Co-funded by the
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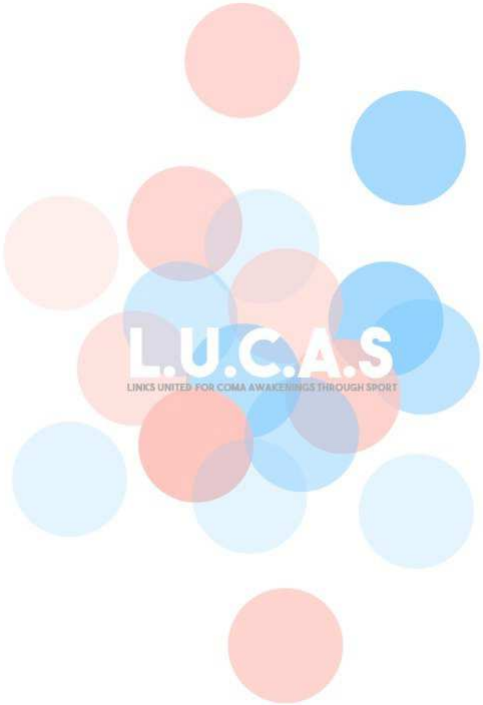
of the European Union

LUCAS Methodology

Analysis of the Pilot Case Study by the Danish partner



This project 557075-EPP-1-2014-1-IT-SPO-SCP has been funded with support from the European Commission.

LUCAS METHODOLOGY
ANALYSIS OF THE PILOT CASE STUDY BY THE DANISH PARTNER

METHODOLOGY

The pilot case study by the Danish partner included seven children between 5 and 14 years of age and their operators. Acquired brain injury (ABI) was a part of all children's diagnosis. The LUCAS methodology was adapted to the *Hoppolek* (jump and joy) programme targeting joyful physical training for children with disabilities.

Hoppolek is a medical device for play and mobility, Class IIa (see Figure 1).

Figure 1: Hoppolek device

Dimensions: The height of Hoppolek is 150-180 cm, depending on the adjustment of the stand (a form of upright spine that parts lock onto); the weight of the base is 43.5 kg; and the stand with knee, pelvic and trunk supports and manoeuvrable arms weighs 10 – 12 kg. The length of the platform is 74 cm and the width is 65 cm. Manufacturing materials consist of steel plate; platform 4 mm, and the other details 2-3 mm.

The device includes a control panel with yellow, red, green, blue, and black buttons. By pressing these buttons, it is possible to experience vibrations, bounces, and rotations – either individually or together (i.e. 1, 2, or 3 feedbacks simultaneously). The vibration is oscillating motion around a horizontal axis simulating a sine wave with peak-to-peak displacement being 0.2 mm, with frequency of 40 – 42 Hz, and acceleration of 33.35 m/s^2. The dynamic bounces are 3 cm, numbering 77 bounces/min with an acceleration of 17.65 m/s^2 (1.8 G). The rotatation has a load on the base of 67 kg: 8.5 revs/min and without any load 10 revs/min. Furthermore, a CD player can be connected for child-

control by a button press. The device is patented. The measurements are conducted by Löfgren Engineering AB with Vibro Scanner, Netter vibration.

The child stands on the round platform (see Figure 1), with or without standing shell, and is strapped in a safe way. By pressing the above-mentioned buttons, the child controls the feedback vibrations, bounces, and rotation and can, thereby, play and enjoy activities such as spinning, jumping, dancing, and at the same time physically train and strengthen the skeleton (Dalén, 2011). Based on this, the aim of Hoppolek is to offer children with disabilities possibilites to joyful physical activitiy on their own premises.

The device is manufactured by Jump & Joy AB, Törnrosvägen 72B, SE-181 61 Lidingö, Sweden. The CEO and founder of Hoppoloek, Ylva Dalén, is graduated as a physiotherapist and has a degree in specialpedagogics at the Swedish School of Sport and Health Sciences in Stockholm, Sweden. Furthermore, she has a licentiate degree from the doctoral students program at the Deparment of Neurobiology, Care Sciences and Society, Division of Physiotherapy, at Karolinska Institutet, Stockholm, Sweden. Dalén has functioned as an expert in the Danish LUCAS methodology pilot case study and she has set up the field studies carried out within this pilot case study.

Physical activity as 'sport' in the context of children

In line with the definition of the term *sport* applied within the LUCAS methodology, sport can be considered as an activity involving physical activities and skills where individuals or teams are involved for pleasure and enjoyment. In line with this, related studies (c.f. Physical Activity During Youth Sport Practices, 2011; U.S. Department Health and Human Services, 2008) states that the most common reasons for why children initially choose to play sports are: having fun, learning new skills, making friends and to be challenged. Yet, free play has shown to produce higher levels of physical activity than organised sports. In addition, a genre of sports is termed "mind sports", where minimal physical activity is involved. Aligned with this, this pilot case study considers the participants' *self-agency* (Vygostsky, 1978; 1987) as significant. In line with this, we argue that the Hoppolek device intentions, i.e. to create conditions for the child to be in control of own physical activity, is essential and an integral tool in the child's self-agency in creating a meaningful physical activity for play and development. Drawing upon the concept of the *Zone of Proximal Development* (ZPD) (Vygotsky, 1978), this pilot case study views the physical activity by means of Hoppolek as a situated activity involving negotiation of meaning between the child and the operator guiding the child during the activity.

Aim of the pilot case study

The aim of the pilot case study was to investigate how the methodology could be utilised with a state-of-the-art hardware product targeting improved sense-proprioception, which implicitly is embodied in any sport activity. The Hoppolek device is designed to stimulate such awareness in a playful way, which is why it was selected for this pilot study. The study was explorative and elaborated on the original LUCAS

methodology, by including children diagnosed with ABI as participants, thereby a wider uptake is posited.

METHOD

The pilot case study carried out by the Danish partners applied a qualitative and explorative approach including video-observations of the children when engaged in the Hoppolek activity, informal conversations with the operators during the Hoppolek activity, and semi-structured interviews (see Appendix 1) with the operators after the Hoppolek activity. Furthermore, a questionnaire was filled in by the operators after the Hoppolek programme was carried out (see Appendix 2).

Inspired by Schön's (1987) concept of the *reflective practitioner*, the informal conversations and the semi-structured interviews with the operators were designed as a training/participation programme. Thus, the informal conversations constituted *in-action* reflections and the interviews were *on-action* reflections.

The gathered data, transcripts from interviews and videos from the observations, were analysed by using the critical incident technique (Flanagan, 1954) to elicit factors that helped promote or detract from the effective performance of the Hoppolek activity or the experience of a specific situation during the activity (Butterfield et al., 2005, p. 483).

In order to validate the findings from our approach, we used triangulation as well as a specific focus on ecological validation.

What, then, can a qualitative approach bring that statistically based science cannot? When comparing a statistically based study and a qualitative directed case study, naturally, it shows that both approaches have strengths and weaknesses. It is important to underline that qualitative studies in the form of case studies are not only pathfinders for later statistical studies (Ramachandran and Blakeslee, 1998). They are also relevant and situated in a way that statistical studies never can be (Jönsson, 2005). Considering the view of the children involved in our study, his or her nuance of improvement(s), progression, and/or change(s) are what is most relevant. The perspective is "before" and "after"; Did this help? Is his/her life better because of this? A range of individual and well-documented case studies can together provide a richer image than the best-planned and implemented double blind tests of subject and control groups (Jönsson, 2005, p. 183).

Accordingly, quantitative and qualitative approaches offer different perspectives on the world, which, when put together into dialogue with each other, can extend our understanding of 'what is going on here?' (Goffman, 1974/1986, p. 8). Different perspectives put attention on aspects of a situation that they can most easily name and understand. The result is a 'frame'; a cluster of normative and causal beliefs that people draw upon to provide them with meaning and direction. As Goffman (1974/1986, p. 247) famously said about 'frames' and 'framing':

> *Given their understanding of what it is that is going on, individuals fit their actions to this understanding and ordinarily find that the on-going world supports this fitting. These organizational premises – sustained both in the mind and in activity – I call the frame of the activity*.

Participants

The pilot case study carried out by the Danish partner included seven children between 5 and 14 years of age and their operators. Acquired brain injury (ABI) was a part of all children's diagnosis. The evaluation of the Hoppolek programme was carried out at the respective institutions.

This pilot study aligns with the social welfare system in Denmark and Scandinavia by referring to the children as participants/end-users and the therapists/facilitators as operators.

PROCEDURE

The Hoppolek activity session started with the operator, sometimes assisted by a colleague, placing the child in the Hoppolek device and adjusting the stand with the knee, pelvic, and trunk supports to fit the height of the child. When this is done, the operator secures the straps so that the child is safely positioned to start using the Hoppolek by him/herself (see Figures 2-3).

Figure 2: The operator secures the straps to support the child's trunk and knees

Figure 3: Two operators adjusting the knee and pelvic support

When the child was safely positioned in the Hoppolek device the operator's strategy was to adjust her guidance to the specific child. For example, one child needed minimal intervention from the operator as the child was enjoying the empowering independency that the Hoppolek gave her in terms of being in an upright position and being able to influence her own activity by choosing among the different types of physical activities (jump, rotate, vibrate) available through pressing the differently coloured buttons. Another child, needed more guidance from the operator to get going and also to move from one activity to another. The operator stated that the intervening actions needed to be carefully considered to not interrupt the child's own pace and emotional state.
The length of the sessions varied between 10 minutes and an hour and took place once a day during weekdays. The variation of the time was dependent on the status of the child the specific day. The evaluation was carried out between June and September 2016.

ANALYSIS AND DISCUSSION

The analysis applied the critical incident technique and was based on semi-structured interviews with seven operators, video observation of seven Hoppolek activity sessions with each of seven children and seven operators at seven different occasions, informal conversations with seven operators, and a questionnaire answered by the seven operators. Three main themes emerged from the analysis:

- Autotelic experience and self-agency
- Awareness of the body in space
- Improvisation and imitation

While the first two themes relate to the child, the third theme is connected to the operator and to the interaction between the operator and the child. This section discusses key components linked with each of these themes.

Self-agency and autotelic experience

The children's possibility to experience a sense of control when engaged in the Hoppolek activity was an important aspect that was emphasised by the operators. For example, the children had the opportunity to choose among the different activities – jump, rotate, vibrate – and they could also choose to do this by including music from the cd-player (Figure 4). They could as well choose to 'rest' in a 'silent space', that is to say that sometimes a child wanted 'no-activity', but to rest, before starting a new activity.
Another factor that was mentioned by the operators was the easiness for the child to manoeuvre and control the Hoppolek device; the child's action was almost immediately followed by a feedback from the Hoppolek and resulted in a short exploratory learning curve as well as being a motivating aspect. One girl was almost asleep upon the start of the Hoppolek activity session, but through the facilitation by the operator, she slowly became aware of what was going on. She started to explore with playful hand movements to experience both rotation and vibration. Accordingly, she exhibited a swift understanding of how to best control her actions and gestures in order to meet the challenge and, most evidently, enjoy the activity.
The operators noted that the children enjoyed the challenge of being in control or, in other words, experience self-agency, while at the same time they developed skills in their

physical manipulation of the Hoppolek. The children were dynamically exploring what was happening under their control, and discovered the 'action space' further through varying the activities between jumping, rotating and vibrating. Five of the children especially indicated an early awareness of a direct correspondence and control to the physical activity emerging from their manipulation of the Hoppolek. Such self-achievement is a rare commodity for such children, and was afforded by the simplicity of the device, which enabled the desired short learning curve exhibited. This self-achievement, i.e. the child's capacity to master the device, is an example of what Vygotsky (1978) names self-efficacy.

The sessions followed a recurring pattern, often observed in children's play, where exploration is followed by playing and emphasis moves from ''what does this object do?'' to ''what can I do with this object", and finally ''hey I'm in control here – and it's fun!''. Sessions were ongoing until the child signified cessation through reduced engagement, which was confirmed by the operator.

Through engagement with the Hoppolek activity, the child could acquire new abilities, expressions and emotions, enabling a mastering of tasks and practicing of skills. As such, this enhanced the child's concentration and motivation to keep on exploring, playing, and training, which emphasised what Csikszentmihalyi (1992) has termed as an autotelic experience. The operators emphasized the children's limited opportunities for such experiences in their everyday life. Rogoff (1990) underlines that interest has a motivating character that channels the child's choices involved in activities.

After the children's engagement in the Hoppolek activity, the operators observed improved awareness, eye-to-hand coordination, and concentration. Thus, it may be concluded that through physically practicing skills, the child experienced a sense of self-agency and, thereby, mastery and consciousness of the situation. In other words, the empowered activity resulted in achievement of control for the child, whereby the success factor, often unattainable from children with such disabilities, was contributing to their emotional self-esteem.

Figure 4: The experience of joy and being in control

Awareness of the body in space

The children in this study showed engagement in every session through an observed concentration and awareness of intent (Figure 5). All operators stressed that the child's engagement with the Hoppolek device had an impact on the child's personal life, as the child learned new ways to play, train, and enjoy through this physical activity. Normally, it was difficult for the children to fully participate in play activities due to their limited abilities. To varying degree, the operators reported that the difficulties in having play experiences possible affected the children's development in general.
The children's exploration of and play with the device pointed towards an increased awareness of their body in space. The physical relationship of synchronised 'child action' to 'Hoppolek action' reinforced this awareness of the child, a sense which also is termed proprioception. The term is a combination of two Latin words that means 'an awareness, or a feeling, of one's own self' (McLinden & McCall, 2002).
The operators emphasised that the engagement with the device was a form of training and that, noticeably, the recognised utterances from the children gave positive meaning to the physical activity. Furthermore, most of the operators underlined that the Hoppolek activity was better than traditional physical training, as it added the enjoyment factor to the training, which enabled the child to have motivating experiences instead of becoming bored of tedious training. All of the operators noted that the engagement with the device enabled the children to develop skills and supported them to incrementally push their movement limits. Four of the operators noted that following the end of the of a Hoppolek session, the children were noticed to be aware of social contact at a slightly higher level. Another operator stated that when the child by moving her hands up and down as well as sideways, and pressing buttons when engaged within a Hoppolek activity, she also develops an awareness and capacity to use her hands in other situations.

Figure 5: Girl showing awareness of her body in space

Improvisation and imitation

Most of the operators emphasised the importance of having the child's desires, wishes, and interests as the starting points for the Hoppolek activity. By having this, enjoyment and playfulness emerges and other outcomes, such as improved coordination, develops as added values. One of the operators expressed this in the interview: "If I want to train her hand motor skills, this is not the starting point, but having play and a playful mind

is. Then, hand motor skills develop as an added value." Another operator related a 'playful mind' to improvisation:

> "I need to be concentrated throughout the whole session, sometimes I need to take a step back and await his actions, while I sometimes need to use my playful mind as well as my experience and improvise to carefully, or playfully, guide him."

The improvisation that the operator was referring to included an intervention approach, which was rich in promoting interaction between the child and the operator (Figure 6 and 7). Thereby, the operator facilitated the child's actions when engaged with the device through what Schön (1987) terms in-action intervention. Thus, in the activity, there is a fit between the skill level of the child and the challenge offered by the device. Furthermore, the improvisational acts involved imitation, which Vygotsky (1987) views as fundamental for a child's development. He applies this term when describing what happens in the Zone of Proximal Development (ZPD) during interaction between a child and a person that is more capable, by stating that the child moves from what (s)he knows to what (s)he does not know through imitation. In the framework of this study, imitation was used two-ways. The child imitated the operator by, for example, repeat actions that was initiated by the operator. However, imitation was also applied by the operator, for example, when the operator did not know what the child intended to do with the device, she repeated utterances, words, gestures, etc. that the child expressed to learn more about the situation. Thereby, the child and the operator collaborated beyond their own capabilities. It was through improvisation by the operator and imitation that the children were able to experience an autotelic state facilitating mastery and growth.

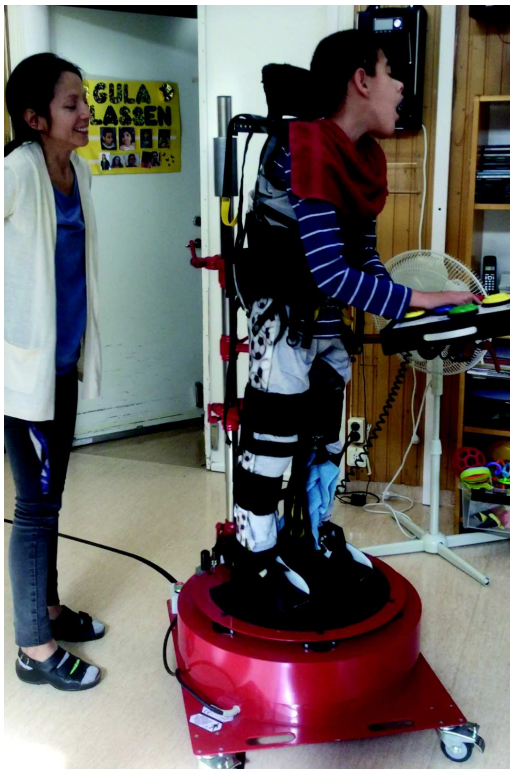


Figure 6: Operator facilitation by taking a step back

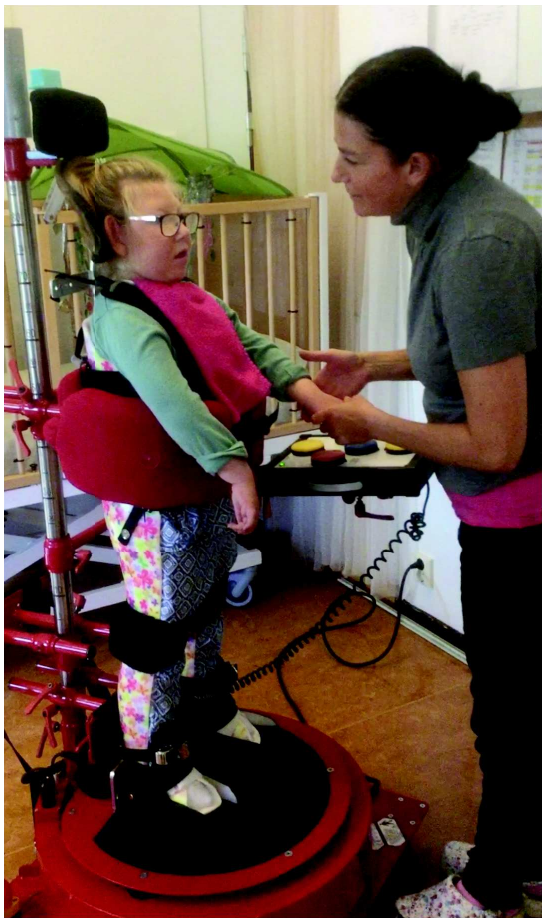


Figure 7: Operator facilitation by initiating an action

Implications

Children with ABI have a huge range of different skills, needs, and desires. Each child therefore needs to be addressed specifically, and the physical activity needs to account for individual needs. Successive physical activity sessions can be evaluated in order to monitor progress of rehabilitation objectives, controlled by the operator. The activity can be adapted and personalised to account for individual differences. Children can be guided through the activity and explore actions themselves. Such activities can provide spaces with as much or as little intervention that is needed in the specific situation by the operator. This kind of activity can partially replace routine therapy sessions. Such activities should be created in a novel, playful, and exploratory context where the children can use the activity in a creative way, thus contributing to enjoyment and increased quality of life.

Conclusion

In this study the goal was to investigate the feasibility of how the LUCAS methodology could be utilised with a state-of-the-art hardware product targeting improved sense-proprioception by utilising the Hoppolek device. The study was explorative and elaborated on the original LUCAS methodology, by including children diagnosed with ABI as participants, thereby a wider uptake is posited.

The results clearly showed that there is a potential for the device as such to function as a tool for physical activity. Remarks were made to the design of the device, which

transcended many existing methods. The results highlighted the positive effect of being able to control the device by those with limited abilities (such as children with ABI) and conclude at the potential of the device as a supplement to traditional therapy techniques. Furthermore, the results highlighted the intervention strategy with the operator as a key person as a prerequisite for engagement and for joyful experiences. The study achieved the following LUCAS methodology objectives:

With disabled people

- The Hoppolek programme offers the children possibilities to influence, choose and be in control of their actions, which is otherwise rare due to the dependency of other people in their everyday life. Thereby contributing to improved quality of life.
- Through the focus on play and playfulness, the programme contributes to psychological well-being, e.g. in terms of happiness, enjoyment, self-agency, and physical well-being, e.g. motor development, reduced stress, increased relaxation, and reduced spasm attacks.
- The programme facilitated improved qualities of the relationship, in particular between the child and the operator. E.g. the child could choose when and how to interact, as well as what to communicate. This empowered the child and gave another dimension to the social interaction.

With operators

- The Hoppolek programme offers the operator to take a step back and let the child lead and, also, to have a moment of joyful interaction with the child. As the programme has the potential to empower the child, it improves the quality of the interaction and, thereby, improves the quality of work life for the facilitator.
- Increased awareness about the child's needs, wishes and desires, as well as about opportunities and challenges to focus on.

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APPENDIX 1: INTERVIEW GUIDE

- Vilka teknologier (inklusive hoppolek, men också andra möjliga teknologier och metoder) använder du i ditt dagliga arbete?
- När och hur använder du hoppolek samt andra möjliga teknologier och metoder?
- På vilket sätt bidrar hoppolek samt andra möjliga teknologier och metoder till barnets lek, lärande och utveckling?
- Potentialer och begränsningar med hoppolek samt andra möjliga teknologier och metoder?
- I vilken utsträckning kan du inkludera hoppolek i ditt dagliga arbete?
- Vilka kort- och långsiktiga konsekvenser har aktiviteter som inkluderar hoppolek?
- Vilka faktorer bidrar till eller hindrar barnets delaktighet i användningen av hoppolek eller annan teknologi används? Kan barnet välja?
    - Fysiska, sensoriska eller sociala faktorer?
- Kan du karaktärisera lekvärdet av hoppolek?
- På vilket sätt utvärderar/bedömer ni lek med hoppolek?
- Hemmets och familjens värde?
- Hur evaluerar ni interventionsmetoder, t.ex. hoppolek?
- Vilka teorier eller andra referensramar ligger till grund för hur ni utvärderar intervention och det resultat som ni vill uppnå?
- På vilket sätt kan hoppolek bidra till barnets delaktighet i aktiviteter?
- På vilket sätt kan hoppolek bidra till barnets interaktion med andra? Vilka är ’de andra’?
- Arbetar ni i team? Vilken funktion har teamet? Hur interagerar ni i teamet?
- Hur definierar ni och utvärderar uppsatta mål? Inkludering av barnet?

APPENDIX 2: QUESTIONNAIRE

Enkät som ingår i LUCAS projektet om fysisk aktivitet för barn med grava funktionsnedsättningar - Hoppolek

Hej!
Tack för att ni vill hjälpa oss i EU_projektet LUCAS!
Fyll i enkäten och skicka tillbaka den i det frankerade svarskuvertet så snart ni kan, tack.

Barnets diagnos och ålder:

……

Hur länge har barnet använt Hoppolek?

……

Vilka metoder använder ni där barnen får möjlighet till fysisk aktivitet?

……

Tycker barnet om att använda Hoppolek?

Ja Nej Vet ej

Kommentar:

……

Finns det anledning tro att Hoppolek är bra för barnets kroppsuppfattning?

Ja Nej Vet ej

Kommentar:

……

Finns det anledning tro att Hoppolek är bra för barnets rumsuppfattning?

Ja Nej Vet ej

Kommentar:

……

Ser ni några risker för barnet när det använder Hoppolek?

Ja Nej Vet ej

Kommentar:

……

Ser ni några effekter på barnet av att de använder Hoppolek?

Ja Nej Vet ej

Kommentar:

……

Kan Hoppolek ersättas av annat hjälpmedel som ger liknande effekter?

Ja Nej Vet ej

Kommentar:……

……

……

……

Om ja, ringa in de ord som stämmer bäst:

vakenhet glädje oro rädsla

nyfikenhet frustration smärta

delaktighet fysisk aktivitet kommunikation

nedstämdhet självständighet samspel

Annat, nämligen:

……

Är Hoppolek lätt att använda för personalen?

Mycket svår Svår Lätt Mycket lätt

Kommentar:

……

Ser ni några risker för personalen?

Ja Nej Vet ej

Kommentar:

……

Har ni övriga synpunkter; skriv gärna nedan!

Tack för hjälpen och ring eller maila om ni har frågor!

Hälsningar
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