered by difficulty or they set a performance goal for a given set of tasks. A typical example for such a task are the ring tossing games, where the children have to choose a distance before tossing the rings.

Within the motive modification modules success-oriented strategies were taught. In games such as the ring tossing game children learn that they perform best when they choose a distance fitting their ability. The structure of the game forces the child to set realistic goals. Building on this experience children learn to adapt their goal setting to their abilities. Later the concepts of "success" and "failure" are introduced. The children learn to evaluate themselves asymmetrically after "success" and "failure". After talking with the children about the

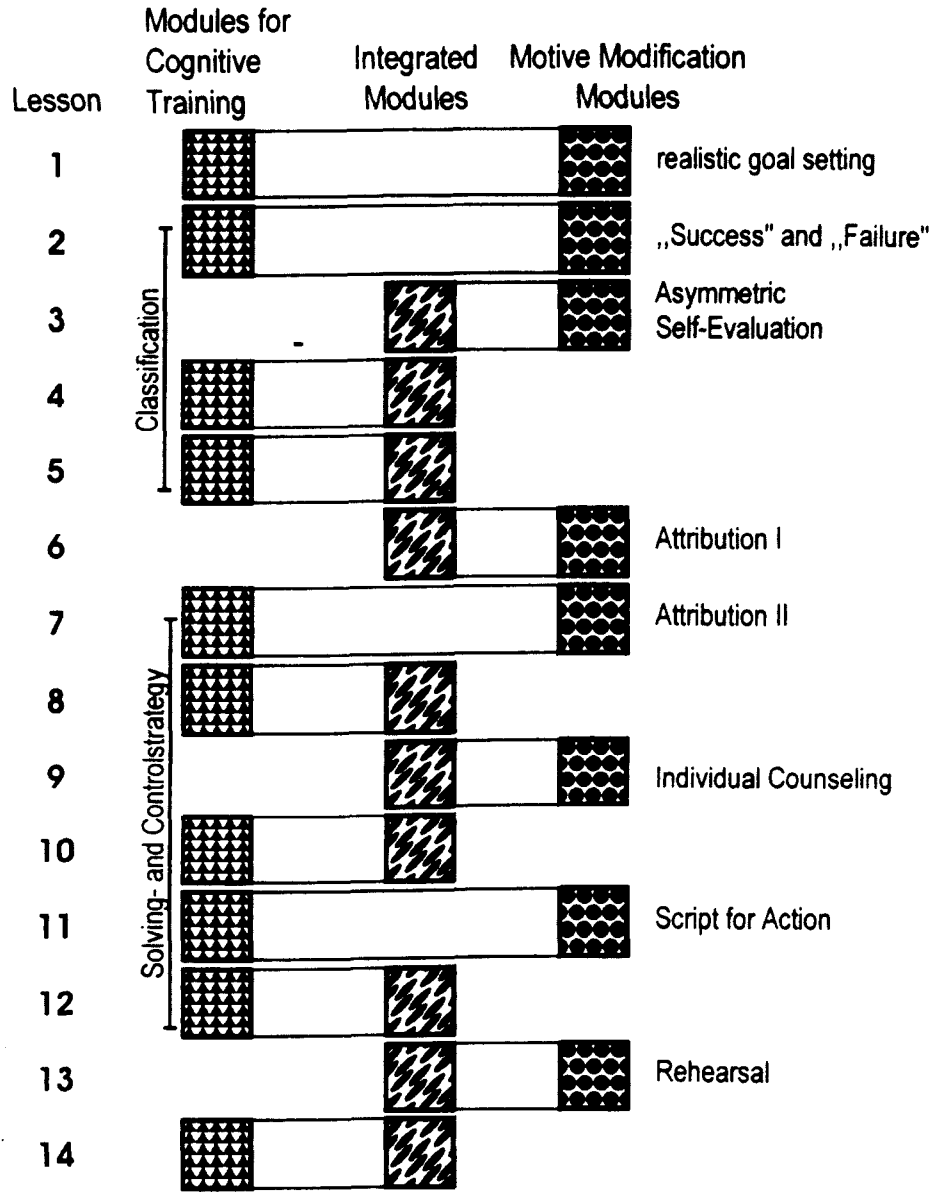

Figure 1
Lessons and structure of the Integrated Training

multitude of reasons for success and failure, the trainer directs the attributional style of the children towards internal causation in case of success and unstable causation in case of failure. Following the techniques described by Rosenthal and Steffek (1991), the trainer models the desired behaviour.

With regard to the strategies of goal-setting the Integrated Training was changed during the running of the reported studies. One aim of the program was to lead children to a realistic but ambitious setting of goals. Thus it is not correct to set goals in such a way that they are reached most of the time. The new goals should rather involve an increase in the level of aspiration. After having observed in an initial group of pupils a defensive style of goal setting, additional *courage points* were introduced. Children could get these additional courage points, when they set their new goal above the level of the last result and when they actually reached this goal. This procedure was meant to encourage a realistic but offensive setting of goals, which is necessary if children are to grasp the relation between effort and success.

Finally, there are the *integrated modules.* The integrated modules were designed to simultaneously improve inductive reasoning and the achievement motive. The integrated modules are characterised by the application of the success-oriented strategies to the inductive reasoning tasks. In Figure 2 the structure of an integrated module is shown.

Before children worked on the inductive reasoning tasks, they were asked to recall their last result in an integrated module. After a short inspection of the tasks, they had to set a goal indicating how many tasks they intended to master. After working on the tasks for ten minutes, the solutions of the children were discussed and judged as correct or incorrect. In the concluding motivational phase the children classified their result as success or failure, looked for causes of their outcome and evaluated themselves on a scale of satisfaction. Thus within the integrated modules, the motivationally important exercises of realistic goal setting, assertive attribution and positive self-evaluation were applied to inductive reasoning tasks, on which the children worked on their own.

An exploratory study on the effectiveness of the Integrated Training

The aim of the study

Following the theoretical assumptions stated above one should expect that the combination of cognitive training with motive modification results in an optimisation of the original programs. But there is also reason to be more cautious, since in the new program the principles and strategies of the cognitive intervention program might be more difficult to detect than in the original program. The training is no longer solely focused on the six different types of tasks and the systematic procedure for solving them. Children also have to learn the success-oriented strategies. This widening of content might weaken the cognitive effect. Therefore, the first aim was to establish with a small sample of pupils, that also within the Integrated Training a substantial cognitive improvement occurs.

Method

The exploratory study was conducted with children of sixth grade from a German primary school. A total of 16 children (11 boys and 5 girls) participated in the study. All children volunteered to participate in the training. Nine of the children were trained in small groups with the Integrated Training. The other seven children served as a control group. These seven children did not receive any training. During the training sessions of the training group, the control group students participated in the normal courses of the class.

The nonverbal subtests of the Culture Fair Intelligence Test, Scale 2 (CFT 2, Cattell, 1960; German version: Weiß, 1987) were used to determine children's abilities in inductive reasoning. The nonverbal subtests of the CFT 2 correspond to different types of inductive reasoning problems (Klauer, 1992). Hence they

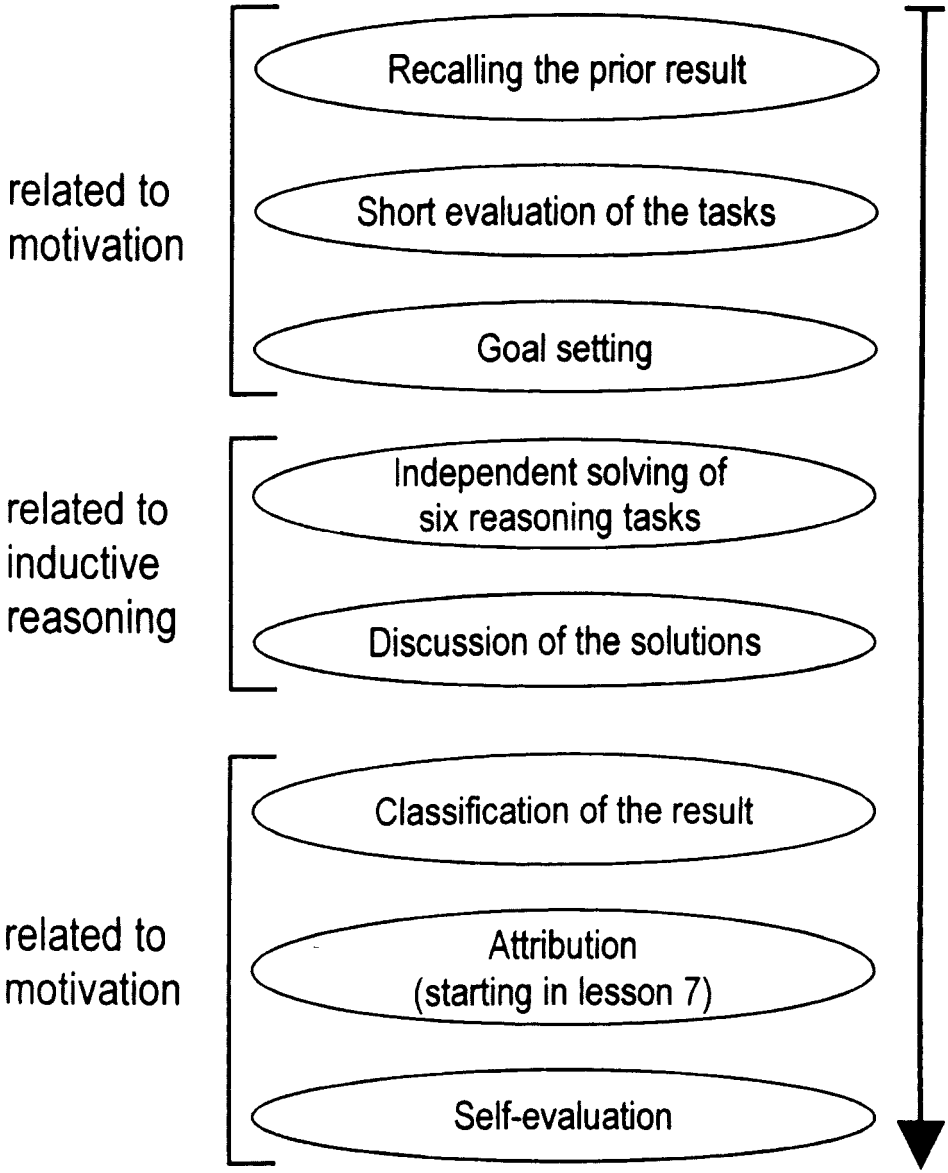

Figure 2
Structure of an integrated module

represent a good measure of an individual's ability in inductive reasoning. The tests were delivered one week before the beginning of the training and one week after the end of the training.

Results

The raw scores of the CFT 2 were transformed into intelligence quotients using the norms for sixth-graders. The pre- and posttest scores of the children are shown in Figure 3. The posttest scores were determined using a parallel form of the CFT. After four months the control group showed a mean retest effect of M=9 IQ-points. In contrast, the training group had a mean gain of M=18 in IQ-points.

A sign test according to Wilcoxon, taking into account zero differences, showed that the gain in IQ-points was statistically significant only in the training group whereas the gain in the control group was not significant (T=0 in the training group, T=4.5 in the control group). Comparing across groups, the differences only just failed to reach significance using a U test (U=18, p=.078). The corrected effect size between the two groups was d=.42. Thus, the Integrated Training resulted in a moderate effect of cognitive improvement (Cohen, 1977).

Conclusions

The small sample size restricted the generalisation of the conclusions that can be drawn from the study. But the significant gain in the training group indicated that after a restructuring of the original program according to motivational principles an improvement of inductive reasoning still could be achieved. Hence it seemed reasonable to evaluate the Integrated Training in a broader study.

Study 2: Comparing the Integrated Training with its original components

Objectives of the study

Since the sample size of the explorative study was small, the positive results have to be interpreted with caution. Furthermore, the design did not allow the exclusion of a Hawthorne effect. Therefore, the effectiveness of the Integrated Training should be ensured using a larger design. Besides enlarging the sample size, a second aim was to test the Integrated Training in comparison to its original components. For this reason a group of pupils was trained only with the original training of Klauer (1991); a second group of pupils received only a motive modification training as described in Rheinberg and Krug (in press). As in the explorative study, there was also a control group that received no training at all. This design allows to determine the effectiveness of the Integrated Training. It also allows to compare the new program with the original programs, on which it is built. Hawthorne effects can be excluded, since the original training of Klauer represents a placebo training with respect to changes in the achievement motive and the pure motive modification is a placebo training with respect to changes in inductive reasoning.

Method

Participants and procedure. All children of the sixth grade of a German comprehensive school took part in this study. A total of 102 children were assigned to four different conditions: 43 were trained with the Integrated Program; 20 received the original training of Klauer (1991); 22 received a pure motive modification program (Rheinberg & Krug, 1993); and 17 children served as a control group. For organisational reasons complete classes had to be assigned to the different conditions of the study. In Table 2 the different groups are described.

The realisation of this study took a total of seven months. Due to resource limitations the data had to be collected in two phases. In the first phase of the study one class received the Integrated Training and another the original cognitive training of Klauer. During this phase data was also collected from the control group. In

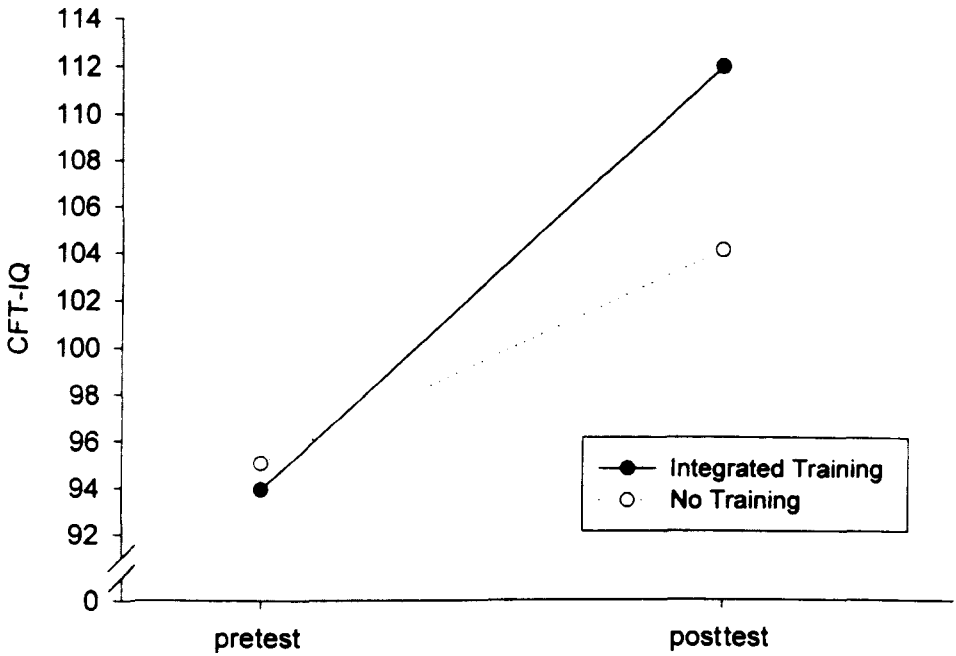

Figure 3
IQ-scores of the different groups in the exploratory study

the second phase an additional class was trained with the Integrated Training and one class received the motive modification program. For the implementation of the training the classes were divided into small groups of three to four children. Each group received two lessons per week. The groups were instructed by psychology students, who had received a special training before leading their groups.

Conditions. The *Integrated Training* was conducted in the form described in the Chapter "Description of the program" (see Figure 1). The exact procedure was described in an extensive manual.

The second condition was an implementation of the *Cognitive Training for Children* (Klauer, 1991). This training was conducted following strictly the instructions contained in the manual of Klauer. The children participated in ten lessons. Since the aim was to compare the Integrated Training with the original version of the cognitive training program, the program of Klauer was not extended to the length of the Integrated Training (i.e., 14 lessons). This has the advantage that under both conditions the same number of inductive reasoning tasks (i.e., 120) has to be worked on. Guided exploration was used as a method of training.

As a third condition the *motive modification program* was realized. The program applied was a variation of the programs described in Rheinberg and Krug (in press). On the basis of a program for fifth graders, the program was adapted in difficulty for sixth graders. Like the Integrated Training this program consisted of fourteen lessons. During the first eight lessons the sequence was analogous to the motive modification modules of the Integrated Training. In the last six lessons the success-oriented strategies were applied to material relevant to

Table 2
Description of the different groups in Study 2

Condition	N	Girls	Boys	Age
Integrated Training	43	23	20	11.89
Cognitive training	20	9	11	11.89
Motive modification	22	12	10	12.02
Control group	17	9	8	12.00

school. But for organisational reasons no material taken from the ongoing courses could be used.

With the control group there was only contact during the pre- and posttest. The children participated in their normal courses. These children knew that they would be trained at the end of the study.

Dependent variables. All children were tested in their classes three weeks (groups of phase 1) or one week respectively before the beginning of the training (groups of phase 2) and one week after the end of the training.

As a test of inductive reasoning, the non-verbal subtests of the CFT 2 were used. The CFT 2 was applied as a speed-test. As a measure of the change in the achievement motive the Achievement Motive Grid (AM-Grid) of Schmalt (1976) was used. This test is a semi-projective grid technique for measuring the nature of an individual's achievement motive. Instead of using the full set of eighteen pictures the test was restricted to eight pictures. The test gives three scores, one for hope for success, and two for fear of failure. The most important measure for this study was the first fear of failure score (FF1), high scores on which indicate a weak self-concept concerning abilities. Whenever AM-Grid was used for evaluating motive modification programs only the first fear of failure scale consistently showed positive results (for examples, see Heckhausen & Krug, 1982).

Results

Inductive reasoning. As in the exploratory study the raw scores of the CFT 2 were transformed to intelligence scores. Figure 4 shows the pre- and posttest values in the CFT 2.

The pretest CFT 2 scores of the control group were surprisingly low (M=91.3). The values increased significantly at the posttest [$t(16)=2.42$; $p=.014$, one-sided test], but were still below an IQ-score of 100. The most clear increase in CFT 2 scores was observed in the Integrated Training. These children reached a posttest score (M=117.0) that was clearly superior to their pretest score (M=102.6). The observed increase was statistically significant [$t(42)=6.77$, $p<.001$, one-sided test] and about a standard deviation above the mean value expected from children of this age. The corrected effect size in comparison to the control group was $d=.60$ (moderate effect according to Cohen, 1977). The original program of Klauer (1991) also led to a significant increase of the scores [$t(19)=2.04$, $p=.027$, one-sided test], but the increase was less strong than in the Integrated Training. The corrected effect size between these two conditions was $d=.62$. Finally, under the motive modification condition a significant increase of scores was also observed [$t(21)=2.38$, $p=.014$, one-sided test], but the increase was the lowest of all conditions. This result is interesting, because the motive modification is a placebo training with respect to cognitive improvement. The corrected effect size between the Integrated Training and the motive modification was $d=.64$. This indicates that the cognitive improvement resulted from the content of our cognitive intervention and not from the fact that some intervention took place. In other words the positive effects on inductive reasoning cannot

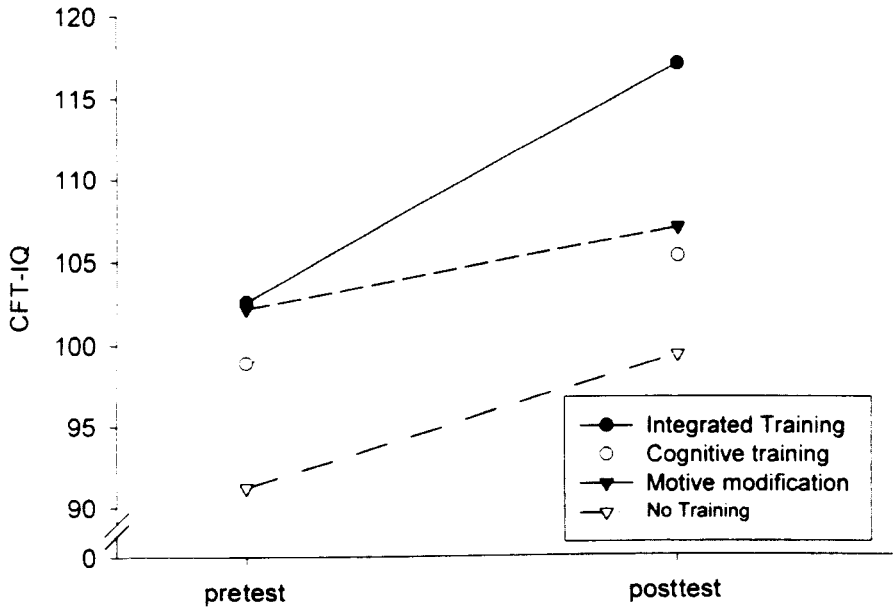

Figure 4
IQ-scores (measured by CFT 2) of the different groups in the main study

be attributed to Hawthorne of similar effects.

Because of the differences in the pretest scores of the four groups, these scores were included as a covariate in the statistical analysis. An analysis of variance with the pretest as a covariate showed a significant effect of the conditions [$F(3,97)=6.97$, $p<.01$]. The influence of the covariate was highly significant [$F(1,97)=82.62$, $p<.001$]. The differences between the different conditions were also tested for statistical significance. Before calculating the tests, the posttest scores were first adjusted by use of covariance analytic techniques. Since on these adjusted posttest scores multiple t-test were performed, we adjusted the size of the $\alpha^*=.008$. The means of the adjusted posttest scores under the different conditions are shown in Figure 5. The mean of all subjects ($M=109.6$) was added to the residual values.

The Integrated Training was clearly superior to the original training of Klauer [$t(63)=3.06$, $p=.002$, one-sided test] and to the motive modification [$t(65)=3.39$, $p=.001$, one-sided test]. The efficiency of the Integrated Training can also be shown in comparison to the control group [$t(58)=3.22$, $p=.001$, one-sided test]. In contrast to these results the efficiency of the original program of Klauer could not be demonstrated in this study. Finally there was no significant difference between the motive modification group and the control group.

Achievement motive. With respect to motive modification an increase in the hope for success and a decrease in fear of failure was expected. As regards the values on hope for success no significant effects were found. Concerning fear of failure there was a different situation. Figure 6 shows the development of the crucial FF1 score during the intervention.

Only the Integrated Training showed the predicted reduction of the FF1 values from pre- to posttest. An analysis of variance on the first

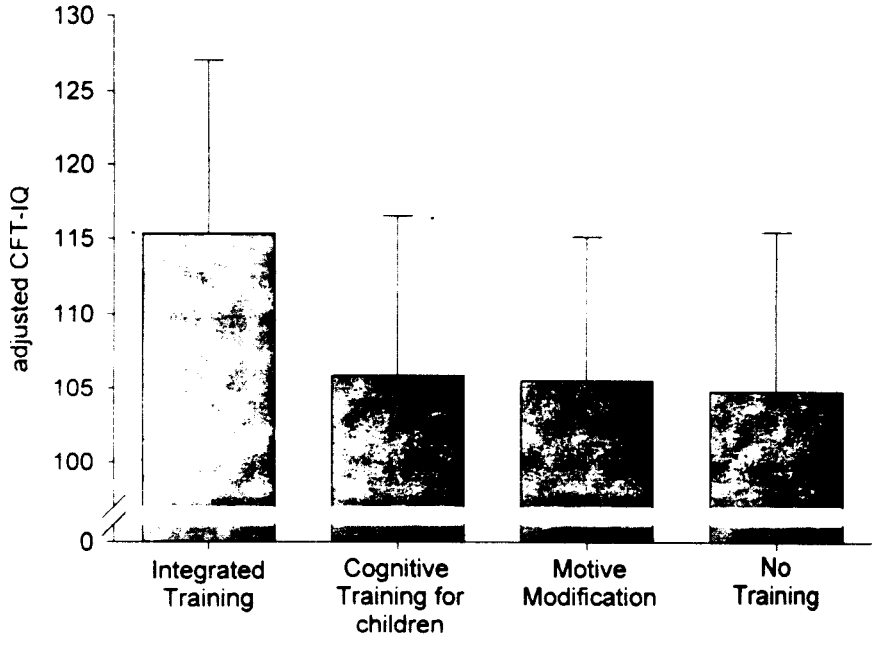

Figure 5
Adjusted posttest scores in CFT 2

fear of failure score with the pretest FF 1 score as a covariate, showed a weak effect of the conditions [$F(3,97)=2.3$, $p<.1$]. The contrast of the Integrated Training to the control group was significant [$F(1,57)=7.01$, $p<.01$]. The corrected effect size was $d=.56$, which implies that there was a moderate effect for the Integrated Training.

Discussion

In summary, the results showed that the Integrated Training leads to the intended cognitive improvement as well as an enhancement of the achievement motive. With respect to the improvement of inductive reasoning skills the Integrated Training did even better than the original cognitive training. By which mechanisms could this superiority be mediated? Obviously the additional motive modification exercises and the integrated modules exercised a positive influence on the actual motivation of the children. The self-determined setting of goals allowed children to choose difficulties that were challenging for them. They were neither bored by insufficient difficulty nor frightened by too exacting demands. After working on the tasks they evaluated themselves not with respect to some standard set by the teacher but by a standard they had chosen individually. The self-determined goals as well as the succeeding self-evaluation introduced additional incentives for the children. This result indicates that motivation should be taken into account when constructing a cognitive training program. But also from a cognitive perspective the Integrated Training was different from the original program of Klauer: The independent work in the integrated modules required from the children a self-initiated application of their newly developed strategies to the reasoning tasks. This implies that the strategies are better trained in comparison to the

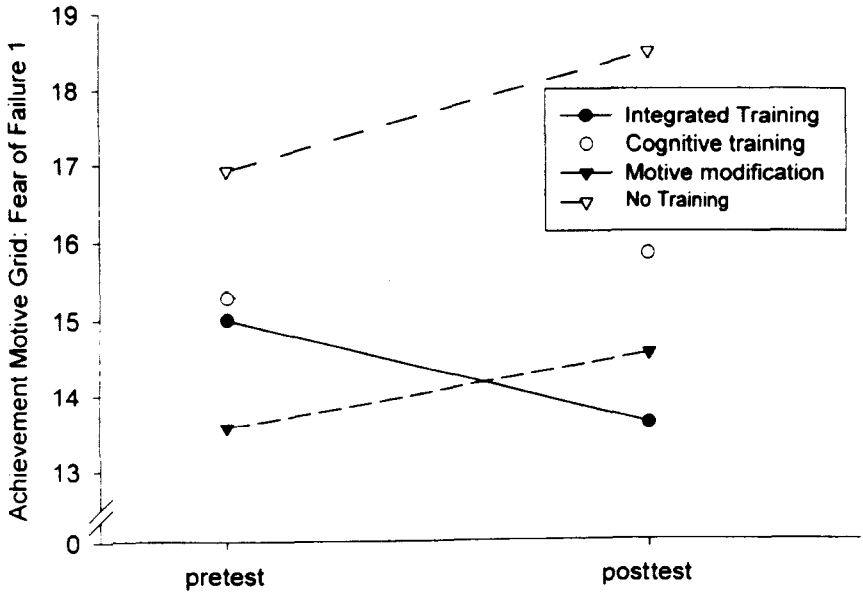

Figure 6
Pre- and posttest values in Achievement Motive Grid, Scale Fear of Failure 1

original situation where the trainer keeps instructing the children how to proceed. Whether the motive modification modules are necessary for the superiority of the Integrated Training or the use of integrated modules is sufficient by itself, is just being tested in our research group (Nemetz, in preparation).

Surprisingly the efficiency of the original Cognitive Training for Children was not confirmed in this study. This result is probably due to the exceptional development of the control group, which showed in the pretest a CFT 2 value way below the expected value for children of this age. It seems that for some unknown reason this group showed its true potential in inductive reasoning only in the posttest. Therefore the nonsignificance of the original training should be interpreted with caution. Furthermore, it is a common finding in intervention research that a usually successful training does not always produce significant results (Hager & Hasselhorn, 1998; Klauer, 1998). Eventually the motivational optimisation of cognitive training is a way not only to increase effects of cognitive training but also to secure their occurrence.

The results are also promising with respect to motive modification. Only the children participating in the Integrated Training showed the predicted effects, where as in the other conditions the fear of failure score rose instead of falling or remaining stable. For a better understanding of this result some information about the German school system is helpful. In primary school all children get a joint education. In the county of Brandenburg, where our study took place, children and their parents can choose after the sixth grade (in most other counties after the fourth grade) which type of secondary school to visit. It is known that at the end of the joint education the mean values of the fear of failure score rise (e.g., Weßling-

Luennemann, 1982). In our study only the Integrated Training was capable to counter this development. A plausible reason why the pure motive modification did not show this effect is probably that for organisational reasons no material of actual courses could be used.

In summary the results showed how much the original instructional programs can profit from their combination. The combination of programs has to be guided by motivational principles. This suggests that in the construction of cognitive training programs motivational aspects should always be considered. The principles used in the present work could also be applied to other cognitive training programs. But the applicability of the principles is not restricted to use within a training setting. They can also be implemented in school education by, for example, adapting the difficulty of the tasks to the abilities of the pupils. Such motive modification situated in instructional settings allows teachers to motivate children not only by use of attractive material but also by changing the underlying motive structure towards success-orientation. This strategy results in much more stable changes of behaviour than what could be achieved by motivating children for single tasks by addressing their intrinsic motivation.

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