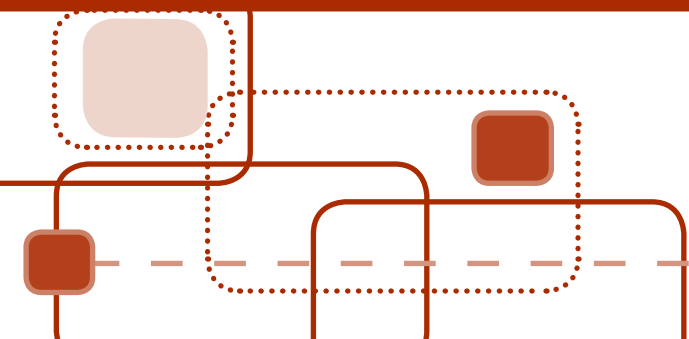




Pain in the back

Avoiding back pain
in children and teenagers



AN EVALUATION OF THE INVESTIGATION INTO THE EFFECTS OF AN EXERCISE
PROGRAMME ON PRIMARY SCHOOL CHILDREN
PROMOTING PHYSICAL ACTIVITY

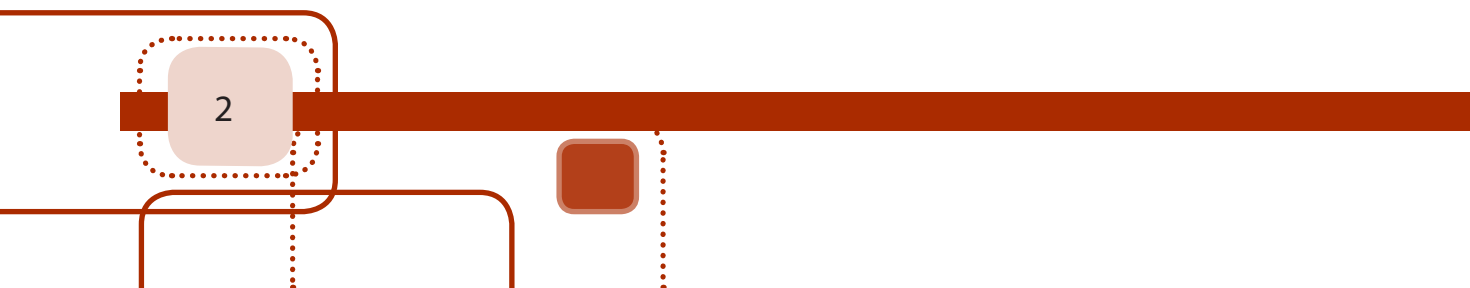


EUROPEAN REGION

World Confederation
for Physical Therapy

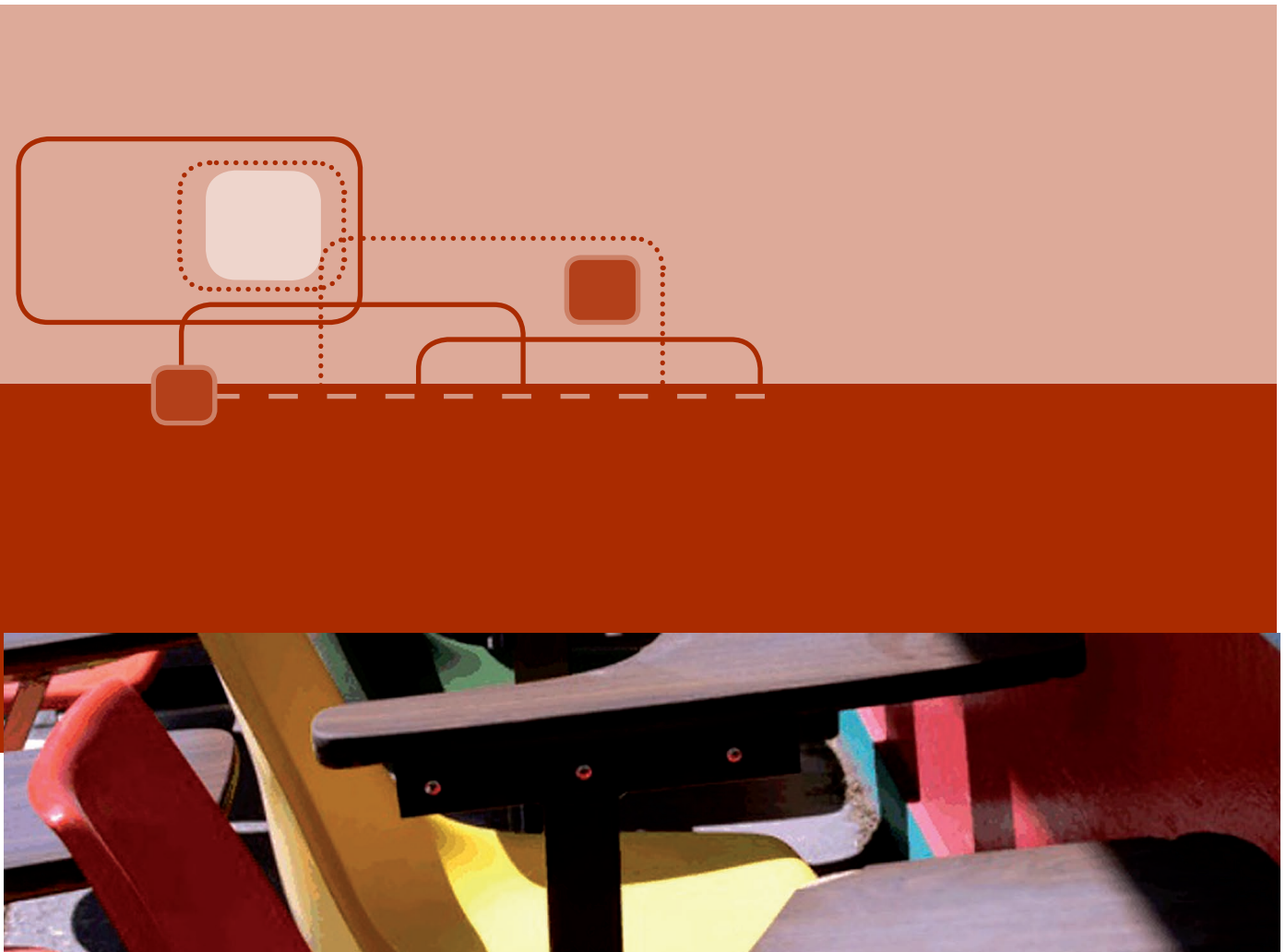


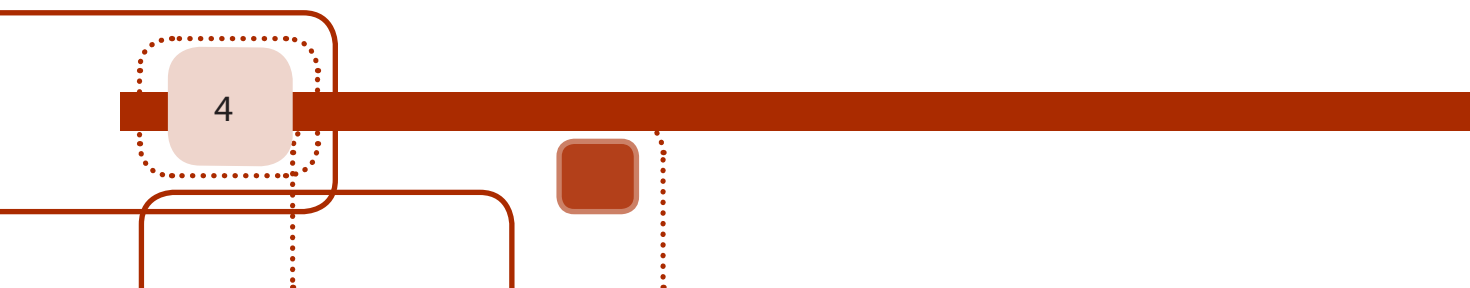
This project has been co-funded by the Executive Agency for Health Consumers under the Public Health Programme 2003 - 2008



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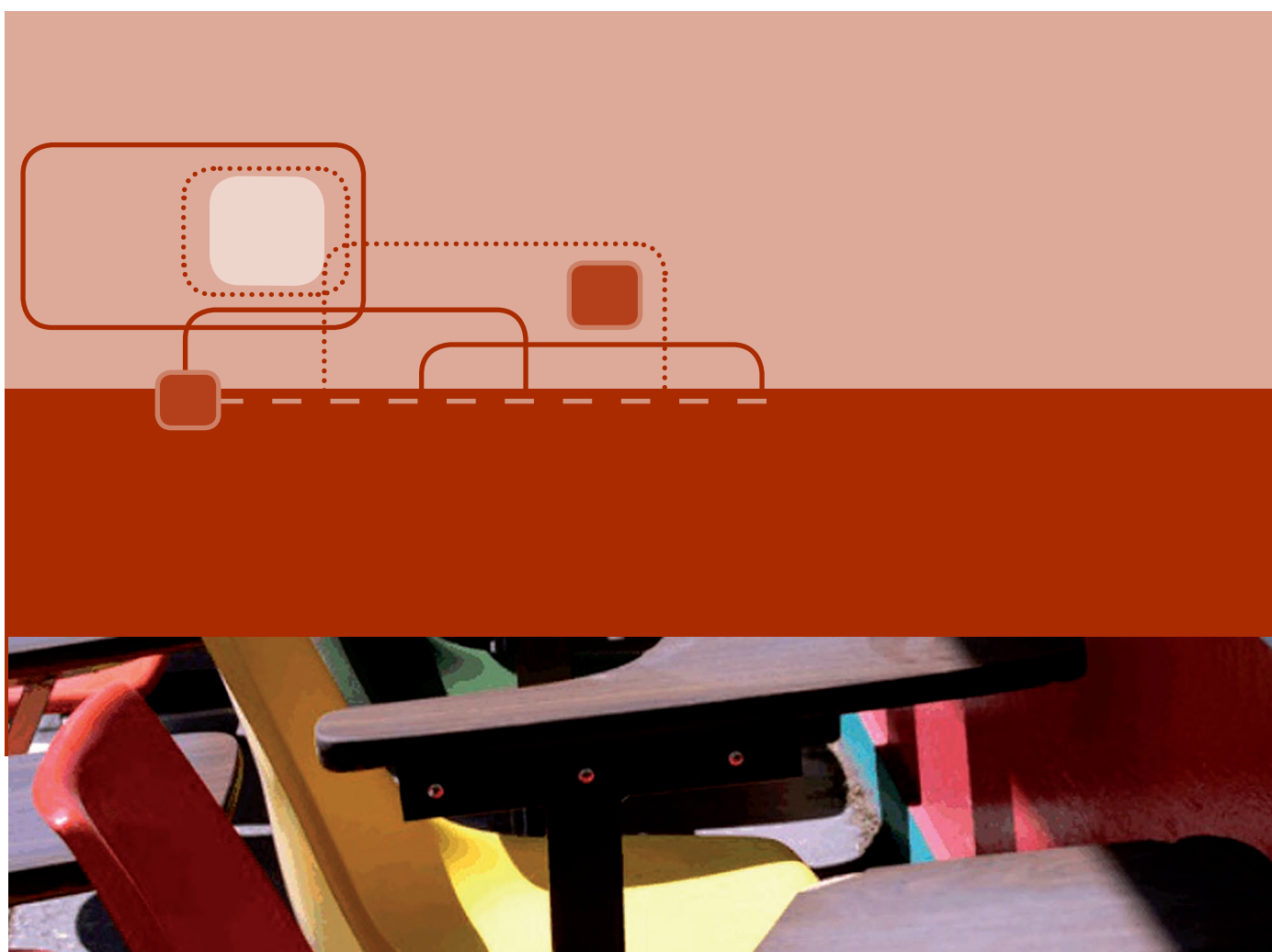
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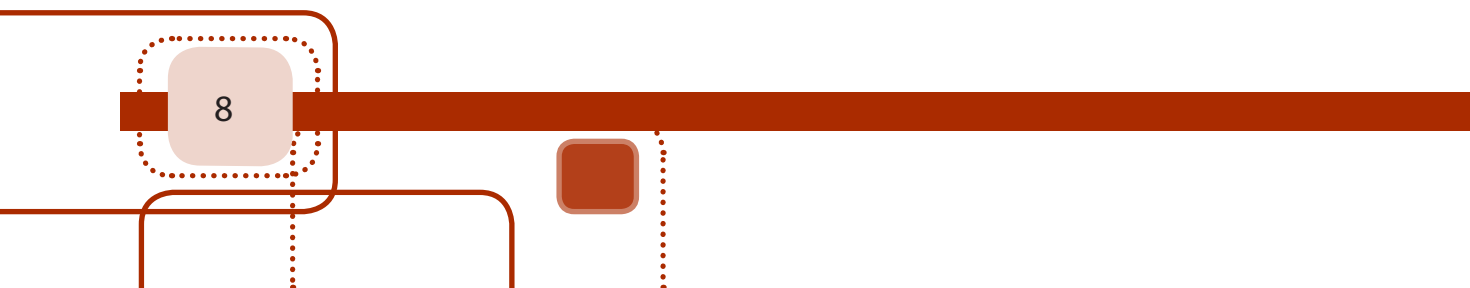
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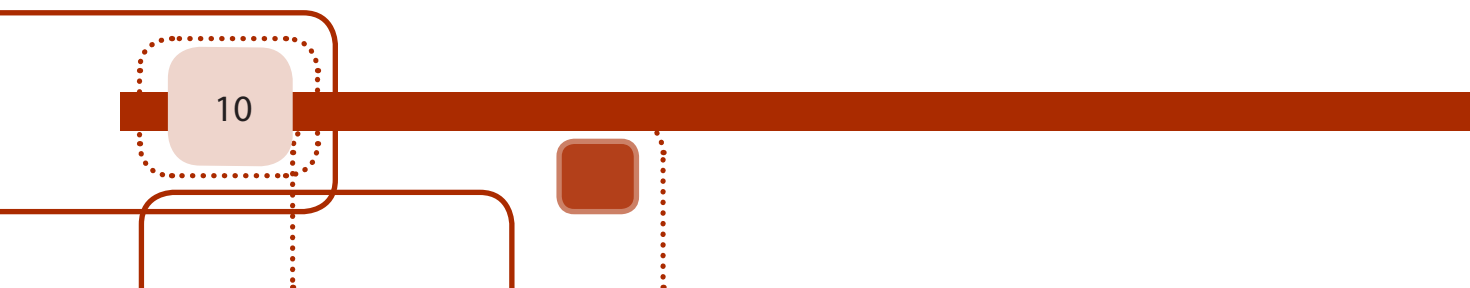
Introduction





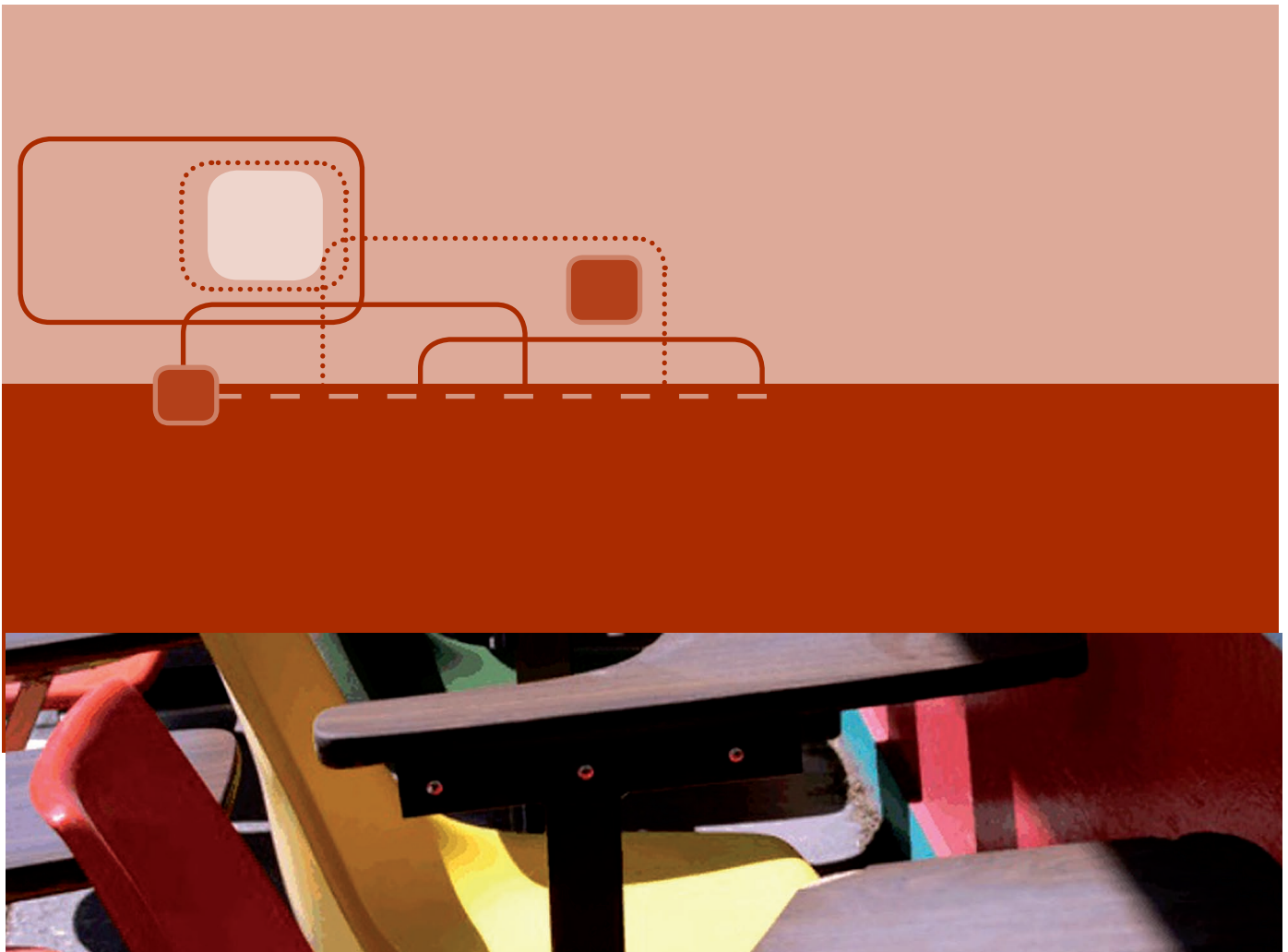
1 Introduction

The evaluation of interventions in the primary prevention of disease and in health promotion is more complex than in normal clinical studies. Unlike normal clinical studies measurements of direct effects cannot be made. In clinical studies e.g. for pharmaceuticals, surgery or for therapies the outcome is normally a directly measurable value. In interventions concerned with the primary prevention of disease and with health promotion the evaluation deals with associated influencing variables. No definite measurements can be made which compare the effects of the intervention Promoting Physical Activity in Primary School Children to the future prevalence of back pain in children and adolescents. This is because monitoring the group is not possible after the intervention had been completed. To support research on risk factors back pain itself is not considered directly. Instead the determinants that affect the occurrence of back pain are investigated.



2

Design of the Evaluation



2 Design of the Evaluation

The evaluation of interventions in the primary prevention of disease and in health promotion is more complex than in normal clinical studies. Unlike normal clinical studies measurements of direct effects cannot be made. In clinical studies e.g. for pharmaceuticals, surgery or for therapies the outcome is normally a directly measurable value. In interventions concerned with the primary prevention of disease and with health promotion the evaluation deals with associated influencing variables. No definite measurements can be made which compare the effects of the intervention Promoting Physical Activity in Primary School Children to the future prevalence of back pain in children and adolescents. This is because monitoring the group is not possible after the intervention had been completed. To support research on risk factors back pain itself is not considered directly. Instead the determinants that affect the occurrence of back pain are investigated.

2.1 Questions to be answered by the evaluation

Different tools are used for the collection of the data for the various parameters before and after the intervention. The analyses of the data will determine the answers to the following questions:

1. Does the intervention have an effect on the children in terms of the amount of the physical activity that they do?
2. Does the intervention have an effect on the children in terms of their physical fitness?
3. To what extent does the intervention have an effect on the children's knowledge of the relationship between physical activity and health?
4. To what extent does the intervention have an effect on the children's well-being?

The evaluation focused on the children. All other persons concerned with the investigation e.g. parents and teachers are not considered directly in the evaluation.

2.2 The intervention group

To assemble the intervention group from each class a pre-screening procedure is carried out using the physical activity questionnaire. The children, who are not in a sports club or who do not frequently undertake any other form of organised or non-organised physical activity form the intervention group. These children answer question 15 'Are you a member of a sports club?' and/or question 22 'Do you play any sport outside of a club?' with a negative response. The answer to question 22 however specifies the following responses:

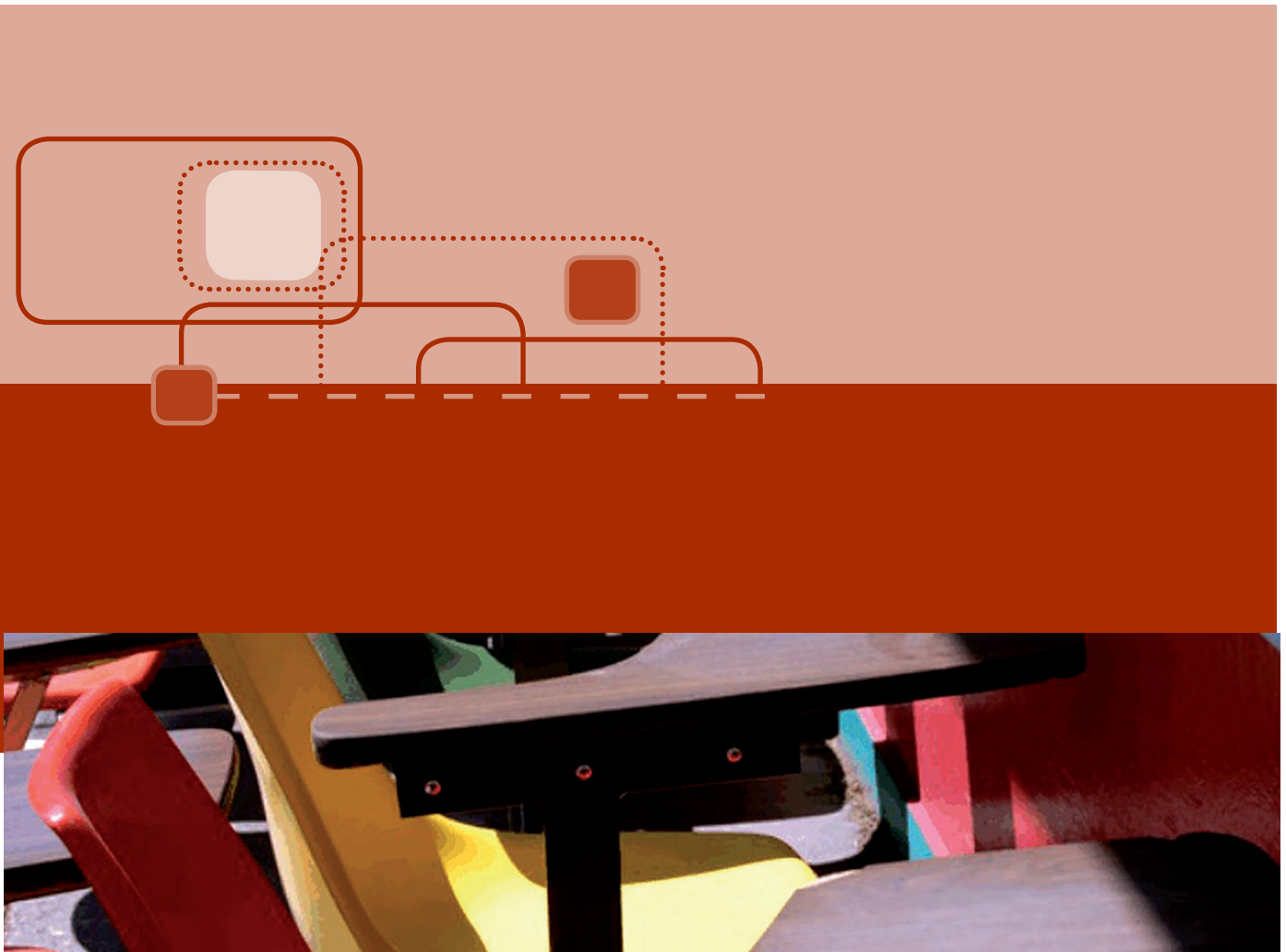
- at least twice a week
- for 60 minutes
- for a period of at least 9 months
- by sweating and getting shortness of breath/wheezing

2.3 The control group

The control group will be assembled in a similar school in the same way as the intervention group. After the pre-screening the children in the control group will be tested in the same way as the intervention group, but without the intervention taking place afterwards. The control group has also to be tested after the intervention and again 6 months later in exactly the same way as the intervention group.

3

Evaluation Tools



3 Evaluation Tools

The various evaluation tools which are used for the investigation of the different parameters are shown in table 1. All data collection will be made directly before and directly after the intervention, and for yet a third time six months later. In this way the amount by which the children's attitudes, behaviour and knowledge will have been reinforced can be monitored.

In this evaluation special care has to be taken to ensure that it can be carried out in a standardised way throughout Europe. As a result the questionnaire and the test modules used have to be very simple so that the distortions that occur (for example, during translation) can be kept to a minimum. A complex experimental setup could also cause such a distortion. It is therefore important to use tests, which can be performed in every facility where testing is carried out using standard equipment.

TAB. 1 EVALUATIONSPLAN

| Participant | Tools and main focus | Timing | Purpose |
|-----------------------|--|--|--|
| Children | Questionnaire in the form of an interview: to get information about the amount of physical activity inside and outside school. The questionnaire is a modified version of the one used for finding out about physical activity in the Kiggs study. | Before the intervention/ after the intervention/ 6 months after the intervention | To check if the children are more or less motivated to take part in more physical activity |
| Children | Test series on motor skills: to collect data about coordination, speed, flexibility, strength and endurance. | Before the intervention/ after the intervention/ 6 months after the intervention | To check if there is a change in coordination, flexibility, strength and endurance |
| Children | Body and physical activity quiz: this is filled out by the children to determine their level of knowledge about the relationships between physical activity and health. | Before the intervention/ after the intervention/ 6 months after the intervention | To check the children's residual knowledge after a period of 6 months |
| Children (6–11 years) | Kindl questionnaire: to collect data about the children's quality of life | Before the intervention/ after the intervention/ 6 months after the intervention | To check for any possible y changes in the children's well-being |

3.1 Physical activity questionnaire

A test module for motor skills (MoMo) was used as part of the German health survey for children and adolescents (KIGGS) which was carried out by the Robert Koch Institute. The module was developed by the Institut für Sport und Sportwissenschaften (Institute of Sports and Sports Science) at the University of Karlsruhe. The aim of this test was to collect data about the health of children and about their motor development. In addition to the motor skill test module, there was also a questionnaire about physical activity which was designed for children between 6 and 17 years old. This questionnaire will provide information about the amount of physical activity that the children do. This evaluation tool is composed of seven different sections:

1. General physical activity
2. Sports activities at school
3. Sports activities in everyday life
4. Availability of sports fields
5. Playing sports in your spare time at a sports club
6. Playing sports in your spare time outside a sports club
7. Other questions (the child's own interests in sport, and physical activity involving other members of the child's family)

This tried and tested evaluation tool should only be used with slight modifications in the current intervention (see appendix). As previously mentioned the questionnaire is to be used to determine if the intervention Promoting Physical Activity in Primary School Children has an effect on the amount of physical activity carried out by the children. In practice the group leader, or another person, who has received a brief period of instruction in the collection of data, will interview the children using the questionnaire and will fill in the answers.

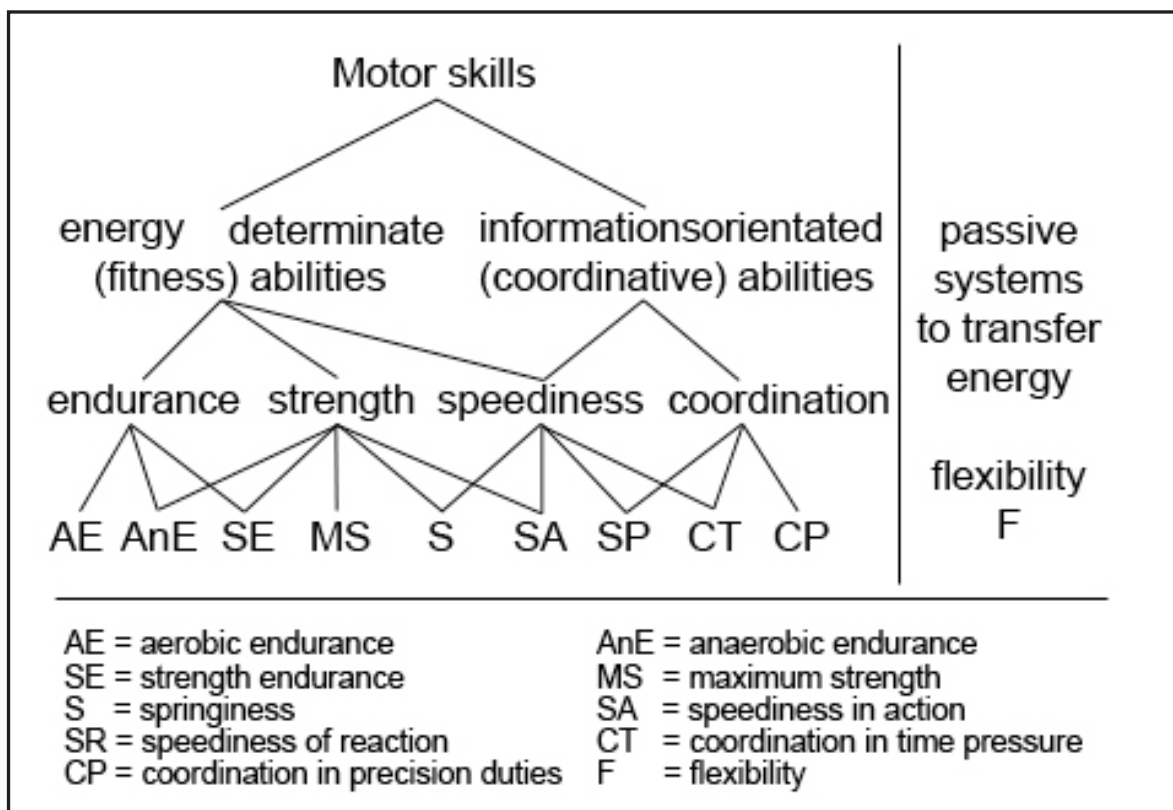
At the same time the questionnaire is used as a pre-screening procedure. The children selected to take part in the intervention group will be those who stated that they were not involved with a sports club, or who did not take part in any other regular physical activity.

The questionnaire has to be translated professionally for it to be used throughout Europe. It is important that the translation takes into account not only the linguistic differences, but also the cultural differences between countries (cross-cultural adaption). The American Academy of Orthopedic Surgeons (AAOS) has developed special guidelines for the standardised use of questionnaires across borders (Beaton et al. 2002).

3.2 Messung von motorischen Fähigkeiten

Bös (2001) arranged the motor skills into two groups: skills dependent on fitness and skills dependent on coordination. There is a further classification at a secondary level into endurance, strength, speed, coordination and flexibility. Flexibility could not be assigned to either the group determined by fitness or that determined by co-ordination. At a tertiary level there are 10 different components (AP – aerobic endurance, AnP – anaerobic endurance, SP – strength endurance, MS – maximum strength, J – ability to perform jumps, SA – speed of action, SR – speed of reaction, CT – coordination under time pressure, CP – coordination carrying out precise activities, F – flexibility).

FIGURE 1: MOTOR SKILLS ¹



¹ Bös (2001)

To determine the motor capability, motor skills tests used in sport are employed. These tests are specially designed exercises where the subject being tested has to achieve his or her maximum performance in a specific task. Attention must therefore be paid to the main criteria usually used in collecting data (objectivity, reliability and validity). The aim is to collect data about the motor abilities of the subject using defined standardised values (Banzer et al. 2004). The collection of the data concerning motor skills used in the intervention is intended to clearly determine:

- the performance level of the children before the intervention
- the change in the children's physical fitness after the intervention

To obtain an idea of the physical fitness of the participants and to further investigate whether the intervention affects their physical fitness throughout the investigation, a series of motor skills tests used in sport is to be employed. This is derived from a testing system for use with children developed by Professor Dr Klaus Bös at the Institut für Sport und Sportwissenschaften (Institute of Sports and Sport Science) at the University of Karlsruhe.

In order carry out the intervention throughout Europe the tests are to be made as easy to carry out as possible. The test system chosen is therefore particularly suitable, as this test system is very easy to set up and perform. It is also possible to carry the test out in every standard gymnasium without the need for any great expenditure on equipment.

The listed test exercises are monitored with regard to the quality criteria of objectivity, reliability and validity. Standard values for girls and boys between 6 and 17 years are available.

TABLE 2: THE MOTOR SKILLS TEST SERIES¹

| Description of the task | | Motor skills | | | | | Passive methods of expending energy |
|-------------------------|---------------------------|-----------------|------------------|-------------|-----------------------|------------------|-------------------------------------|
| | | Endurance AE | Strength SE S | Speed SA | Coordination CT CP | Flexibility F | |
| Locomotion movement | walking, running, jumping | 6 min | SLJ | 20 m | Bal bw, JS | | |
| Partial body movement | upper limbs trunk | | PU SU | | | SR | |

Logogram of the test items

¹ Deutsche Vereinigung für Sportwissenschaften 2007

3.2.1 Tasks for the test series

1. Speed: 20 meter shuttle run

Test objective

- Investigation of speed in action.

Task

- A distance of 20 metres has to be covered as quickly as possible.
- At the starting position the subject stands up straight with both feet behind the line.
- The audible signal will come from an external starter.
- The timing will end at the finish line.
- The subject being tested is tested twice.

Data collection

- Time of the run will be measured to an accuracy of within 1/10 second.

Data handling

- The faster of the two runs is used as the test value.

Setting up

- The starting line is the endline of the handball court, the finish line is the halfway line
- If there is no handball court 20 metres must be measured and marked out by hand.

Equipment

- Stop watch
- Handball court (or an alternative 20m distance)
- Cones for marking out the distance

Details

- The person being tested has to wear sports shoes.
- Training in the use of the stop watch could improve the accuracy of measuring.

2. Coordination when performing precise activities: balancing backwards

Test objective

- Investigation of coordination when carrying out activities involving precision.

Task

- Balancing backwards on each of 6 cm, 4.5 cm und 3 cm beams
- The starting position is the starting board
- The steps are counted until the first contact is made with the ground
- One practice going forwards and one going backwards is allowed
- There are two tests on each beam which will count as part of the intervention
- The task to be carried out must be demonstrated beforehand.

Data collection

- The number of steps are counted
- The first step on the beam is not counted; the counting should start only when the second foot is placed on the beam.
- The number of points for the test is the number of steps until the person being tested first touches the ground, or 8 points is entered as the test result.
- If the person being tested needs less than 8 steps to cross the beam, the test value is 8 points.

Data handling

- The test value is the sum of the points from all 6 tests

Setting up

- Fix the board and the three beams to the ground so they cannot slip.
- Use shims to stabilise the construction and to remove any unevenness in the beams

Equipment

- 6.0, 4.5 and 3.0 cm wide beams which are 200 cm long
- Start board, 40 x 40 cm and 5 cm high

Details

- The person being tested has to wear sports shoes.

3. Coordination under time pressure: jumping sideways

Test objective

- Investigation of coordination under time pressure

Task

- Jumping sideways to and fro over a midline on a piece of carpet with both legs together as fast as possible in 15 seconds.
- The subject being tested has five practice jumps before the start of the test.
- Two valid tests with a one minute pause in between
- The task to be carried out must be demonstrated beforehand.

Data collection

- The number of jumps achieved in 15 seconds are counted (to one side = 1, to the other side = 2, etc.)
- Jumps which land on the midline or those which land over the side lines, and jumps which are not achieved with both legs are not counted.

Data handling

- The test value is number of the jumps in the test which has the highest number of jumps.

Setting up

- The carpet has to be secured so it will not slip.

Equipment

- Stop watch
- Carpet which will not cause any slipping (50 x 100 cm) with a line down the middle.
- Double sided adhesive tape to secure the carpet

Details

- The person being tested has to wear sports shoes.

4. Flexibility: stand and reach

Test objective

- Investigation of the flexibility of the body.

Task

- The person being tested stands on a bench or on a specially made box and slowly bends his or her body forwards. The hands should reach parallel as far down as possible along a centimetre scale. The legs are to be kept straight.
- The stretched position which is reached has to be held for two seconds.
- The value will be read off from the farthest point where the fingers touch the scale.
- There are two valid tests and the test person should stand up straight in between.

Data collection

- The values of both tests need to be recorded.
- The scale below the level of the soles of the feet is positive and above the soles of the feet it is negative.

Data handling

- The highest value in relation to the level of the soles of feet is used as the test value.

Setting up

- A centimetre scale (with values under and above zero) is fixed to the bench or to a specially constructed box.
- The zero mark is at the level of the soles of feet. The value below the zero point is positive, above zero it is negative.
- The person being tested does not wear any shoes and the legs are to be kept straight.

Equipment

- Bench or box
- Scale in centimetres
- Adhesive tape

Details

- The person being tested does not wear any shoes

5. Strength endurance: press-ups

Test objective

- Investigation of the dynamic strength endurance of the upper limbs.

Task

- As many press-ups as possible in 40 seconds.
- At the start the person being tested is in a face down position with the hands touching each other behind the back or the backside (starting position). The hands are then moved to below the shoulders and the person being tested presses up until the arms are stretched and the body loses contact with the floor. Then one hand will be removed from the floor and brought to touch the other hand with only the hands and feet touching the ground. On the way down the arms bend until the body goes back to the face down position and the hands then go back in the starting position.
- Attention should be paid to the legs which have to be stretched and the back needs to be straight (it should not be hollow).
- The actual number of press-ups performed (always with the hands back in the starting position) in 40 seconds is counted.
- The task to be carried out must be demonstrated beforehand and the person being tested may practise two press-ups before the test.

Data collection

- The number of correctly performed press-ups in 40 seconds is counted.
- The criteria used for the test are that :
 - The hands and feet touch the ground.
 - Both hands touch each other once when they are both on the floor and when they are both behind the back.
 - During the press-up the legs and the body must leave the floor at the same time.

Data handling

- The test value is the number of correctly performed press-ups in 40 seconds.

Setting up

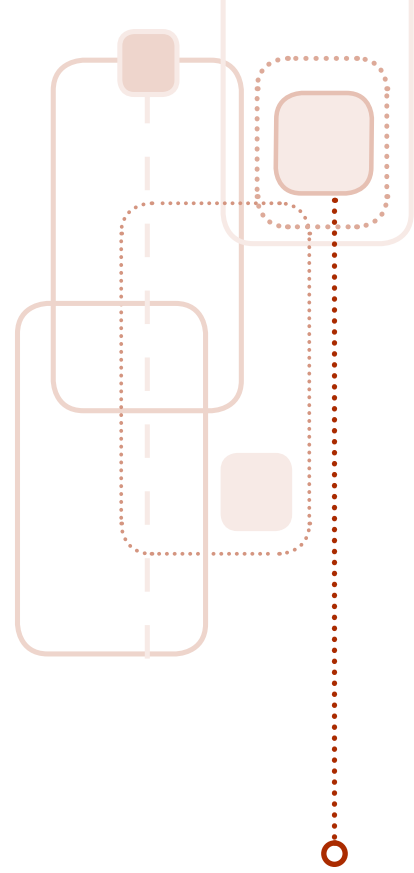
- The test will be performed on a gym mat.

Equipment

- Stop watch
- Gym mat

Details

- The person being tested has to wear sports shoes.



6. Strength endurance: sit-ups

Test objective

- Investigation of the strength endurance of the torso muscles

Task

- As many sit-ups as possible in 40 seconds.
- The person being tested lies on the back with the feet on the floor, the legs bent (at an angle of approximately 80°) and the hands folded behind the neck (starting position).
- From the starting position the upper part of the body has to move up until the elbows touch the knees.
- The person being tested is only tested once.

Data collection

- The number of correctly performed sit-ups in 40 seconds is counted.

Data handling

- The test value is the number of correctly performed sit-ups in 40 seconds.

Construction

- The test will be performed on a gym mat.

Equipment

- Stop watch
- Gym mat

Details

- The person being tested has to wear sports shoes.

7. Ability to jump: standing long jump

Test objective

- Investigation of the ability to jumps.

Task

- The person being tested has to jump as far as possible in one jump.
- Take off and landing must be carried out using both legs.
- Falling over backwards when landing is not allowed.
- The task to be carried out must be demonstrated beforehand and the person being tested may take two practice jumps.

Data collection

- The distance between the scratch line and the heel of the rear foot at the landing will be measured in centimetres.

Data handling

- The longer of two jumps is used as the test value.

Construction

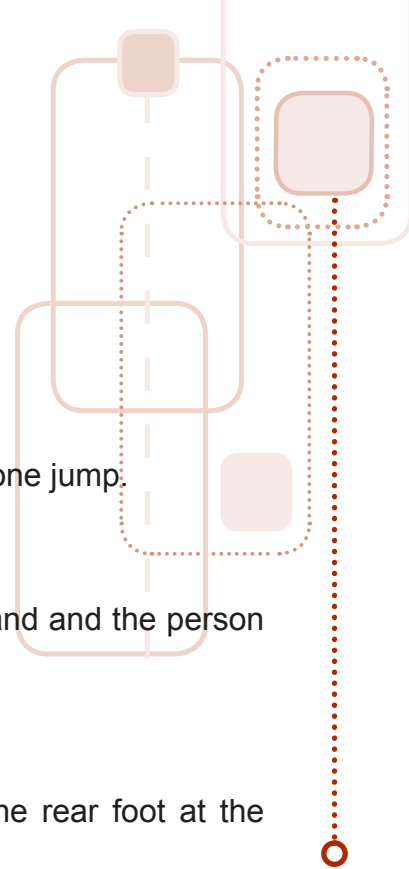
- The test will be performed on the gym floor or on a jump mat. When a jump mat is used, it has to be secured so that it will not slip.

Equipment

- Measuring tape
- Adhesive tape

Details

- The person being tested has to wear sports shoes



8. Aerobic endurance: 6 minute run

Test objective

- **Investigation of aerobic endurance by running.**

Task

- Run around a volleyball court as many times as possible.
- It is possible to build running groups of up to 10 pupils, but then the persons being tested need numbered bibs for identification.
- Both running and walking are allowed.
- During the run the remaining time needs to be announced at one minute intervals.
- At the end of the six minutes the persons being tested stay where they are and sit down, or run on the spot so the distance in metres remaining in their uncompleted circuit can be measured.
- Based on average values (for 6 to 8 years olds 24 seconds and for 9 to 12 years olds 20 seconds per circuit) the test leader or an assistant will set the tempo for the first two rounds to establish the pace for the run.

Data collection

- The distance (in metres) which is run in 6 minutes is recorded. This is obtained from the number of circuits (1 circuit = 54 metres if using the volleyball court) and the distance remaining in the uncompleted circuit.

Data handling

- The test value is the distance of the run completed (in metres) after 6 minutes.

Setting up

- The course is a volleyball court (9 x 18 metres).
- One circuit is a distance of 54 metres.
- The corners of the field (50 cm in from the corners) and in middle of the long side of the court must be marked.

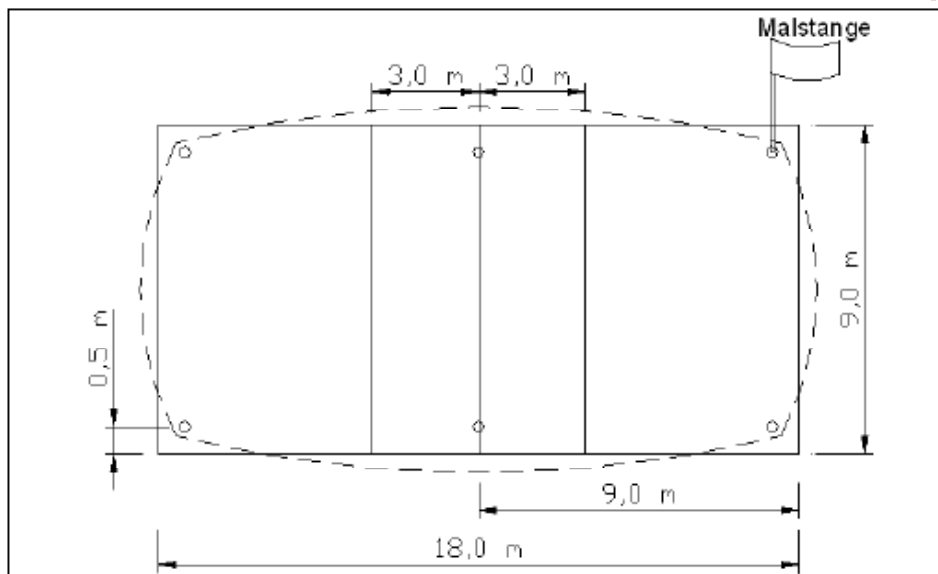
Equipment

- Stop watch

- 10 numbered bibs
- 6 poles or cones to mark out the course

Details

- The person being tested has to wear sports shoes.



3.3 Body and physical activity quiz

This body and physical activity quiz is suitable for children and is based on the theoretical content of the intervention which is provided by the group leader in the various lessons and worked upon by the children themselves in the work sheets. The 10 questions comprising the quiz (see appendix) reflect the content of the anatomy lessons on the one hand, and on the other hand they reflect the relationship between physical activity and health. With the aid of the cartoon characters the questions become more straightforward to answer in an enjoyable manner.

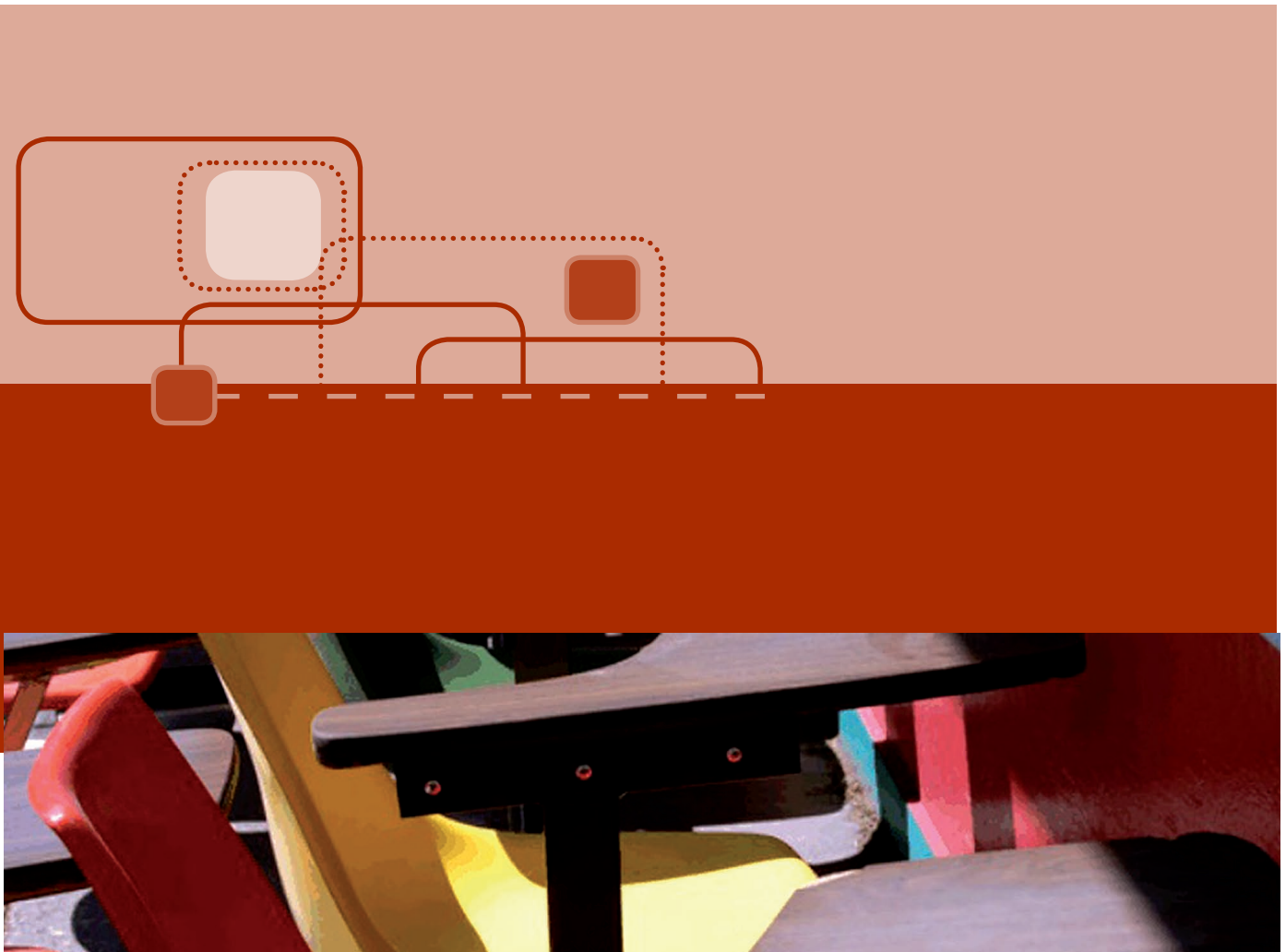
3.4 Kindl questionnaire about the quality of life

The KID or KIDDY-KINDL questionnaire developed by Ravens-Sieberer and Bullinger (1999) is used to collect data about the well-being of the children for the purposes of the intervention. This questionnaire is a multidimensional tool for collecting data about the children's quality of life in relation to health matters and focuses on the young people's mental and somatic well-being. This tool has already been used in several studies including international ones (HBSC); the psychometric results are shown to be both highly significant and highly reliable. This questionnaire on self-assessment is composed of six different parts:

1. physical well-being
2. mental well-being
3. self-esteem
4. family
5. friends
6. school

4

Limitations of the evaluation



4 Limitations of the evaluation

The current state of research makes it clear that the most promising way to prevent back pain in children and adolescents is to motivate them to carry out physical activity through play and by practising sports. The chances of success will become greater if this process is commenced sooner rather than later. For this reason the chosen target groups are children of primary school age.

The first limitation is that the internal validity of the intervention is reduced because of the quasiexperimental design. This means that in the evaluation of 'natural groups' (in this case - classes of children within the schools) it is not possible to make a randomized choice of the intervention groups and control groups.

Secondly some inaccuracies will emerge because the study is being carried out throughout Europe because of

1. The translation of the evaluation tools
2. Cultural difference
3. The different local circumstances in rural and urban regions.

Regarding the translation of the evaluation tools the focus is placed on the physical activity questionnaire. As already mentioned in 3.2.1 the problem will be dealt with by using the guidelines of the American Academy of Orthopaedic Surgeons (AAOS) concerning the translation of this kind of questionnaire. In this way linguistic inaccuracies, as well as inaccuracies due to cultural differences will be minimised.

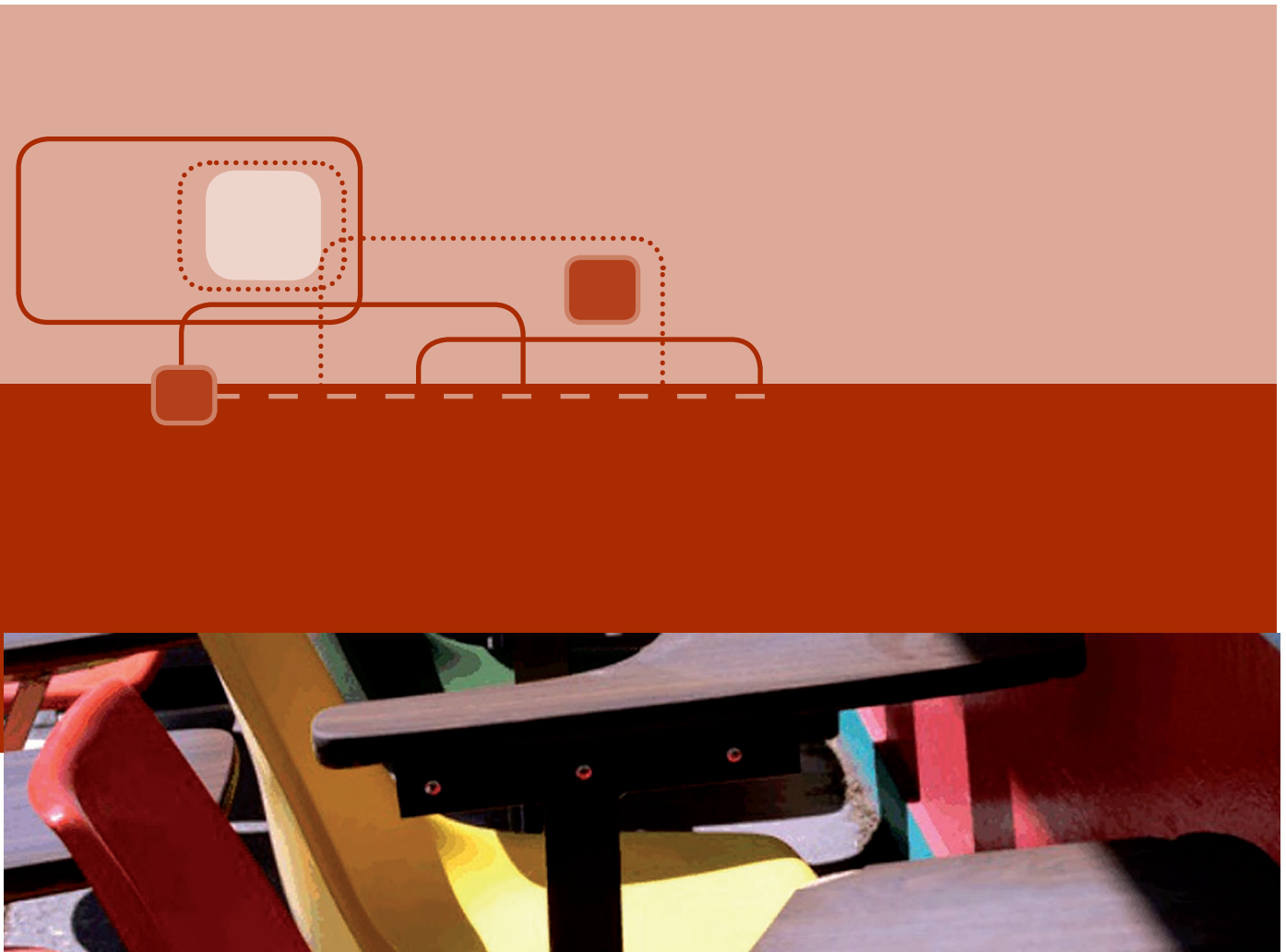
Concerning cultural differences the various structures and methods of operation used by the participating personnel and participating institutions (e.g. physiotherapists, schools, etc.) in the various European countries will be the main problem. An attempt will be made to overcome these problems using standardised methods of evaluation on the one hand, and on the other by using the flexibility offered by the concept when it comes to dealing with regional variations. While the concept of the intervention is able to adapt to the different needs of the various European member states because it is able to provide special options and offer different countries a range of preferences, the evaluation tools

to be used are standardised; as a result they are more readily acceptable and more widely applicable. This is also important if the data is to be collected consistently and later analysed at a central location in a consistent manner.

Different regional variations could occur between rural and urban areas within a single country as well as within Europe. This will therefore be taken into consideration in the analysis, and at the same time it will provide a comparison of rural and urban areas.

5

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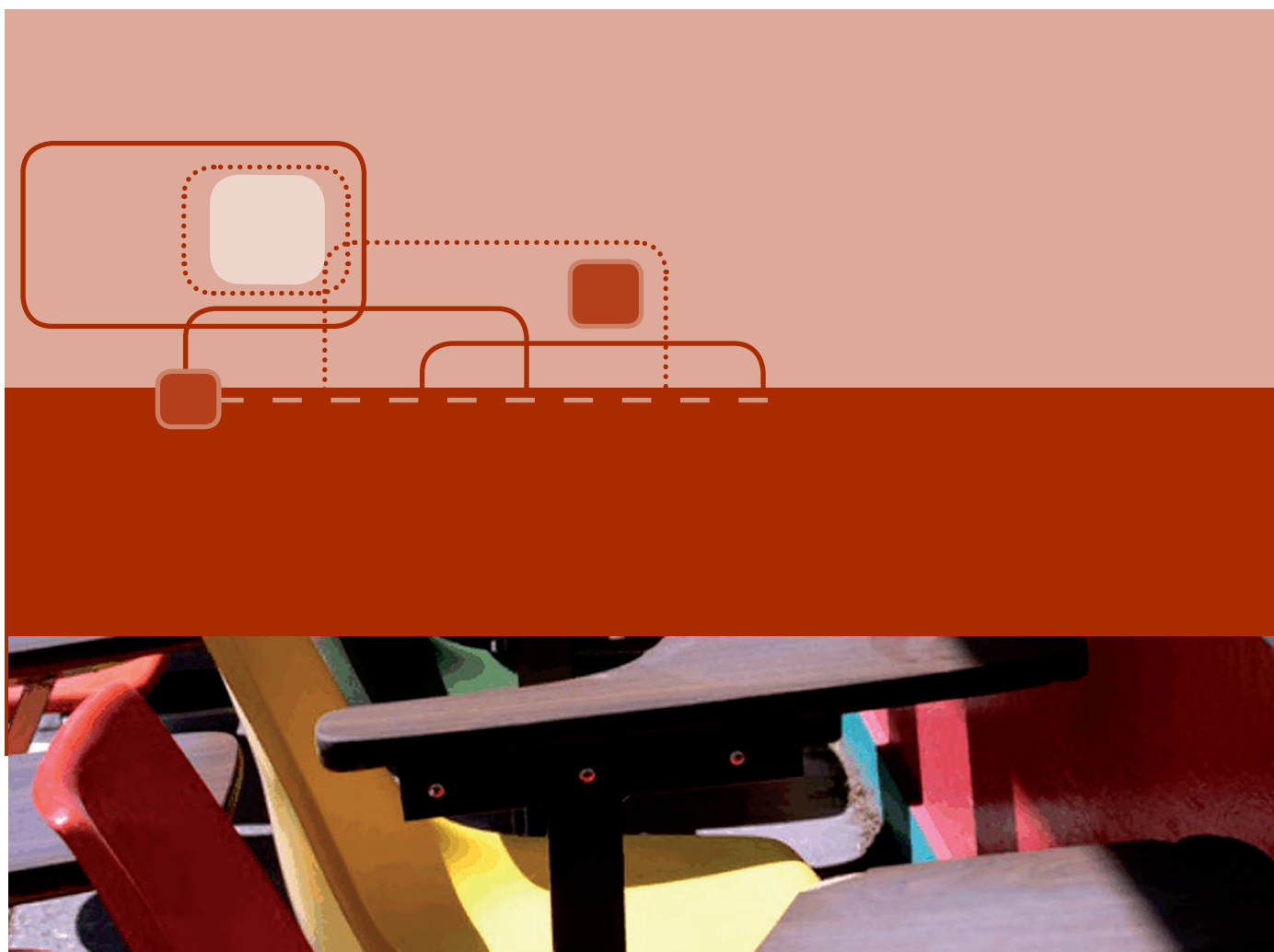


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6

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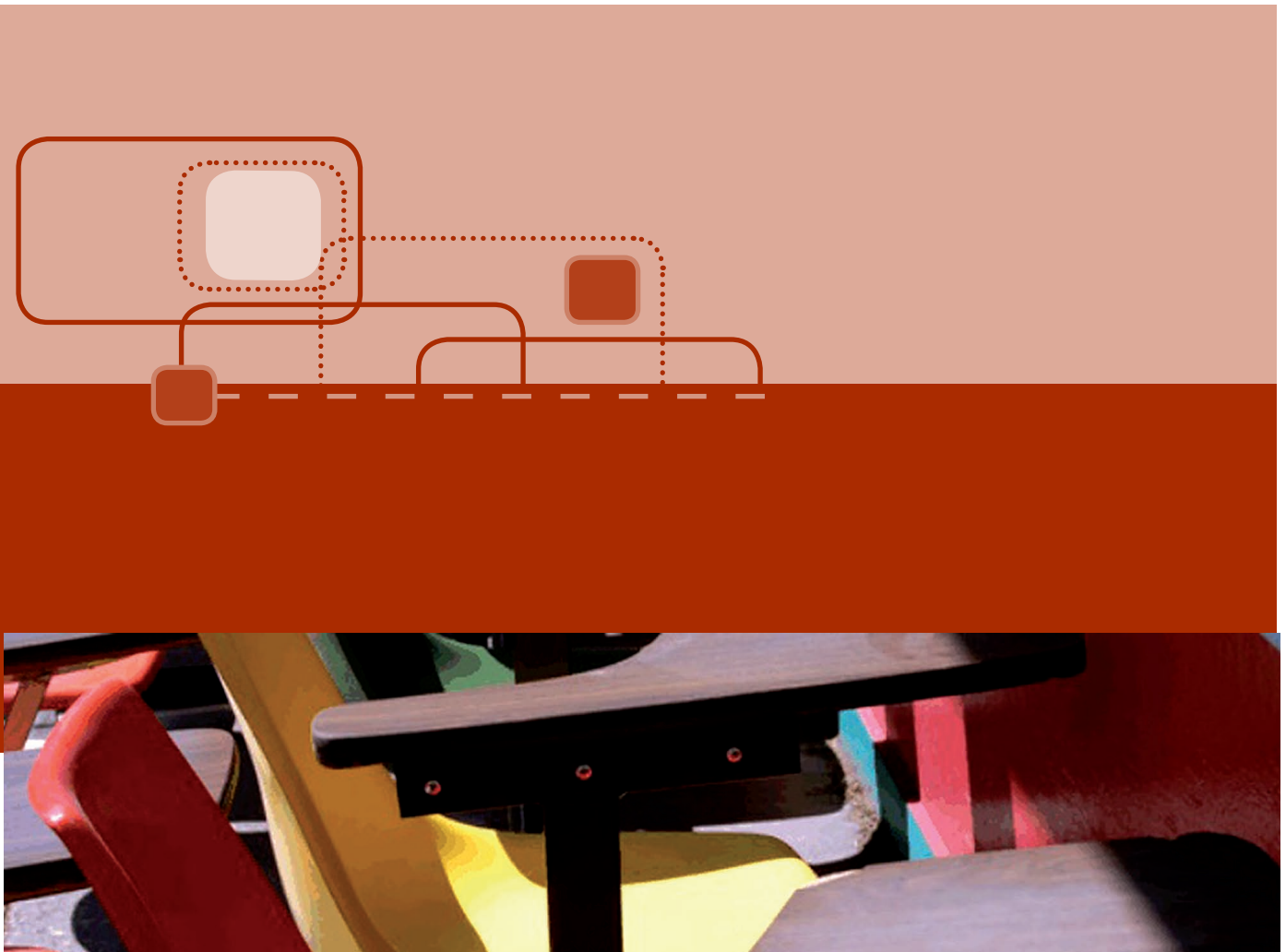
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Appendix



1 Appendix

1. Physical activity questionnaire
2. Request prior to the motor skills tests / parents' letter of consent
3. Test recording sheet
4. Appeal to data collectors
5. Body and physical activity quiz