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The effectiveness of the klapp method in adolescents with kyphosis

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Abstract

Introduction: In the aftermath of the COVID-19 pandemic, the dramatic increase in the use of mobile devices such as mobile phones and computers has had a significant impact on lifestyles, particularly among children. The prevailing hunted posture, often accompanied by passivity and sedentary behaviour, may affect children's physical development and cause pain in areas such as the cervical and lumbar spine, as well as respiratory problems in advanced stages. The Klapp method, developed to treat kyphosis, promotes stretching, mobilisation and strengthening of the spine, enhancing the sense of improved posture (Smith & Brown, 2015)

Aim: This study seeks to highlight the effectiveness of the Klapp method in correcting kyphotic posture in adolescents, an age group significantly affected by modern sedentary habits.

Methodology: The study is based on a review of the relevant literature, with a focus on publications from 2010 onwards. The analysis targets studies investigating the effect of the Klapp method on spinal deformities (Patel & Singh, 2020).

Sample and Method: The practical application of the Klapp method was tested on a sample of two adolescents (boy and girl) aged 14 years with kyphotic posture. The assessment included questionnaires, visual observation of posture, posture posture test, flexion test, measurement of thoracic mobility and application of Klapp exercises.

Conclusions: The Klapp method proved effective in improving posture and increasing thoracic mobility. The adolescents noted a significant reduction in pain in areas such as the neck and lumbar spine, as well as an improved sense of posture, confirming the positive effect of the method.

Keywords: Physiotherapy, kyphosis, adolescents, klapp method spinal deformities, scoliosis

Introduction

Kyphosis is a vertebral deformity characterized by an increase in the normal curvature of the thoracic spine beyond 40 degrees, leading to abnormal rounding of the upper back (Smith & Brown, 2015) ^[13]. It is one of the most common problems that can occur throughout life from childhood and adolescence to old age (Todd J. *et al.*, 2006) ^[16]. The most common type is functional kyphosis which is the result of incorrect posture and can be corrected actively, by the patient, or passively. It is usually treated conservatively by means of a targeted therapeutic programme of exercise and training in correct posture. In the case of secondary kyphosis, such as in the case of severe power bending, we adapt our program to the patient's needs.

Another type is organic/rigid kyphosis. This category includes any form of kyphosis that cannot be corrected by the patient and in most cases is due to alterations of the vertebrae (e.g. Scheuermann's disease, Pott's disease, senile kyphosis and others), (Kotzaelias D. 2011) ^[6]. This kyphosis can be observed from childhood to old age. In some circumstances it is pre-existing and in others it occurs during adulthood. Some of the most well-known causes leading to flexible or rigid kyphosis are an injury, developmental abnormalities, degenerative disease, inflammatory rheumatic disease, infectious diseases, surgical procedures, neuromuscular diseases and incorrect posture (L. Solomon *et al.*, 2007) ^[14].

During adolescence, the incidence of kyphotic deformities has increased, particularly due to prolonged use of digital devices such as mobile phones and computers.

The COVID-19 pandemic has exacerbated the situation, with an increase in sedentary lifestyles leading to problems such as neck, back and back pain, and in advanced cases,

difficulties in respiratory function ((Hristara *et al.*, 2014) ^[4]. The Klapp method, is an active therapeutic exercise that aims to stretch, mobilize, and strengthen the spine, offering both pain reduction and postural improvement (Patel & Singh, 2020) ^[9]. The advantages of active exercise are many more compared to those of passive effect. This is because through the active participation of the patient and continuous training of the motor and static muscles of the body, a good sense of posture is achieved which is the ultimate goal of the klapp method.

Rudolph Klapp, developer of the method, aimed to stretch and strengthen muscles by all fours positions, easily applied and that can be used in small groups (Iunes DH, *et al.*, 2010, Fischinger B, 1984) ^[2, 7, 3]. Klapp noted that bipedal animals have scoliosis, while quadrupeds not. Therefore, such primitive positions would allow vertebrae repositioning, leading to spine realignment (Fig. 1, 2).



Fig 1: Spinal alignment



Fig 2: Position of the spine

Doctor Klapp realized that incorrect posture leads to rapid muscle dysfunction between the back and abdominal muscles, which negatively affects the position of the spine. He also observed that in quadrupeds, scoliosis never occurs. Thus the method based on this theory consists of exercises mainly in the quadrupedal position. The quadrupedal position blocks certain parts of the spine making it possible to move only in the affected areas. Also importantly, it made it known that the spine ensures static and dynamic function while creating a protection for the nerves and blood vessels. In his opinion the most important and sensitive ages are, as soon as the infant starts to support his body, the age of six and adolescence (Hristara *et al.*, 2014) ^[4].

The method is widely applied, from the correction of vertebral deformities such as kyphosis, lordosis and scoliosis, to the treatment of thoracic cage abnormalities and thoracic cage shape changes after thoracoplasty, as well as in the treatment of spinal muscle interference from polio and spinal osteochondrosis (Thomson & Green, 2014) ^[15]. The main categories of Klapp exercises include flexibility, mobilisation, lengthening, correcting incorrect postures and strengthening, aiming to provide comprehensive spinal care. With the Klapp method it is possible to perform and incorporate more difficult and complex exercises slowly and gradually progressing towards correct posture and alignment

of the spine and improving muscular balance in the trunk. Its beneficial effects in the correction of idiopathic scoliosis, both in children and adults, have been extensively documented by a large international literature (Dantas *et al.*, 2017) ^[1]. In the present study, the Klapp method is evaluated as a therapeutic approach for the correction of vertebral deformities, with a particular focus on kyphosis. The study also builds on previous studies, such as that of Lunes *et al.*, (2010) ^[7] and Dantas *et al.*, (2017) ^[1], examining the application and results of the Klapp method in cases of scoliosis and kyphosis.

Literature Review

Prior to commencing the study, a literature review was conducted to search for previous research on the effect of the Klapp method on spinal deformities, utilising databases (Table 1). Studies from 2010 onwards were used, with keywords such as "children", "physiotherapy", "kyphosis", "Klapp method", and "scoliosis" (Smith & Brown, 2015) ^[13]. The choice of this particular method in the treatment of scoliosis is more widespread, in relation to the treatment of kyphosis. There is quite a bit of research on its effect on scoliosis, as opposed to the effect on kyphosis, for which research is nil.

Table 1: The effect of the Klapp method on spinal deformities, utilising databases

Researchers	Purpose	Sample	Results
Denise H Lunes <i>et al.</i> , 2010 ^[7]	Efficacy of the klapp method for the treatment of scoliosis by computer-assisted biophotogrammetry	16 students of average age 15 years with idiopathic scoliosis.	The klapp method was an effective therapeutic approach to improve shoulder symmetry. An increase in elasticity was observed in the hip joints and IDC. It was not effective in thoracic kyphosis & cervical lordosis.
Dantas <i>et al.</i> , 2017 ^[1]	Effect of the klapp method in adolescents with idiopathic scoliosis.	22 teenagers, 12 people in the O.P. & 10 people in the O.E. (inactivity). O.P performed 8 klapp exercises, 3 times/week, 50 min for 20 sessions. Measurement of dorsiflexion strength with dynamometer.	The results showed an improvement in the strength of the extensor muscles in the O.P. which in the long term leads to better posture. Cobb angle did not seem to improve.
Thaynná de Oliveira Fernandes, Alessandro Pin, 2020 ^[17]	Comparison of the effectiveness of Klapp and GPR (Global Postural Re-education) methods in the treatment of idiopathic scoliosis.	People between 20 and 30 years of age of both sexes with idiopathic scoliosis.	Details of the stretches and postures used in both methods are described, focusing on various muscle groups and postural corrections. Inclusion and exclusion criteria for the study are also detailed.
Nelkie Xyza Butel <i>et al.</i> , 2022	Evaluation of the impact of Klapp exercises provided through postural rehabilitation on health-related quality of life and spinal curvature in patients with scoliosis.	30 patients. The Klapp exercise was performed for 20 sessions, five times a week.	Klapp exercises provided through tele-rehabilitation reduce the degree of spinal curvature (p=0.05) and increase the quality of life (p=0.000) of patients with scoliosis, but there is no significant difference in terms of pain intensity (p=0.257).
Elena Amaricăi, 2016 ^[18]	Comparison of different kinetic methods, including the Klapp method, in the treatment of idiopathic scoliosis in adolescents.	9 adolescent patients, aged 14 to 17 years, diagnosed with various forms of idiopathic scoliosis	Height, body weight and scoliosis curvature (measured by the Cobb angle) were assessed at the start of the mobility programme and after 6 months of rehabilitation. Due to the small sample size, it was not possible to draw conclusions about the statistical effectiveness of the three treatment methods. However, both the Schroth method and the Vojta method, in addition to conventional therapy, are therapeutic options in adolescent idiopathic scoliosis.

Analysis of Studies

The studies selected for the literature review included research focusing on method klapp. The study (Iunes *et al.*, 2010) ^[2, 7] addressed the effectiveness of the Klapp method in the treatment of scoliosis, through quantitative analysis using computerized biophotogrammetry. Sixteen students with an average age of 15 years with idiopathic scoliosis were treated with the Klapp method. To analyze the treatment effects, they were photographed before and after the treatments, following a standardized photographic method. All photographs were quantitatively analyzed by the same examiner using ALCimagem 2000 software. The results of the research showed that the Klapp method was an effective therapeutic technique for dealing with trunk asymmetries and improving its flexibility. However, it was not effective for changes in pelvic asymmetry, head positioning, cervical lordosis, or thoracic kyphosis. Klapp method was effective for gibbosity stabilization and it improves spine extensor muscle strength. O Dantas *et al.*, (2017) ^[1], in their research argue that ineffectiveness in changing body symmetry in study participants, after intervention, may have occurred because of minimal body asymmetries, in some measures were less than a degree of deviation. Postural changes are frequent in children and adolescents, because in this development stage, posture undergoes many adjustments and adaptations to body changes demanded by biopsychosocial factors (Savian *al.*, (2011) ^[11]). Some of these changes are inherent to the child’s postural development and tend to disappear during growth, as lumbar hyperlordosis, knee valgus and internal hip rotation Segura DC *et al.*, (2011) ^[12]. On the other hand, some asymmetries might be caused by daily demands on the

body and result in negative impacts on posture during childhood and adult age (Savian *et al.*, (2011) ^[11], Segura DC *et al.*, (2011) ^[12]. O Thaynná de Oliveira Fernandes *et al.*, (2020) ^[17], refer that the Global Postural Reeducation (GPR), conceived in the 80s by Philippe Souchard, consists of the muscular work in chains, thus allowing the reorganization and restoration of the muscle’s maintainers of posture. The klapp method was developed by Rudolf Klapp in the decade of 40, after the observation that only Bipedes had scoliosis, where they were made activities on quadruped position, attenuating the strength of gravity on the spine. Our purpose was to compare the two therapeutic methods in the treatment of idiopathic scoliosis adulthood. Both methods reduced the scoliosis present in subjects after the treatment period as compared to the increase seen in the control group (6.7%), with a slight advantage for the klapp method (a reduction of 21%) in relation to the RPG (a reduction of 17.5%). But the results were not significant. Although both methods have reduced the Cobb angle, showing a clinical relevance of results, this reduction was not statistically significant. The reduced sample size certainly influences here, requiring research in larger groups to obtain more reliable results. O Nelkie Xyza Butel *et al.*, (2022), in their research argue that Klapp exercises delivered via telerehabilitation can improve the quality of life of patients with health-related scoliosis. Given that a-patients have good internet connection, consistent follow-up, and good adherence to specialist instructions for therapist intervention. H Elena Amaricăi (2016) ^[18], in their research refer that the evolution of scoliosis pacienților using different treatment methods kinetotherapy. Another objective is the reprezentat

of relief area methods that are never efficient in treatment at the point of seeing the duration of recovery, at the time the patient's presence in the kinetherapy room is to preserve the core muscles. Adolescent patients, who have recovered between the ages of 14 and 17, have been diagnosed with various forms of idiopathic scoliosis and have been trained in three years for treatment purposes. Height, body weight and scoliosis curvature (measured by the Cobb angle) were assessed at the start of the movement program and after 6 months of rehabilitation. Due to the small sample size it was not possible to draw conclusions about the statistical effectiveness of the three treatment methods. However, both the Schroth method and the Vojta method, alongside classical therapy, are therapeutic possibilities in adolescent idiopathic scoliosis.

The results of the literature review indicate that the Klapp method contributes to the stabilization of the spine and improves the strength of the extensor muscles of the spine. It may be a feasible and practical method of treatment for the prevention and rehabilitation of spinal deformities.

Methodolog

Sample

The study was conducted in the 1st High School 1 of Patras and the aim was to evaluate the effectiveness of the Klapp method in adolescents with kyphosis. Two adolescents, one boy and one girl, aged 14 years, presenting kyphotic posture, participated. The study involved two adolescents and the exercises lasted one month with a total of 8 treatment sessions, thus limiting our ability to generalize the findings to a larger population. Prior to the start of the study, informed consent was obtained from the participants' parents. The evaluation process included several activities.

Limitations of the Investigation

The first and most important limitation of the study was the small sample size and the limited time to implement the Klapp exercises. In addition, the lack of a comparison group or a long-term follow-up program limited our ability to assess the durability of the results. It is important in future studies to expand the sample and increase the duration of the treatment program to achieve greater statistical significance and allow for comparative evaluation with other methods or approaches.

Initiation of the investigation

The survey began by completing a 13-question questionnaire aimed at collecting data on physical activity, mobile phone use habits, pain experience and general knowledge or experience of the Klapp method. The children were then assessed which included:

A. visual observation of posture from the standing position (on the side) for:

- Existence of kyphosis and
- Checking the shoulders for inward rotation/shoulder blades in abduction; downward rotation,
- View of the cervical spine ,
- Inability to straighten the spine.

The girl: Observation showed a canine posture with shoulders in inward rotation and shoulder blades in abduction-downward rotation and suppression. No projection of cervical spine or lumbar lordosis or inability to straighten the spine was observed (Fig. 3).



Fig 3: Kyphotic posture before intervention

The Boy: Observation showed a pronounced kyphotic posture with the shoulders in internal rotation and the scapulae in abduction-down rotation and avulsion. It also had a small anterior projection in the cervical spine and an anterior tilt of the pelvis. No inability to straighten the spine was observed (Fig. 4).

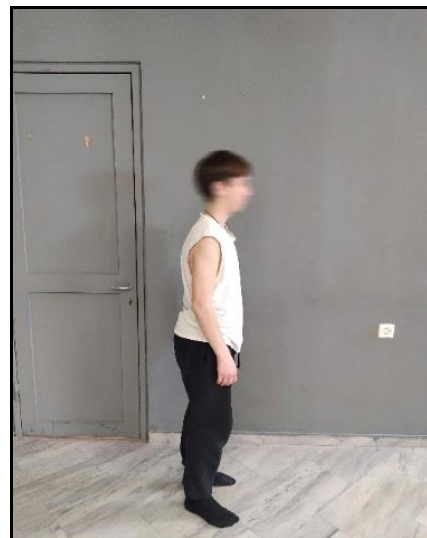


Fig 4: Kyphotic posture before intervention

B. The fingertip-to-floor test. Distance of fingers from the ground to measure the elasticity of the spine

Girl: Fingers touched the ground

Boy: 11 cm distance of the fingers from the ground

c. The measurement of the mobility of the thorax, for the existence of hypomobility of the thorax (less than 5 cm). The measurement was made at the following points:

Under the armpits (inhalation - exhalation)

(inhalation - exhalation); and

Under the rib cage (inhalation - exhalation), under the rib cage (inhalation - exhalation).

The values found in the measurements in the boy and girl are shown in the table below. The difference in measurement in inhalation and exhalation below 5cm reveals the degree of reduced thoracic mobility in the respective regions (Table 2, 3).

Table 2: Pre-Intervention Assessment for a Male Subject

Category	Measurement Under the Armpits	Xiphoid Process	10th Rib
Inhalation (cm)	87	76	75
Exhalation (cm)	83	73	73
Difference (cm)	4	3	2

Table 3: Pre-Intervention Assessment for a Female Subject

Measurement Category	Under the Armpits	Xiphoid Process	10th Rib
Inhalation (cm)	80	66	67
Exhalation (cm)	77	64	65
Difference (cm)	3	2	2

After the assessment stage was completed, participants attended a therapeutic Klapp exercise program. The program was done twice a week for 50 minutes for one month. Neck and upper/lower limb stretches and isometric exercises were performed on the mattress from a quadrupedal position prior to the application of the exercises. The following Klapp exercises were applied as shown in the following pictures (Fig.5, 6, 7, 8, 9, 10, 11):

Four point walk followed by two point walk & back walk: This exercise is basic, it is a mobility exercise and always applied at the beginning of the program.



Fig 5: Four point stepping

Breathing exercise from a kneeling position: (raising hands with inhalation - lowering hands with exhalation).



Fig 6: Breathing exercises

Simple bounce glide with simultaneous breathing: (a stretching, strengthening and corrective exercise).



Fig 7: Simple glide

Bunny hop: (for stretching and strengthening).



Fig 8: Jumping the hare

Breathing exercise from a quadrupedal position: Inhalation with head elevation and lordosis of the anterior tilt of the pelvis and exhalation with head descent and kyphosis of the anterior tilt of the pelvis .



Fig 9: Induced lordosis



Fig 10: Breathing out - kyphosis



Fig 11: Greetings

Greetings: (For stretching and mobilization of the thalamus).

Results

The study showed positive results in both the epiphysis test and chest mobility, and the subjects themselves reported a better sense of posture.

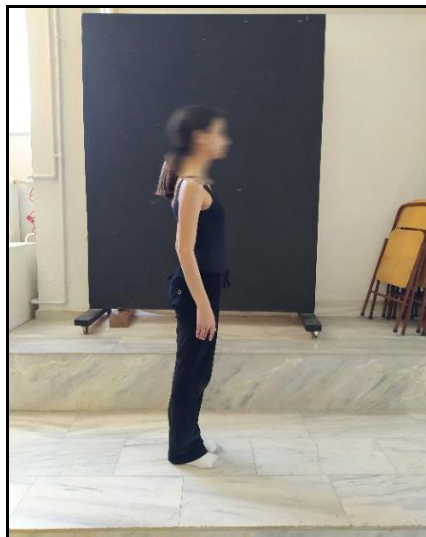


Fig 12, 13: The posture after the intervention

Improving posture as shown in the images below (Fig. 12, 13):

Both children after the intervention had improved posture with a reduction in medial shoulder rotation and scapular abduction and the boy additionally showed a reduction in anterior head projection.

1) The finger tip-to-floor test (Table 4).

The boy showed 2 cm improvement in the finger tip-to-floor test after the Klapp intervention .

Table 4: Finger-to-Floor Distance Measurement Before and After Intervention

Subject	Distance Before (cm)	Distance After (cm)
Male	11	9
Female	0	0

2) Improving the mobility of the chest

The boy before the intervention showed hypomobility of the thorax in all three points measured with a tape measure. Three measurements were performed, namely under the armpits with a hypomobility of 4 cm (below normal 5 cm), at the xiphoid process with a hypomobility of 3 cm and at

the 10th rib with a hypomobility of 2 cm. After the intervention there was a huge improvement in thoracic mobility and in particular the measurement under the armpits reached 8 cm above normal, in the xiphoid process reached 11 cm above normal and the measurement on the 10th rib reached 8 cm (Table 5).

Table 5: Respiratory Measurements for a Male Subject Before and After Intervention

Measurement Category	Before Intervention	After Intervention
Under the Armpits		
Inhalation (cm)	87	90
Exhalation (cm)	83	82
Difference (cm)	4	8
Xiphoid Process		
Inhalation (cm)	76	80
Exhalation (cm)	73	69
Difference (cm)	3	11
10th Rib		
Inhalation (cm)	75	76
Exhalation (cm)	73	68
Difference (cm)	2	8

The girl before the intervention showed hypomobility of the chest at all three points measured with a tape measure. Three measurements were performed, namely under the armpits with a thoracic hypomobility 3 cm below normal, at the xiphoid process with a hypomobility of 2 cm and at the 10th rib with a hypomobility of 2 cm. After the Klapp intervention the girl showed a great improvement in thoracic mobility, namely the measurement under the armpits reached 11 cm, in the xiphoid process reached 14 cm and the measurement on the 10th rib reached 8 (Table 6).

Table 6: Respiratory Measurements for a Female Subject Before and After Intervention

Measurement Category	Before Intervention	After Intervention
Under the Armpits		
Inhalation (cm)	80	86
Exhalation (cm)	77	75
Difference (cm)	3	11
Xiphoid Process		
Inhalation (cm)	66	76
Exhalation (cm)	64	62
Difference (cm)	2	14
10th Rib		
Inhalation (cm)	67	68
Exhalation (cm)	65	60
Difference (cm)	2	8

Treatment Program

The treatment program consisted of Klapp exercises twice a week for 50 minutes with a total of 8 treatment sessions over a period of one month. Before the start of each session, neck and upper/lower limb stretches were performed, as well as isometric exercises in a quadrupedal position. Klapp exercises included four point walking, twopoint walking and backward walking, which are basic mobility exercises and are usually applied at the beginning of the program. Guidance on proper bed positioning, encouragement of symmetrical posture in the sitting and standing positions, and training in proper walking posture with emphasis on posterior scapular projection exercises for a more upright posture were also necessary. The klapp exercises increase the strength of the extensor muscles of the spine. Also are used to facilitate and flex the muscles of the spine. Stretching and strengthening exercises for the thoracic region have been shown to provide improvements in pain and thoracic kyphosis.

Results

The study recorded positive results in the improvement of the epiphysiological test and in chest mobility. In addition, participants reported an improved sense of posture, with a reduction in internal shoulder rotation and shoulder blade abduction. Specifically, the boy showed an improvement in thoracic mobility at the three measured points and a reduction in anterior head projection, while the fingertip-to-floor test improved by 2cm. In the girl there was also a significant improvement in thoracic mobility at the three measured points.

In conclusion, the Klapp method is an effective therapeutic approach in improving thoracic mobility and enhancing overall posture in adolescents with kyphosis. Specifically, improvement was observed in both spinal flexibility and thoracic mobility, with a marked reduction in distance on the flexion test and significant improvement in measured

points. At the same time, participants reported better postural sensation and a reduction in pain in areas such as neck and back. This method improves spine extensor muscle strength.

The methodology and results of the present study provide suggestive evidence of the effect of the Klapp method on improving posture and thoracic mobility in adolescents with kyphosis. However, further studies with a larger sample size and long-term follow-up are needed to confirm and extend the findings.

Discussion

Lack of movement and prolonged and incorrect sitting position contributes to the increase in the incidence of spinal deformities in children. Early postural control in children is crucial to prevent the development of musculoskeletal problems that will develop and possibly persist into adulthood. Very important to give instructions as to the training of correct standing and sitting posture during reading, the weight of the school bag and the correct way to wear the school bag. Also to implement therapeutic exercise programmes to prevent spinal deformities, specifically kyphosis (Hristara-Papadopoulou *et al.*, 2014, Oyewole *et al.*, 2010; Rusnák *et al.*, 2020) ^[4].

Through the research conducted on two adolescents with kyphosis, it was found that the Klapp method is an effective therapeutic approach. Specifically, chest mobility after the intervention significantly improved in both the inhalation and exhalation phases. The flexion test also improved (decreased the distance of the fingers from the ground) in the boy by 2cm. In addition the participants felt to have better posture and at the same time a reduction in pain in areas such as neck and back.

Conclusion

The term kyphosis is used to define the hollow forward curve of the spine and is used to describe both normal (the mildly smooth curve of the thoracic spine) and pathological (excessive thoracic flexion or straightening of the normal cervical or lumbar lordotic curve). Kyphosis can reduce the quality of life of people at all ages. Through therapeutic exercise programs we can manage to correct or even eliminate this spinal deformity by intervening in childhood. The therapist must have an excellent knowledge of anatomy, pathophysiology and the evaluation process so that he or she can judge what the therapeutic goals are and which techniques to follow.

Klapp method was effective for gibbosity stabilization and strengthening of extensor muscles. Also, as demonstrated by our research, the Klapp method is a proven and reliable technique for dealing with kyphosis and is a useful tool for its effective treatment.

Proposals

On the basis of the results of this survey, the following are proposed:

- Checking children's posture.
- Training of correct standing and sitting position on the desk, chair.
- Correct way of holding the school bag.
- Implement therapeutic exercise programs to prevent kyphosis.
- Application of the Klapp method as it is also recreational in nature.

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Annex 1

1. Physical Activity

- On average, how many hours per week do you spend on outdoor sports activities (e.g. basketball, football, martial arts, dance)?

- None
- A little (up to 2 hours)
- Quite a bit (2-5 hours)
- Very much (5-10 hours)
- Extremely much (more than 10 hours)

2. Use of Mobile Device

- How often do you use a mobile phone or tablet?

- Not at all
- A little (up to 1 hour per day)
- Quite a lot (1-3 hours a day)
- A lot (3-5 hours a day)
- Extremely much (more than 5 hours a day)

- Where do you usually use your mobile phone or tablet?

- At the office
- In a chair
- Standing up
- In bed/couch

- Do you know what the correct posture is when using a mobile device?

- Not at all
- A little
- Quite a bit
- Very

3. Perception of discomfort and pain

- Have you experienced any discomfort (pain, stiffness, numbness) in the following parts of your body? (Check all that apply)

- Head
- Eyes
- Neck
- Back
- Waist
- Hands
- Shoulders

- When do you mainly feel pain?

- In a sitting position (e.g. when reading)
- In a standing position
- In bed/couch

- If you felt pain, what was its intensity? (Choose from 1 to 10)

- [1] [2] [3] [4] [5] [6] [7] [8] [9] [10]

- What actions did you take for this problem?

- Medication
- Physiotherapy
- No action

4. Interventions and Klapp Method

- If you used physiotherapy, which techniques were applied to you?

- Massage
- Kinesiotherapy/Special exercises
- Klapp therapy programme
- Other: _____

- Are you familiar with the Klapp method?

- Yes
- No

- Have you tried the Klapp method?

- Yes
- No

- If not, would you be interested in trying it?

- Yes
- No

- Would you be interested in learning more information about this method of therapeutic exercise?

- Yes
- No