Mental Practice in Children
A Systematic Review

Simone Friedrich (2054400)
Eva Schmitz (2054508)

Tutor:
Drs. Susy Braun

Hogeschool Zuyd
Gezondheid en Techniek
Fysiotherapie

DANKWOORD

Bijzondere dank gaat uit naar Drs. Susy Braun die ons gedurende het hele proces begeleid en met grote inzet ondersteund heeft in ons projectmatig werken. Zij stond altijd voor ons klaar en heeft ons gemotiveerd het beste eruit te halen.

Dr. Sandra Beurskens en Prof. Derick Wade willen wij bedanken voor hun zinvolle en constructieve bijdrage en tijd die zij voor ons hebben vrijgemaakt. Zij waren als externe begeleiders nauw betrokken bij het project.

Mede dankzij hen en nog vele andere personen uit onze omgeving is het ons gelukt deze scriptie te presenteren.

VOORWOORD

Evidence based handelen is bij de opleiding fysiotherapie van de Hogeschool Zuyd sinds enige jaren geïntegreerd in het onderwijs en wordt in het laatste studiejaar voortgezet door het wetenschappelijke werken aan een afstudeerproject. Binnen de opleiding worden er inmiddels meerdere projecten binnen verschillende speerpunten aan de studenten aangeboden. Door deze speerpunten kunnen projecten elkaar in de tijd opvolgen. Voorbeelden van speerpunten zijn 'pijn', 'meetinstrumenten' en 'bewegingsprogramma's'.

Er is ook een speerpunt 'mentale training'(mental practice) en studenten uit voorgaande jaren hebben al aan verschillende projecten gewerkt met betrekking tot mentale training, onder andere bij de revalidatie van CVA- en Parkinsonpatiënten en de neuropsychologische factoren die daarbij een mogelijke rol spelen.

In de literatuur over mentale training in de fysiotherapie vindt men informatie over de toepassing bij volwassenen maar minder over de toepassing bij kinderen. Het is namelijk onder andere de vraag vanaf welke leeftijd mentale training toegepast kan worden. De persoonlijke en cognitieve ontwikkeling van een kind speelt daarbij een grote rol. Wij willen verzamelen wat er tot nu toe aan onderzoeken gedaan is.

Ons eigen afstudeerproject sluit aan de vorige projecten aan, maar gaat zich op kinderen richten en biedt daarmee een nieuw onderdeel in de speerpunt 'mental practice'. Door middel van een systematische review willen wij een overzicht geven over de effecten bij kinderen met betrekking tot een motorische taak. Daarbij richten wij ons zowel op gezonde kinderen, als ook op kinderen met een beperking.

De systematische review is geschreven in het Engels. Er is wel een Nederlandstalige samenvatting.

Wij wensen u veel leesplezier.

Simone Friedrich en Eva Schmitz

SAMENVATTING

Doelstelling: Literatuurstudie naar de effecten van mentale training bij kinderen.

Data bronnen: Er is een systematisch literatuuronderzoek in de Cochrane Database of Systematic Reviews, PubMed/Medline, Pedro, Rehadat en Science Direct uitgevoerd door twee onderzoekers onafhankelijk van elkaar. Studies die gepubliceerd waren tot en met november 2008 werden geselecteerd.

Studieselectie: Er zijn drie Randomized Controlled Trials (RCT) en een Controlled Clinical Trial (CCT) geïncludeerd, die de effecten van mentale training bij gezonde kinderen en kinderen met een beperking tot en met 18 jaar met betrekking tot de verbetering van een motorische vaardigheid hebben onderzocht.

Studiebeoordeling: Drie onderzoekers hebben de methodologische kwaliteit onafhankelijk van elkaar beoordeeld. Belangrijke kenmerken en resultaten zijn geëxtraheerd en samengevat.

Resultaten: Twee studies hebben de verbetering van motorische eigenschappen in jonge atleten onderzocht, terwijl twee andere studies over kinderen met Mild Mental Disabilities (MMD) en Developmental Coordination Disorder (DCD) gingen. In alle vier de studies werden positieve effecten gerapporteerd op het gebied van motoriek. Echter de methodologische kwaliteit was algemeen laag en de interventiegroepen waren klein. De mentale training interventies varieerden van elkaar, even als duur en frequentie.

Conclusie: Kinderen lijken fysiek te kunnen profiteren van mentale training. Er kon geen relatie gelegd worden tussen het effect en populatie kenmerken enerzijds en interventie-inhoud anderzijds. Bij vervolgonderzoek wordt aanbevolen hiermee rekening te houden.

Trefwoorden: imagery, mentale training, kinderen, MMD, DCD, jonge sporters, systematisch literatuuronderzoek

ABSTRACT

Aim: To assess the effects of mental practice training in children.

Data source: A systematic literature search of the Cochrane Database of Systematic Reviews, PubMed/Medline, Pedro, Rehadat, and Science Direct was performed by two researchers independently. Eligible studies published up to November 2008 were selected.

Study selection: Three Randomized Controlled Trials (RCTs) and one Controlled Clinical Trial (CCT) on the effects of mental practice training in healthy and impaired children up to 18 years on the improvement of a motor skill were included.

Data Extraction: The methodological quality assessment was performed by three reviewers independently. Important characteristics and outcomes were extracted and summarized.

Results: Two studies investigated the motor skill improvement in young athletes, whereas two studies involved children with Mild Mental Disabilities (MMD) and Developmental Coordination Disorder (DCD). In all four studies positive effects were reported. However, the methodological quality in general was low and the intervention groups were small. The mental practice interventions differed from each other. Intervention periods and frequencies varied.

Conclusion: Children seem to benefit from mental practice, but more research has to be done. In future research longer intervention periods may be considered.

Key words: imagery, mental practice, motor imagery, children, MMD, DCD, young athletes, systematic review [publication type]

INDEX

INTRODUCTION

Mental practice is often used to improve performance within sports, music, and increasingly within the field of (neurological) rehabilitation. In sports mental practice can be aimed at the improvement of concentration, the capability to pay attention to one's action and to ignore both internal and external stimuli. In rehabilitation another aim can be to improve a certain motor task by imagining the parts of the movement mentally, as for instance, catching an object. The person can think about the weight, the procedure, the power he/she needs and the feeling of the catch. Different aspects and facets of mental practice are already used within the rehabilitation of stroke patients, Parkinson patients, after cancer, head injury, patients with multiple sclerosis or chronic pain (1).

In the literature terms like "mental imagery", "movement imagery" or "motor imagery" are used in addition to "mental practice"(2). To avoid confusion with regard to the content, definitions of the different concepts are given. "*Mental imagery* refers to the active process by which humans re-live sensations with or without external stimuli. This cognitive technique can be performed vividly, during which different modalities of sensory input, such as visual, auditory, tactile, kinesthetic, olfactory, gustatory, or any combination of these senses" can be generated (3, p.1133). *Movement imagery* is described as quasi-perceptual experiences of movements, which you are not conscious of and which are shown without any stimulus present that normally would arouse that experience (2). Objects or persons can be the subject of the imagery (3, 4). "For instance, mental rotation is a form of movement imagery in which subjects have to rotate a geometric figure mentally in order to identify its shape" (3, p.1133). *Motor imagery* according to Decety (5) refers to the mental simulation of any kind of motor act without motor execution and is preferred by researchers, as the human body is involved (3, 4).
Furthermore, there is a big difference between *motor imagery* that refers to a specific cognitive operation and *mental practice*, a training method that can use various cognitive processes, including motor imagery (6). Thus, we believe that it is important to differentiate between the process of imagining a movement once or a few times (motor imagery) and the act of repeating the imagined movement several times with the intention of learning a new ability or perfecting a known skill (mental practice) (3).
In this review we used the definition given by Braun et al 2006: "Mental practice is an internal representation of movement that is activated and the execution of the movement repeatedly mentally simulated, without physical activity, within a chosen context. It is used for the goal-oriented improvement or stabilization of a given movement" (7, p.843).

Neurophysiological research suggest that motor imagery shares many of the same neural and physiological components as the performance of the actual movements, for instance increases in

muscular activity, spinal excitability, autonomic system activity, and an increase in neural activity in areas associated with movement, such as the supplementary motor area, cerebellum, and basal ganglia (8, 9). The results of six studies in which motor imagery is compared to motor performance indicate that imagined motor performance is subject to the same environmental and physiological constraints (10-15). Behavioral studies also show the link between motor imagery and actual movements; they show high correlations between the speed of actually performed and imagined movements (11, 16). For example, the time to complete a movement in imagination is similar to the time necessary to actually perform the same movement. In addition to that Fitts' law, which states that more difficult movements take more time to produce physically than do easier ones, is also found to be the case with imagined movements (3, 11). These findings have led many to argue that motor imagery is the 'efference copy' of real movements. Imagined movements can only come to one's mind when the actual movement intended is inhibited (16, 17).

All of those aspects mentioned above were results from studies with adults, but what is the evidence for the effects of mental practice in children? Up to now, different aspects of imagery and mental practice are already used in children, for instance in the treatment of pain in sick children (18-21) or in psychology (22). Mental practice in children is also getting increased attention as part of sports, physiotherapy and rehabilitation, because of the possible advantages it might have if performed correctly and on a regular basis. It can be applied conveniently and easily. After having learned the technique, there is no special equipment needed and the trainer need not be present; mental practice can be done anywhere (23). In addition, it can be useful if children are not able to train physically, for example after a surgery. Mental practice requires great effort and concentration on the imagined task. For children who cannot concentrate or pay attention for a longer time and who are distracted easily this can be a practical difficulty. A well-defined fantasy of children can be an advantage to imagine the task easier, but it can also be the source for unrealistic goals (e.g. flying).

There is a widespread belief that mental practice is useful in children, but a current overview of the evidence to support this belief is missing. The main aim of this review is to give an overview of the evidence with regard to possible effects of mental practice in children with regard to motor skills.

METHODS

Figure 1 (p.5) gives an overview of the search strategy, the selection criteria, and assessment of the quality of the selected studies.

Data Sources

For the literature search the following databases were used: Pubmed/Medline, Cochrane, Pedro, Rehadat and Science Direct. Imagery, mental practice, motor imagery, children, pediatrics, rehabilitation, sport, effects, and motor activity were used as keywords. Reference tracking and author tracking was applied to find more articles. All searches were done by two independent investigators (SF, ES). The detailed search strategy is available from the authors.

Study selection

In this paragraph the criteria of the study selection such as the type of study, participants, types of tasks, interventions, and outcome measures are described.

Types of study and participants

Included articles were written in English, German, and Dutch and were searched up to November 2008. The population could consist of both healthy children and children with any kind of impairment aged up to 18 years. Only RCTs and CCTs that investigated the effects of mental practice in children were selected. In Pubmed we marked the limitations: human, English, German, Dutch, Controlled trial, meta-analysis, RCT, review and the age of 0-18 years.

Types of tasks, interventions, and outcome measures

To be included, the tasks of the studies had to be a motor task for children in the setting they were practiced (skills). Interventions could take place in sports, (physio- or occupational) therapy or rehabilitation. The mental practice therapy could be any motor imagery intervention (dose/intensity) that might reasonably improve physical activity (more than a week). This would imply that a minimum of several sessions would be needed to improve skills. It was allowed to combine the mental practice interventions with any other co-intervention (e.g. video). Interventions that either did not deal with an improvement of a motor skill or dealt with self-hypnosis, sensation of pain or relaxation alone were excluded. Studies with outcomes that assessed a potential improvement of a specific movement, task or activity (effects of mental practice) were included. Studies were excluded if imagery was used to enhance performance on a psychological level such as controlling anxiety, changing self-confidence or decrease of pain (perception).

Data Extraction

Two reviewers (SF, ES) screened the titles and abstracts of the articles. For selecting relevant studies the eligibility criteria regarding type of study, participants, tasks, intervention, and outcome measure were used. If it was not clear whether a study should be included based on title and abstract, the full text was read. If there were still any uncertainties, a third reviewer (SB) was included in screening the article.

Methodological quality of the RCTs and CCT

The included RCTs and CCT were independently assessed by three reviewers on methodological quality (SF, ES, SB). Twelve items from the Amsterdam-Maastricht Consensus List for Quality Assessment (AMCL) were used (24, 25). This was based on other systematic reviews with physiotherapy interventions (7, 25). The ACML had to be adapted, because some items were not appropriate for a physical intervention such as "description of side effects". The AMCL includes all important items from the Delphi list (26). The articles were not blinded because the reviewers were already familiar with the literature.

Each criterion was scored either positive (+ ; 1 point), negative (- ; 0 points) or unclear (? ; 0 points), so that a maximum score of 12 points could be achieved. Before assessing the articles on quality the twelve criteria were defined to reduce differences between the reviewers (appendix 1, tab.3). For example, it was necessary to define "acceptable" in "acceptable withdrawals during intervention period". It was set at 10% during the intervention period. Acceptable compliance was considered sufficient if patients themselves or therapist and relatives reported that the participants followed the given instructions and if the number of withdrawals was limited. The item "relevant measures" was divided into two points: first the outcome of the measurements had to answer the research question and, second, it was necessary that the relevant measurement outcomes were described (see 'types of outcome measures'). Intention-to-treat analysis was scored positive in case all randomized patients were reported for the most important moments of effect measurement irrespective of non-compliance and co-interventions (25). A long term follow up was defined as an outcome assessment $\geq$ 6 months after the intervention period. No cut off was used for the methodological quality.

Study characteristics of the RCTs and CCT

The following data were extracted: study design and population, intervention and task, measurements and outcome (tab. 2, p.10-11).

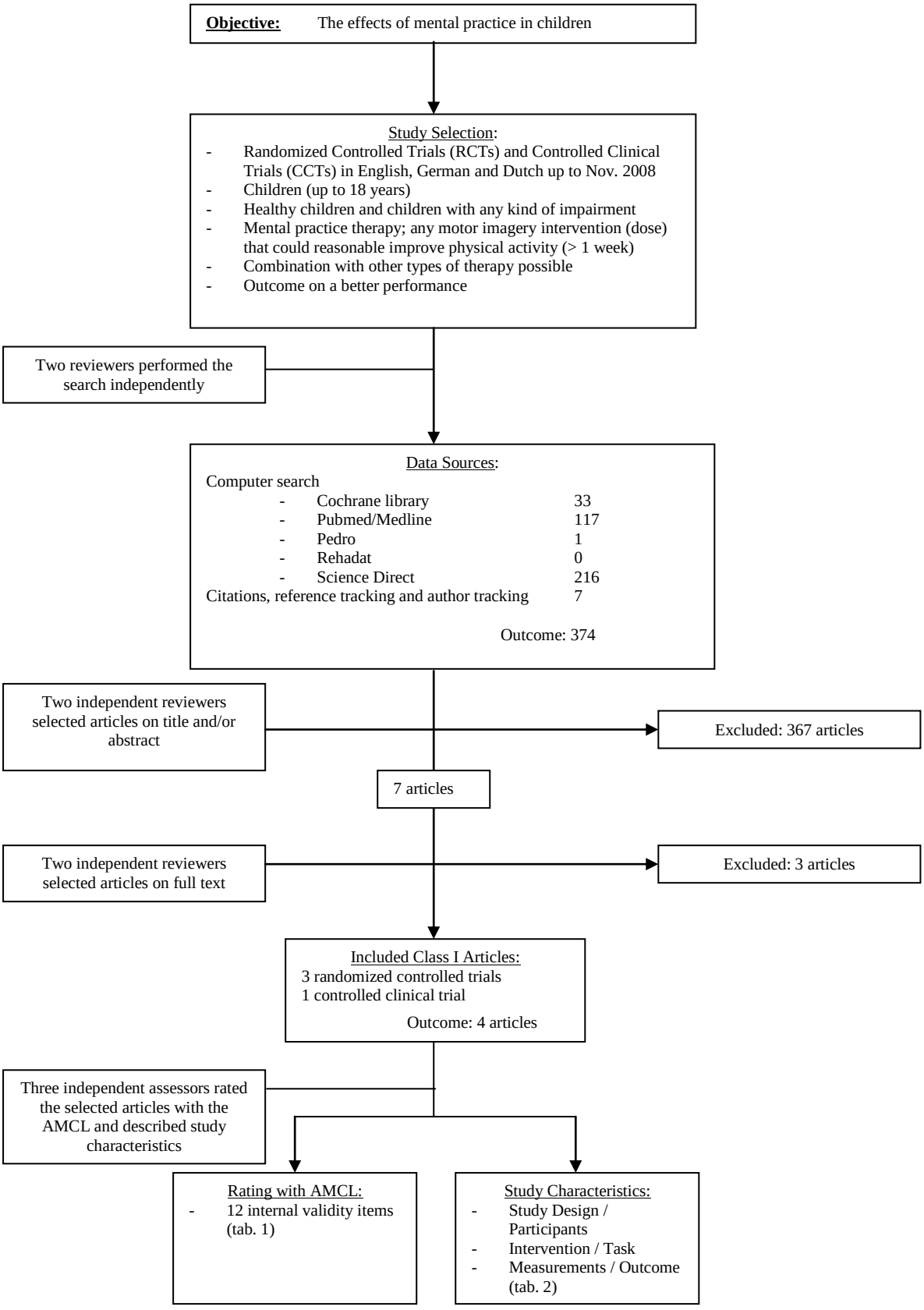

Figure 1: Overview of literature search, criteria and rating.

RESULTS

The selection procedure and the selected studies are shown in figure 1. Articles were excluded because,

(1) they did not meet the criteria for population characteristics,
(2) the intervention involved forms of self-hypnosis (psychotherapy) (e.g. 27), relaxation (e.g. 21) or stress management (e.g. 22) but were not combined with any physical activity,
(3) the outcome measures did not assess improvement of activities or skills but functions, for example the grade of relaxation or pain perception (e.g. 18-21),
(4) the aim of the study was to determine whether or not subjects were able to perform imagery (ability question), not to benefit from a mental practice intervention (effect question) (e.g. 9, 15, 16, 28-35),
(5) the intervention was applied just one or two times (e.g. 36-38), which was the case in most ability studies and the dose of the intervention therefore inappropriate to lead to physical effects on an activity level,
(6) studies were excluded, which dealt with the effectiveness of an assessment scale (e.g. 39) or
(7) a combination of the above.

Three (32, 36, 37) of the seven initially identified articles were excluded after the full text was read. Four studies were identified that assessed the effects of mental practice in children. Two studies (40, 41) involved young athletes, whereas the other two included children with Mild Mental Disabilities (MMD) (42) and Developmental Coordination Disorder (DCD) (23). Methodological quality and study characteristics of the included articles are described in table 1 respectively table 2. One study (41) used mind and body imagery techniques in combination with initial relaxation, video sessions and physical training to improve the performance accuracy and the technical rating for the topspun and underspun of young table tennis players. In the second study (40) the use of imagery in combination with physical training, video observation and relaxation in tennis players to improve the performance of the service, both placement and technique, is described. In another study (42), children with MMD received imagery practice before they performed a motor oriented task (pursuit rotor) and a cognitively oriented task (peg board). The last included article reported the effects of visual imagery exercises, relaxation techniques, modelling and motor exercises with a CD-Rom in children with DCD (23).

Methodological quality

The methodological quality of the four effect studies was between 4.5 and 6 from the reported articles and between 4.5 and 8 after contacting the authors (tab. 1).

Three of the four studies were randomized (item 1a) (23, 40, 42). In all four studies blinding of the care provider was not described (item 3); in none of them the patients were blinded (item 6). Only two studies had the same treatment dose for the co-intervention and control group (item 4) (41, 42). In three studies (23, 40, 42) there were no withdrawals during the intervention period, in one study (41) this item was not reported (item 7). One study (41) described an acceptable compliance of the children to the experimental intervention, in two studies (23, 40) this item was unclear and in the fourth it was clearly described that the compliance was not acceptable (42).

Authors of the studies were contacted to clarify the question mark scores. If the responses lead to a changed score, the item was marked with a star (*). Pooling of data was considered inappropriate due to the heterogeneity between the trials regarding intervention characteristics and measurements.

Table 1: Quality assessment of internal validity of selected RCTs and CCT with the Amsterdam-Maastricht Consensus List (AMCL) for quality assessment (modified version) (24)

Items		Zhang (41)	Atienza (40)	Screws(42)	Wilson(23)
1a Randomization	(0,5pt)	-	? (+)*	+	+
1b Concealment of allocation	(0,5pt)	-	? (-)*	?	? (?)*
2 Comparable subgroups at baseline		+	+	?	+
3 Blinded care provider		? (?)*	? (-)*	?	? (-)*
4 Correction for attention; same treatment (dose), cointervention		+	-	+	-
5 Acceptable compliance		+	? (?)*	-	? (+)*
6 Blinded patient		-	-	-	-
7 Acceptable withdrawals during intervention period		? (+)*	+	+	+
8 Blinded outcome assessor		+	+	?	+
9a Relevance measures: kind of measure	(0,5pt)	+	+	+	+
9b Description of measurement	(0.5pt)	+	+	+	+
10 Timing assessment		+	+	+	+
11 Intention to treat analysis		? (+)*	? (+)*	?	? (+)*
12 Long term follow up		? (-)*	? (?)*	?	? (-)*
Total		**6 (8)***	**5 (6.5)***	**4.5**	**5.5 (7.5)***

NOTE. Range 0 to 12 points
Legend: +, 1 point; -, 0 points; ?, 0 points
* question mark changed into a + or - after receiving the requested information from the author(s). If an item still was unclear, because the author(s) did not give any further information, the score was not changed.

Effects of mental practice

In the two sports studies, the effects of mental practice on either the table tennis forehand (underspun and topspun) (41) or the tennis service was investigated (Tab. 2) (40). Two effects were measured: the *technical quality* of the skill as assessed by experts (40, 41) and the *performance accuracy* of the return (table tennis) (41) or *performance placement* (accuracy and speed) (40) in the tennis service. Both studies had the same study design. Three groups were compared; one control (only physical training) and two experimental groups. In the

experimental group, the intervention was either video observation combined with physical training or video observation combined with mental practice and physical training.
In the study by Zhang et al only the mental practice group improved on *all assessed tasks with regard to the table tennis forehand*. The video group and the physical group did not significantly differ from pretest level with regard to the *technical quality* of the forehand whereas the *performance accuracy* of the underspun ball increased significantly in all three groups (but most in the mental practice group).
The study results by Atienza et al showed that the imagery practice group improved significantly in the *technical quality* of the tennis service but did not show significant change with regard to service placement (did improve however). The video observation group did improve significantly in both technical quality of the service and tennis service placement (mainly through increase of service speed). The posttest comparison between groups indicated that the effects of the two experimental groups did not differ significantly from each other with regard to the technical quality. Both experimental groups showed significant differences with the only physical practice group.
Comparing the two sport studies with regard to the effects of the mental practice groups one can see that the mental practice group in the table tennis study improved in both technical quality and performance accuracy and whereas in the tennis study only the technical quality improved significantly.
In Screws and Surburg they tested the children on a motoric oriented task (Pursuit rotor task) and a cognitive oriented task (Peg Board Task). They found out that physical training is more effective than mental practice in the cognitive orientated task. However with regard to the change in performance scores from the pretest and posttest it is reported that imagery practice had the greatest influence on motor skill performance of the cognitive task. In general mental practice was better than no intervention.
In the study by Wilson et al an imagery group, a perceptual motor training group and a no practice group were compared. Only the imagery and perceptual-motor training groups showed equal improvement on their level of coordination from pre- to posttest. Three children in the imagery group, who represented three of the four most impaired on the M-ABC at pretest, showed particular benefits from the imagery training.

Effects in relation to intervention characteristics

Mental practice was used to perform better on motor tasks. The major strategies in the mental practice interventions were: video observation sessions and imaging of a specific motor skill. The two studies in sports (40, 41) combined physical training with mental practice. In the study by Zhang et al mental practice was given in combination with an introduction on mental practice, a relaxation training, video sessions and existed of initial relaxation “mental readying” for imagery and mind/body imagery of selected skills, first guided and afterwards

independently. Atienza et al used video sessions, relaxation and imagery training resembling to the intervention by Zhang et al. The sport type, the task that was selected for mental training, the video-modeling productions and the number of imagery sessions differed in the two sport studies (40, 41).
Only in the study by Screws and Surburg relaxation techniques were not used, but participants received an imagery practice orientation before they mentally practiced their task. In this study the motor imagery intervention was not described properly as far as the content was concerned (42). In Wilson et al the mental imagery intervention consisted of visual imagery exercises from a CD-ROM, relaxation, modelling and motor imagery exercises.

In two of the four studies, the intervention period lasted more than 20 weeks, including the pretest, all introductions, imagery sessions and the posttest (40, 41). Two studies included children with disabilities and intervention periods ranging from 1 ½ weeks to 5 weeks (23, 42). The frequency of the mental imagery training varied from three times/week twelve minutes (41) to one time/week sixty minutes (23) and in one study the dose was not mentioned (42). None of the other studies had a follow up period or measurement.
In general, no relation between the intervention characteristics and the effects could be found.

Effects in relation to participants' characteristics

In general the population size in all studies was small and ranged from 12 to 54 children. Dividing the participants into subgroups the experimental groups were even smaller, especially in the studies of Atienza et al and Screws and Surburg (5 to 18 subjects). The inclusion- and exclusion criteria were only specifically described in the two therapeutic studies (23, 42).
The ages of the participants varied from 7-13 years and all studies showed that children at this age might benefit from mental practice. This accounts for both healthy children and children with impairments (DCD, MMD). One study (41) included both female and male participants, another study (40) only female. In the remaining two studies the gender of the participants was not described (23, 42).
In general, subject characteristics could not directly be related to outcome (tab. 2).

Table 2: Overview of research results regarding several study characteristics of the selected RCTs and CCT

Study	Method/Population	Intervention, mental imagery task	Measurement instruments, moments and follow-up and outcome
Zhang et al(41)	CCT N= 40 Table tennis players n= 13 Exp. group 1 n= 14 Exp. group 2 n= 13 Control group • Age 7-10y • Mean age = 8.3y • 21 male, 19 female • Average experience in table tennis = 2.7y	• Relaxation, video, MI of selected skills from their "preferred" player • Task: table tennis forehand attack • While group 1 had MP, other groups had normal physical training for an equivalent period of time • Exp. group 1: Video + mental training + physical training - *Introduction:* 1st week, 3x 30min: discus value, practical implications and techniques of MP - *Relaxation Training:* 2nd and 3rd week introduction to basic relaxation skills, 3x/week for 20min (reduced to 5min) - *Video:* 1/week; 4th, 8th, 12th, 16th, and 20th weeks; 30min (forehand attack techniques of top Chinese table tennis players) - *MI Training:* 4th week to the end (18weeks), 3x/week, 12min each: initial relaxation (5min), mental readying for imagery (30-60sec), and mind/body imagery of selected skills (6min) - In the 4th, 5th and 6th weeks guided imagery, after that independently • Exp. group 2: Video observation + physical training - Same video sessions as group 1 • Control group: Physical training	• Pretest and Posttest (after 22 weeks) • Forehand-shot accuracy: forehand attack to 50 topspun balls and 50 underspun balls: accuracy of the return - Total score: 50-150 • Technical quality: 4 experienced coaches (blinded) observed each player, rated quality independently - Grades 1(low quality) to 7 (high quality) - Measurement of interrater consistence • Outcome: - Exp. group 1: - Technique: significant improvement - Accuracy: significant improvement (greater than in other two groups); - Exp. group 2: - Technique: remained approximately at pretest level - Accuracy: improvement only in underspun balls; - Control group: - Technique: remained approximately at pretest level - Accuracy: improvement only in underspun balls; • No follow-up
Atienza et al (40)	RCT N=12 Tennis players n=4 Exp. group 1 n=4 Exp. group 2 n=4 Control group • Age 9-12y • Mean age = 10.6y • All female • Exclusion: by coaching staff of school on basis of accuracy, speed and technique	• imagery video and relaxation • Task: tennis service • 1 video session and 2 imagery sessions/ week; partially based on the criterion used by Zhang et al. (1992) • Exp. group 1: Physical training + video - Video model observation: 24 weeks, 1/week 5min • Exp. group 2: Physical training + video + imagery - Video model observation: as in experimental group 1 - Basic relaxation: 3 weeks, 6x 20min sessions - Imagery training for tennis service: 24 weeks, 2x 15min sessions/week; each session included 3 components of initial relaxation, mental readying + imagery of the selected skill • Control group: Physical training	• Pre- and posttest (after 24 weeks) • Service placement: Avery-Richardson Tennis Service Test • Technical quality: specific measure for the six skills • Pretest: 3 groups were similar in both service placement and technique • Outcome: • Exp. group 1: - Technique: significant improvement compared to control group, but does not significantly differ from exp. group 2 - Placement: significant improvement (service speed) • Exp. group 2: - Technique: significant improvement compared to control group, but does not significantly differ from exp. group 1 - Placement: improved, but not significant • Control group: - Placement + technique: no significant changes • No follow- up

Abbreviations: MP, mental practice; MI, mental imagery; PRT, Pursuit Rotor Task; PBT, Peg Board Task; MMD, Mild Mental Disabilities; DCD, Developmental Coordination Disorder; WISC-R, Wechsler Intelligence Scale for Children-Revised; IQ, Intelligence Quotient

Table 2 (Continued): Overview of research results regarding several study characteristics of the selected RCTs and CCT

Study	Method/Population	Intervention, mental imagery task	Measurement instruments, moments and follow-up and outcome
Screws and Surburg (42)	RCT N=30 Children with MMD Pre-test: n= 15 Peg Board Task n= 15 Pursuit Rotor Task Experiment: n_{PBT} = 5 Exp. group 1 n_{PBT} = 5 Exp. group 2 n_{PBT} = 5 Control group n_{PRT} = 5 Exp. group 1 n_{PRT} = 5 Exp. group 2 n_{PRT} = 5 Control group • Age11-13y • Mean age = 12.5y • IQ's: 50-70 • Excl.: auditory, visual, orthopaedic, behavioural impairments; medication that hinders motor perf.	• Motor imagery • 5 practice trials on either the PRT (motor-orientated) or PBT (cognitive-orientated); game before the pretest • PBT/pretest: place pegs in correct order (right and left hands) as fast as possible for 20 trials of 30sec with 30sec of rest between each trial; score: number of pegs placed in the proper order after each trial • PRT/pretest: track a rotating light with a stylus using the preferred hand for 20 trials of 30sec, with 30sec of rest between each trial • <u>Exp. group 1: Physical practice group</u> - Practiced 20 trials on either the PBT or PRT for 8 sessions, 5 days/week - PRT or PBT for 30sec, during rest period of 30sec after each trial, constructed geometric shapes on a Geoboard • <u>Exp. group 2: Imagery practice group</u> - Image practice orientation - Mentally practicing of the assigned task • <u>Control group: Geoboard</u> - Same amount of time as exp. groups = 164min - One warm up trial of 30sec on assigned task (PRT or PBT), 2min Geoboard for 8 sessions, 5 days/week • Posttest = pretest	• MMD-identification: - WISC-R (IQ) - State Alabama Department of Education Criteria • Pretest and Posttest (after 8 practice sessions) - Data analysis: time on target for the PRT and number of pegs placed correctly for the PBT • <u>Outcome:</u> • Exp. group 1: - PBT: significantly superior to exp. group 2 - PRT: the same significant differences than exp. group 2 to control group • Exp. group 2: - PBT: significantly better than the control group; more effects on PBT than on PRT - PRT: shows the same significant differences than exp. group 1 to control group • Control group: - PBT + PRT: no significant differences • No follow-up
Wilson et al (23)	RCT N=54 Children with DCD n=18 Exp. group 1 n=18 Exp. group 2 n=18 Control group • Age 7-12y • Exclusion: history of neurologic disease • Inclusion: score < 50th percentile for their age on the M-ABC	• Imagery, CD-ROM, relaxation • <u>Exp. group 1: Imagery</u> - 5h individual training; sessions of 60min; 1/ week for 5 weeks - Visual imagery exercises: child judged or predicted the movement trajectory of a series of colored disks - Relaxation + mental preparation: relaxation techniques to reduce muscle tension, increase imagery effectiveness, develop increased kinaesthetic awareness. "Fettuccine Fingers" for 5min. - Observed actions, copying by using real movements, then imagined performing - Modelling + MI exercises: video-audio sequences of fundamental motor skills + mental rehearsal of skills from ext. perspective + overt practice • <u>Exp. group 2: Perceptual- motor training</u> - Individual training sessions: 60min, 1/week for 5 weeks - Combination of gross-, fine- and perceptual-motor activities • <u>Control group: No treatment</u>	• Pre- and posttest (M-ABC; after 5 weeks) • <u>Outcome:</u> • Exp. group 1: - equal differences than exp. group 2 • Exp. group 2: - equal differences than exp. group 1 • Control group: - no significant differences - 3 of the 4 most impaired children in exp. group 1 showed particular improvement • No follow-up

Abbreviations: MP, mental practice; MI, mental imagery; PRT, Pursuit Rotor Task; PBT, Peg Board Task; MMD, Mild Mental Disabilities; DCD, Developmental Coordination Disorder; WISC-R, Wechsler Intelligence Scale for Children-Revised; IQ, Intelligence Quotient

DISCUSSION

Many studies were identified which investigated an aspect of mental imagery in children, but only four studies assessed the effects of mental practice (23, 40-42). These four studies reported that mental practice training had positive effects on the performance of the assessed motor task and that children might benefit from mental practice.

Methodological aspects of the review

Systematic reviews, including this one, probably miss some studies because of the limitations in searching algorithms and the categorization of studies in databases. Mental practice may be described in other terms such as cognitive or behavioural treatment. Furthermore studies of mental practice in children were relatively old (published 1992 to 2002) and often not properly accessible.

It was difficult to assess the methodological quality of the studies, because a lot of the items were not reported properly. For instance, it was in two studies not sufficiently described whether there was a randomisation or not (40, 41). This resulted in low scores on the methodological quality. Guidelines aimed at improving the standard of reporting studies only started to be promoted in 1995.

There are points of criticism concerning the standardized rating of the methodological quality with the original protocol of the AMCL. Blinding of patients is impossible if a cognitive strategy within a treatment is assessed. We decided to maintain the original rating definitions because assessing methodological quality should be objective and standardized rather than altered to the limitations of the field research.

Positive was the contact with authors to get for instance full text articles and later on to get a more precise table of the methodological quality of the included studies. After contacting the authors the overall scores changed in three articles, so that one article stands out from the others (42). Sometimes the answers did not bring more clearness and the reliability of their response was questioned (authors did not give any further explanation, just replied with yes or no). Meta-analysis was not possible regarding the lack of comparability.

Effects of mental practice in children

The effect studies included functional tasks (tennis service, forehand attack in table tennis and fundamental motor skills) and constructed tasks such as the Peg Board and a Predictive Timing Task. The two studies by Zhang et al and Atienza et al give some evidence, that mental practice in children in sports might be primarily useful in increasing the technical quality of a motor skill (technical quality more than accuracy). Zhang et al expected that the combination of video and mental practice would make the required image clearer and more stable in the children's mind and help to transfer the high level of technical quality viewed on the video into the quality of

their own subsequent execution of the skill. According to Zhang et al mental practice in combination with physical training and video observation was an appropriate intervention to improve a certain motor skill. Children need the imagery sessions to integrate the images of the video in their own performance (41). Atienza et al however put emphasis on the use of video to optimize the imagery technique. They stated that systematic viewing of video-modeling productions could facilitate the creation of useful internal representation which allowed integration of the complex movements of tennis service. These different opinions may be the reason for small differences in the chosen task and mental practice intervention content. First Zhang et al chose for a reactive task (forehand attack) whereas Atienza et al chose for a nonreactive task (tennis service). Second, the distribution of video and imagery sessions were different. Atienza et al had fewer imagery sessions than Zhang et al per week (two vs. three), but had more video sessions (one session a week vs. one session a month).

The study of Screws and Surburg provided some evidence that the use of mental practice facilitates motor task performance in children with MMD. The results suggest that the imagery group who performed the cognitive-oriented motor task was able to develop a more effective practice loop by ruling out inappropriate courses of action. This is in line with the proposition of Feltz and Landers (43) that "mental imagery effects are basically associated with cognitive-symbolic rather than motor components of the task". Nevertheless it is worthy of comment that the IQ of the children in this study was very low (ranging from 50-70). Based on one study we can however not make a statement about the influence the intelligence quotient might have on the use of mental practice.

The study of Wilson and co-workers supported the hypothesis that imagery training can facilitate the development of motor skills in children with impaired motor performance (DCD) and that this is equally effective as perceptual-motor training. It even appeared that the imagery training engenders a significant change in motor outcome in the most impaired children.

Patient characteristics, task, interventions and dose

Mental practice seems to be effective in both healthy and impaired children (DCD and MMD), but no statement can be made if it is more useful in a special population category. With regard to children and sports it seems that mental practice is particular useful to train the technical quality of a certain movement. In children with DCD it can be suggested that especially the most impaired children can benefit from mental practice.

Based on this review one cannot tell from which age on children could use mental practice. More research has to be done with different population categories.

There is no evidence that one intervention protocol was more effective than another. No similarities could be found within the studies neither on the content of the intervention protocol nor on the intervention dose. This inevitably leads to a wide range of intervention contents and time spend on imagery (periods) in the four studies. However, in general a longer intervention

period must be regarded as useful to assess the effects of mental practice and not only the ability of using mental imagery.

Other research with children and movement imagery

Most research in children with regard to mental practice is done on the ability if children are able to perform motor imagery. Main topics are if the age, task and perhaps pathologies have influence on the ability to generate images.

One main topic in imagery research with children is the age at which children are able to use imagery as a training method. Considering Piaget's classification of child's development, which is generally accepted, children at the age of seven to eight years use imagery for the first time (44, 45). This could explain why the authors of the included studies chose children at the age of seven or older. However during this research we also found studies which were contradictory to Piaget's thesis. Strauss Marmor (35) and Kosslyn et al (31) indicate that 5-year-olds can use kinetic imagery similar to 8-year-olds. Kosslyn et al suggested that different processes are used to carry out aspect of imagery, and that this is true for 5-year-olds, 8-year-olds, 14-year-olds, and adults. The authors found out that younger children are relatively poor at scanning, rotating and generating objects in images, but are relatively good at maintaining images. Munroe-Chandler et al (46) concluded that even if a number of studies demonstrated that children under seven years can use imagery under certain conditions, there is general agreement that these children have more difficulties than older ones. Imagery ability improves with ages (47, 48) until 14-year-old children are similar to adults in their imagery ability (31, 44, 45).
Recently Molina et al found out that the emergence of motor imagery can be found approximately at the age of seven years. In this study 5-year-olds seemed not to be able to imagine themselves acting in the imagined condition (34).
There is still uncertainness and contradictory information about the age when children are able to produce mental images for the first time and if this might relate to the gender of the child. The limited amount of research (31, 46) investigating gender differences in children's use of mental practice could account for these inconsistent findings and therefore the question remains whether there are, for instance, specific tasks or parts of mental practice that are gender specific.

When comparing studies, it seems that the task might have an influence on the ability and motivation of children to perform imagery.
In most of the imagery studies that were investigated besides the effect studies, the visually-guided pointing task (VGPT) or a hand- or object-rotation task is used which has been shown to be a valid and reliable measure of motor imagery (13, 17, 49). Other imagery studies used a more functional approach such as free throw shooting (basketball) (38), throwing a ball to a target (36) or taking a puppet back to her home (34). It is arguable which approach might be the

best way to test the imagery ability and the effects of mental practice in children. The VGPT and object rotation provide a standardisation of testing but they are very abstract and it is possible that children are more motivated with a functional task. This may have consequences on the effects and as far as the authors of this review are concerned, effects should be measured in a functional context.

The pathology which is studied most is DCD. In this kind of research the main aim is to explain motor clumsiness in children. An inability to generate imagined movements is associated with the presence of motor clumsiness in otherwise healthy children with DCD (16, 33). Use of the visually guided pointing task has shown that Fitts' law does not hold in most children with DCD with regard to speed-accuracy trade-off, which is typically seen in age-matched controls (14, 15). This pattern of performance implicates that children with DCD have problems to generate mental imagery which may reflect an impaired ability to process efference copy signals. To treat motor clumsiness in children with DCD it might be useful to start at the production of the internal efference copy signals. The included effect study with children in DCD (23) puts emphasis on this statement.

CONCLUSION

Mental practice in children is not a new topic and al lot of research has already been done. There seems to be some evidence that children at the age of 7-13 years might benefit from mental practice and that this accounts for both healthy children and children with impairment (DCD, MMD). However this evidence is based on four studies with small intervention groups. Nevertheless we found many publications investigating the ability of children to perform imagery (only one session). Research in children seems to focus on determining the age at which children can generate realistic images. Much more research has to be done on the effects of mental practice considering a longer intervention period.

REFERENCES

1. Dickstein R, Deutsch JE. Motor imagery in physical therapist practice. Phys Ther. 2007 Jul;87(7):942-53.
2. Braun SM, Geraets J. Het gebruik van bewegingsvoorstellingen in de revalidatie: hoe maak je de transfer van sport naar therapie? Jaarboek Fysiotherapie/Kinesitherapie 2009. Houten: Bohn Stafleu van Loghum; 2009.
3. Jackson PL, Lafleur MF, Malouin F, Richards C, Doyon J. Potential role of mental practice using motor imagery in neurologic rehabilitation. Arch Phys Med Rehabil. 2001 Aug;82(8):1133-41.
4. Decety J, Grezes J. Neural mechanisms subserving the perception of human actions. Trends Cogn Sci. 1999 May;3(5):172-8.
5. Decety J. The neurophysiological basis of motor imagery. Behav Brain Res. 1996 May;77(1-2):45-52.
6. Ravey J. In response to: mental practice and imagery: a potentional role in stroke rehabilitation. Phys Ther Rev. 1998;3:53-4.
7. Braun SM, Beurskens AJ, Borm PJ, Schack T, Wade DT. The effects of mental practice in stroke rehabilitation: a systematic review. Arch Phys Med Rehabil. 2006 Jun;87(6):842-52.
8. Jeannerod M, Decety J. Mental motor imagery: a window into the representational stages of action. Curr Opin Neurobiol. 1995 Dec;5(6):727-32.
9. Williams J, Thomas PR, Maruff P, P.H. W. The link between motor impairment level and motor imagery ability in children with developmental coordination disorder. Hum Mov Sci. 2008;27.
10. Decety J, Jeannerod M, Prablanc C. The timing of mentally represented actions. Behav Brain Res. 1989;34:35-42.
11. Decety J, M. J. Mentally stimulated movement in virtual realtiy: Does Fitts' law hold in motor imagery. Behav Brain Res. 1996;72:127-34.
12. Dominey P, Decety J, Broussole E, Chazot G, Jeannerod M. Motor imagery of a lateralises sequential task is asymmetrically slowed in Hemi-Parkinson's patients. Neuropsychologia. 1995;33:727-41.
13. Jeannerod M. The cognitive neuroscience of action. London: Blackwell; 1997.
14. Maruff P, Wilson PH, DeFazio J, Cerritelli B, Hedt A, Currie J. Asymmetries between dominant and non-dominant hands in real and imagined motor task performance. Neuropsychologia. 1999;37:379-84.
15. Wilson PH, Maruff P, Ives S, Currie J. Abnormalities of motor and praxis imagery in children with DCD. Hum Mov Sci. 2001;20:135-59.
16. Wilson PH, Maruff P, Butson M, Williams J, Lum J, Thomas PR. Internal representation of movement in children with developmental coordination disorder: a mental rotation task. Dev Med Child Neurol. 2004;46:754-9.
17. Crammond DJ. Motor imagery: never in your wildest dream. Trends Neurosci. 1997;20:54-7.
18. Martz Huth M, Broome ME, Good M. Imagery reduces children's post-operative pain. Pain. 2004;110:439-48.
19. Martz Huth M, Van Kuiken DM, Broome ME. Playing in the park: what school-age children tell us about imagery. J Pediatr Nurs. 2006;21(2).
20. Piira T, Hayes B, Goodenough B, Von Baeyer CL. Effects of attentional direction, age, and coping style on cold-pressure pain in children. Behav Res Ther. 2006;44:835-48.

21. Pöllki T, Peitilä AM, Vehviläinen-Julkunen K, Laukkala H, Kiviluoma K. Imagery-induced relaxation in children's postoperative pain relief: a randomised pilot study. J Pediatr Nurs. 2008;23(3).
22. Strachan L, Munroe-Chandler K. Using imagery to predict self-confidence and anxiety in young elite athletes. Journal of imagery research in sport and physical activity. 2006;1(1).
23. Wilson PH, Thomas PR, Maruff P. Motor imagery training ameliorates motor clumsiness in children J Child Neurol. 2002;17:491-8.
24. van Tulder M, Furlan A, Bombardier C, Bouter L. Updated method guidelines for systematic reviews in the cochrane collaboration back review group. Spine. 2003 Jun 15;28(12):1290-9.
25. van Tulder MW, Ostelo R, Vlaeyen JW, Linton SJ, Morley SJ, Assendelft WJ. Behavioral treatment for chronic low back pain: a systematic review within the framework of the Cochrane Back Review Group. Spine. 2001 Feb 1;26(3):270-81.
26. Verhagen AP, de Vet HC, de Bie RA, Kessels AG, Boers M, Bouter LM, et al. The Delphi list: a criteria list for quality assessment of randomized clinical trials for conducting systematic reviews developed by Delphi consensus. J Clin Epidemiol. 1998 Dec;51(12):1235-41.
27. Anbar RD. Self-hypnosis for management for chronic dyspnea in pediatric patients. Pediatric. 2001;107(2).
28. Cayenberghs K, van Roon D, Swinnen SP, Smits-Engelsman BCM. Deficits in executed and imagined aiming performance in brain-injured children Brain Cogn. 2008.
29. Choudhury S, Charman T, Bird V, Blakemore SJ. Adolescent development of motor imagery in a visually guided pointing task. Conscious Cogn 2007;16:886-96.
30. Jarus T, Ratzon NZ. Can you imagine? The effect of mental practice on the acquisition and retention of a motor skill as a function of age. The Occupational Therapy Journal of Research. 2000;20(3).
31. Kosslyn SM, Margolis JA, Barrett AM, Goldknopf EJ, Daly PF. Age differences in imagery abilities. Child Dev. 1990;61:995-1010.
32. Levin JR, McCabe AE, Bender BG. A note on imagery-inducing motor activity in young children. 1975;46:263-6.
33. Lewis M, Vance A, Maruff P, Wilson PH, Cairney S. Differences in motor imagery between children with developmental coordination disorder with and without the combined type of ADHD. Dev Med Child Neurol. 2008;50:608-12.
34. Molina M, Tijus C, Jouen F. The emergence of motor imagery in children. J Exp Child Psychol. 2008;99:196-209.
35. Strauss Marmor G. Development of kinetic images: when does the child first represent movement in mental images? Cogn Psychol. 1975;7:548-59.
36. Taktek K, Zinsser N, St-John B. Visual versus kinesthetic mental imagery: efficacy for the retention and transfer of a closed motor skill in young children. Can J Exp Psychol. 2008;62(3):174-87.
37. Varley WH, Levin JR, Severson RA, Wolff P. Training imagery production in young children through motor involvement. J Educ Psychol. 1974;66(2):262-6.
38. Wrisberg CA, Anshel MA. The effects of cognitive strategies on the free through shooting performance of young athletes Sport Psychologist. 1989;3:95-104.
39. Kwekkeboom KL, Maddox MA, West T. Measuring imaging ability in children. J Pediatr Health Care. 2000;14(6).

40. Atienza FL, Balaguer I, Garcia-Merita ML. Video modeling and imaging training on performance of tennis service of 9- to 12-year-old children. Percept Mot Skills. 1998;87:519-29.
41. Zhang LW, Ma QW, Orlick T, Zitzelsberger L. The effect of mental-imagery training on performance enhancement with 7-10-year-old children. Sport Psychologist. 1992;6:230-41.
42. Screws DP, Surburg PR. Motor performance of children with mild mental disabilities after using mental imagery. Adapt Phys Activ Q. 1997;14:119-30.
43. Feltz DL, Landers D. The effects of mental practice on motor skill learning and performance: A meta-analysis. J Sport Psychol. 1983;5:25-57.
44. Piaget J. Science of education and the psychology of the child. New York: Viking; 1071.
45. Piaget J, Inhelder B. Mental imagery in the child. New York: Basic Books; 1971.
46. Munroe-Chandler KJ, Hall CR, Fishburne GJ, Strachan L. Where, when and why young athletes use imagery: An examination of developmental differences. Res Q Exerc Sport. 2007;78(1):103-16.
47. Fishburne GJ, Hall CR, Franks IM. The development of imagery ability in children. In: Hahn E, Carl K, editors. Sport and the talented. Cologne, Germany: Bundesinstitut für Sportwissenschaft; 1987.
48. Hall CR, Pongrac J. Movement imagery questionnaire. London, Ontario, Canada: The University of Western Ontario; 1983.
49. Sirigu A, Duhamel J, Cohen L, Pillon B, Dubois B, Agid Y. The mental representation of hand movements after parietal cortex damage. Science. 1996;273:1564-7.

APPENDIX 1: Amsterdam-Maastricht Consensus List for quality assessment (modified version)

Tab 3: Amsterdam-Maastricht Consensus List (AMCL) for quality assessment based on van Tulder et al (25), modified for this review

Item	Rating criterion
1a Randomization	Item has a positive score if the concealment of treatment allocation is explicitly described to be randomized (e.g. some form of centralized randomization scheme; numbered or coded containers; sequentially numbered, sealed, opaque envelopes). Clearly inadequate procedures are alternation, or reference to case record numbers, dates of birth, day of the week or any other such approach.
1b Concealment of allocation	Item has a positive score if it is explicitly described if the allocation of the interventions was blinded (e.g. sealed envelopes). The item is scored with a question mark if it is not clearly described. If the allocation is described the item has a negative score.
2 Comparable subgroups at baseline	Item has a positive score if the study groups are comparable at baseline for the most important prognostic factors (e.g. same mean age, sort of impairment, duration of complaint, social background, same experience and level in sports).
3 Blinded care provider	Item has a positive score if the care provider is blinded regarding treatment allocation.
4 Correction for attention; same treatment (dose), co-intervention	Item has a positive score if the different intervention groups had the same treatment dose and if co-interventions are equally divided among the intervention groups.
5 Acceptable compliance	Item is considered as sufficient if patients themselves or therapist and relatives reported that the participants followed the given instructions and if the number of withdrawals was limited.
6 Blinded patient	Item has a positive score if patients were blinded regarding treatment allocation and the method of blinding is appropriate.
7 Acceptable withdrawals during intervention period	Item has a positive score if the percentage of participants who were included in the study but did not complete the observation period were less than 10%.
8 Blinded outcome assessor	Item has a positive score if the outcome assessors were blinded regarding treatment allocation.
9a Relevance measures: kind of measure	Item has a positive score if the measurement answered the research question. Types of outcome measure: Item is positive if the measurement assessed a potential improvement of a specific movement, task or activity (effects of mental practice). Item has a negative score if the measurement assessed performance enhancement on a psychological level such as controlling anxiety, changing self-confidence or decrease of pain (perception).
9b Description of measurement	Item has a positive score if relevant outcome measurements are described (text, table, graphic).
10 Timing assessment	Item has a positive score if the outcome assessment is approximately at the same time in all intervention groups (max. difference 1 week).
11 Intention to treat analysis	Item has a positive score if all randomized patients are reported for the most important moments of effect measurement irrespective of non-compliance and co-interventions.
12 Long term follow up	A long term follow up was defined as an outcome assessment ≥ 6 months after the intervention period.

APPENDIX 2: Reflectie

In het begin was mentale training een onbekend onderwerp voor ons. Wij wisten niet wat mentale training precies inhield en wat het met fysiotherapie te maken had. Daarom hebben wij ons door middel van literatuur en contact met inhoudsdeskundigen erover geïnformeerd wat mentale training nu eigenlijk is, en dan vooral hoe het bij kinderen toegepast wordt. In deze fase hadden wij al gemerkt dat er verschillende meningen en opvattingen over mentale training bestaan en het onderwerp vaak bediscussieerd wordt.

Het schrijven van een systematische review over wat er eigenlijk op dit moment aan literatuur beschikbaar is over mentale training bij kinderen leek ons daarom heel erg zinvol en interessant. Toch was het niet gemakkelijk om een bruikbare vraagstelling te formuleren, omdat er verschillende definities zijn betreffende het begrip mentale training. Bovendien moesten wij onder andere de volgende beslissingen nemen:

- Worden alleen studies over gezonde kinderen of ook kinderen met een beperking geïncludeerd?
- Is het zinvol om artikelen te includeren die de voorwaarden beschrijven die aanwezig moeten zijn om mentale training toe te passen?

Uiteindelijk hebben wij deze en nog vele andere beslissingen genomen en waren benieuwd hoeveel studies wij zouden vinden. In het begin zag het er goed uit, omdat wij vele studies over mentale training bij kinderen hadden gevonden. Het was ons al snel duidelijk dat er slechts vier artikelen waren die over de effecten gingen en aan de selectie criteria voldeden.

Tijdens het hele proces van zoeken en selecteren van de artikelen konden wij een hele hoop vaardigheden verbeteren. Zo hebben wij nu bijvoorbeeld en hele andere insteek als wij artikelen in databases gaan zoeken en kijken wij op een andere manier tegen artikelen aan. Wij hebben geleerd hoe je een goed artikel van een minder goede onderscheid met betrekking tot de methodologische en inhoudelijke kwaliteit. Ondanks dit feit was het vaak moeilijk om de belangrijkste uitspraken van de artikelen te extraheren en te analyseren.

Wij zijn op onze weg tot de uiteindelijke review tegen verschillende discussiepunten aangelopen. Het was soms bijvoorbeeld moeilijk om de verschillende uitspraken van auteurs te vergelijken en te beslissen of zij zich nu ondersteunden of juist tegenspraken.

Omdat wij allebei graag in onze laatste stageperiode naar het buitenland toe wilden hebben wij naar aanraden ervoor gekozen om een systematische review en geen onderzoek uit te voeren. Men zei, dat je het dan makkelijker hebt omdat je er “maar” een bepaalde richtlijn moet volgen.

Achteraf gezien was dat het beste wat we konden doen. Onafhankelijk van de plaats, tijden en andere mensen konden wij continu werken en elkaar motiveren als wij er even geen zin in hadden. Wij waren helemaal verantwoordelijk voor ons zelf en hebben in de loop van een heel jaar dat wij aan de scriptie hebben gewerkt, een persoonlijke ontwikkeling meegemaakt. De samenwerking en verdeling van taken was goed. Wij waren allebei in staat om kritiek te ontvangen van elkaar of onze begeleiders tijdens het project. De buitenlandse stage gaf geen complicaties. De Engelse taal was een grote uitdaging voor ons en maakte het schrijven van een Engelse review zelfs gemakkelijker. De gedachte dat wij er naderhand een artikel van zouden maken die misschien gepubliceerd kon worden motiveerde ons heel erg gedurende het werken aan de review.

Samenvattend kunnen wij zeggen dat onze klinische zicht op dingen veranderd is tijdens het lezen van verschillende artikelen en het schrijven van onze scriptie. In het afgelopen jaar is ons bewustzijn voor wetenschappelijk werken erg vergroot. En een ding weten wij nu zeker:

Het schrijven van een systematische review is meer dan allen het volgen van een richtlijn!

Simone Friedrich
Eva Schmitz