



Thesis submitted in fulfilment of the requirements for the degree of Educational Master in Physical Education

# **THE EFFECT OF USING VR APPS DURING PHYSICAL EDUCATION CLASSES ON THE LEARNING MOTIVATION OF SECOND GRADE SECONDARY STUDENTS: A QUASI- EXPERIMENTAL STUDY**

**Het effect van het gebruik van VR-apps tijdens de lessen  
lichamelijke opvoeding op de leermotivatie van leerlingen uit de  
tweede graad van het secundair onderwijs: een quasi-experimentele  
studie**

**JOKE VANDERGUCHT & LUNA MAGIS  
2024 - 2025**

Supervisor: Prof. Dr. Wouter Cools  
Advisor: Hans Van Boven  
Faculty of Multidisciplinair Instituut Lerarenopleiding  
Vrije Universiteit Brussel, Pleinlaan 9, 1050 Brussels, Belgium

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# Table of Contents

<b>1. Abstract</b> .....	<b>7</b>
<b>2. Introduction</b> .....	<b>8</b>
<b>3. Methods</b> .....	<b>10</b>
3.1 <i>Research design and participants</i> .....	10
3.2 <i>Intervention</i> .....	11
3.3 <i>Outcome measures &amp; measurement procedure</i> .....	12
3.4 <i>Statistical analyses</i> .....	13
<b>4. Results</b> .....	<b>14</b>
<b>5. Discussion</b> .....	<b>15</b>
<b>6. Conclusion</b> .....	<b>20</b>
<b>7. References</b> .....	<b>21</b>
<b>Appendices</b> .....	<b>26</b>
<i>Appendix 1: Informed Consent</i> .....	27
<i>Appendix 2: Questionnaires</i> .....	31
<i>Appendix 3: QR Codes Linking to Pre- and Post-Intervention Motivation Surveys</i> .....	37
<i>Appendix 4: VR Introduction</i> .....	39
<i>Appendix 5: Samenwerking</i> .....	40
<i>Appendix 6: Consent form for disclosing Master’s thesis</i> .....	42
<i>Appendix 7: SPSS output</i> .....	43
<i>Appendix 8: lesson preparation – table tennis</i> .....	47
<i>Appendix 9: lesson preparation – kickboxing</i> .....	50
<i>Appendix 10: lesson preparation – fun lesson</i> .....	52

# 1. Abstract

**Introduction:** Motivation to participate in physical education (PE) often declines during adolescence, negatively affecting physical activity levels and overall well-being. Virtual reality (VR) may offer an innovative approach to enhance student motivation by increasing engagement, enjoyment and autonomy. This study aimed to investigate whether the use of VR applications during PE lessons could influence the learning motivation of second-grade secondary school students in Flanders, based on Self-Determination Theory (SDT).

**Method:** A quasi-experimental design was employed with 107 students (mean age = 14,9 years) from four secondary schools. Participants were assigned to a VR-based experimental group or a traditional PE control group. The intervention lasted three weeks, with one lesson per week. Motivation was assessed pre- and post- intervention using the Revised Perceived Locus of Causality Scale (PLOC-R). Non-parametric tests (Wilcoxon signed-rank and Mann-Whitney U) were used to analyze changes across five motivational subscales.

**Results and discussion:** Descriptive data showed that the EG maintained or slightly improved levels of intrinsic and identified regulation, while the CG exhibited minor decreases. A reduction in amotivation was observed in the EG but not in the CG. However, no statistically significant group differences were found. These trends suggest that VR may help stabilize or modestly enhance self-determined motivation. However, technical limitations, a short intervention period, and contextual factors (e.g., language barriers, varying socio-economic backgrounds) may have limited the observed effects. Future studies should integrate VR more deeply within pedagogical frameworks such as TPACK and explore its use over longer periods.

**Conclusion:** Although no significant effects were detected, the descriptive results indicate that VR has the potential to support motivational outcomes in PE, particularly by reducing amotivation. Future research should consider longer interventions, integration within pedagogical frameworks (e.g., TPACK), and mixed-method approaches to better understand VR's impact on motivation and learning in PE settings.

**Keywords:** Virtual Reality, Physical Education, Learning Motivation, Self-Determination Theory

## 2. Introduction

A decline in motivation for physical education (PE) among high school students is a well-documented issue (Dudley et al., 2013; Mowling et al., 2004), with significant implications for both physical and mental health. Students with low motivation for PE are more likely to experience psychological distress, including lower self-esteem and poor body image (Haug et al., 2023; Brown, 2014). Motivation in PE has also been found to positively influence performance in PE classes (Martono et al., 2024). However, as students age, their interest and engagement in PE often decrease, leading to lower participation rates and reduced inclination toward physical activity (PA) outside of school (Deng et al., 2022). This decline in PA levels is reflected in global and regional statistics. According to the World Health Organization (2022), over 80% of adolescents fail to meet the recommended levels of PA. In the Flemish context, recent data from the Health Behaviour in School-aged Children (HBSC) study show that only 20.1% of adolescents meet the recommended daily levels of PA (Dierckens, Schrijvers, & Deforche, 2023). These findings are particularly concerning given the strong evidence linking regular PA to the prevention of obesity, cardiovascular disease, and other metabolic disorders (Hills et al., 2015; Janssen & LeBlanc, 2010). Moreover, PA has been shown to enhance cognitive function and overall well-being, positively influencing academic performance and concentration (Caldas & Reilly, 2019; Kohl et al., 2013). In contrast, reduced motivation can lead to psychological effects, as PA is known to alleviate anxiety and depression (Singh et al., 2023; Biddle et al., 2018). Importantly, research indicates that motivation in PE correlates strongly with maintaining a physically active lifestyle, which is essential for mitigating these health risks (Xu et al., 2024; Dale & Corbin, 2000).

To better understand how to support motivation in PE, it is important to examine the underlying factors that influence it. A recent meta-analysis by Vasconcellos et al. (2020) identified several factors that negatively affect motivation in PE, including a lack of autonomy support, perceived incompetence, and limited social connectedness. These findings underscore the importance of a need-supportive learning environment in sustaining student engagement. Various motivational theories, including Self-Determination Theory (Deci & Ryan, 2000), emphasize the importance of motivation in the learning process. According to this theory, motivation is situated on a continuum ranging from amotivation—defined as a complete lack of motivation or interest—to extrinsic motivation, where behavior is driven by external stimuli, and ultimately to intrinsic motivation, in which learners engage in an activity out of genuine interest or

personal satisfaction. Within the domain of extrinsic motivation, Deci and Ryan (2000) further categorize four types based on the degree of self-determination involved. These include external regulation, where behavior is guided by rewards or punishments; introjected regulation, which is driven by internal pressure or guilt; identified regulation, where individuals recognize the personal value of the activity; and integrated regulation, where the behavior is fully aligned with one's values and considered part of the individual's identity. From the self-determination theory, we learn that focusing on autonomy, connectedness and a sense of competence in pupils contributes to their intrinsic motivation to engage in PE.

A promising way to promote intrinsic motivation in PE is using immersive technology. The integration of such technologies into education has become a growing focus of research, particularly regarding its potential to enhance student motivation and engagement. Immersive technologies, as contextualized within the framework of the Reality-Virtuality Continuum by Milgram et al. (1994), and revisited by Skarbez, Smith, and Whitton (2021), span the continuum from reality to virtuality. This range includes augmented reality (AR), which overlays digital elements onto the real world, to fully immersive virtual reality (VR), which creates entirely synthetic environments.

Several studies have highlighted the motivational benefits of VR-based learning environments. For example, Ma et al. (2023) reported increased engagement, motivation, and problem-solving in physiology courses. Parong and Mayer (2018) similarly observed greater interest and motivation in biology lessons using immersive VR, while Jiang and Fryer (2023) confirmed the general motivational impact of VR across educational contexts. Liu et al. (2019) found that immersive VR exercise improved situational motivation among young adults, making physical activities more enjoyable and engaging. Similarly, Fernández-Vázquez et al. (2024) explored the combination of VR and gamification in PE, demonstrating improved motor skills and increased effort perception among students. Complementing these findings, Lee et al. (2021) examined VR-based soccer instruction and found that students in VR-enhanced PE classes demonstrated increased confidence, better focus, and a heightened sense of control compared to those in traditional classes.

While these findings provide valuable insights, most studies still focus on traditional academic subjects such as science (Ma et al., 2023; Lee et al., 2010; Parong & Mayer, 2018) and language learning (Hua & Wang, 2023). At the same time, there is growing evidence of VR's relevance

in more practice-oriented domains, such as vocational education (Long et al., 2024; Thomann et al., 2024). However, research examining the use of VR in PE remains limited, despite its potential to enhance engagement and motivation. To address this research gap, this study aims to explore the effects of VR applications on the learning motivation of second-grade high school students in physical education. By doing so, it seeks to enhance the understanding of VR's potential in improving educational outcomes and to lay a foundation for further research in this underexplored domain.

## 3. Methods

### 3.1 Research design and participants

In this quasi-experimental study, a convenience cluster sampling strategy was used to recruit secondary schools from the Flemish Community in Belgium. A total of seven schools were contacted via email and telephone. The purpose of the study and the expected involvement of participants was clearly communicated to school staff. To be eligible for participation, classes were required to offer a 100-minute PE block per week, scheduled as two consecutive 50-minute lessons. In addition, schools were required to have access to table tennis tables. Schools or classes that did not meet this requirement were excluded. Ultimately, four of the seven contacted schools met the inclusion criteria and were included in the study. These schools provided access to the participating pupils, who formed the study population. The study included Flemish secondary school students from the second grade. No distinction was made based on educational track; students from general (ISCED 3A), dual (ISCED 3B), and labor market oriented (ISCED 3C) tracks were all eligible to participate. Pupils who were absent during the three-week intervention period were excluded from the analysis.

A total of 166 students initially participated in the study with 78 students assigned to the experimental group (EG) and 88 to the control group (CG) at the pre-test stage. During the three-week intervention period, five students in the EG and 32 in the CG were excluded from the analysis due to absence during one or more sessions. Additionally, 10 students from the EG and 12 from the CG were excluded due to incorrectly completing the questionnaire, including the use of invalid codes or missing data. This resulted in a final sample of 107 participants. The mean age of the participants was 14.9 years ( $SD = 0.761$ ).

### 3.2 Intervention

The study was conducted across four secondary schools during the months of January, February, and March of 2025. Prior to the start, a pilot study was conducted on December 12, 2024, to assess the overall research procedure and identify the most user-friendly questionnaire tool. Insights from the pilot study informed our decisions regarding tool selection, procedural clarity, and estimated participant burden. An informed consent form was distributed and signed by all students prior to the start of the intervention (see Appendix 1). The form outlined the purpose of the study, the reasons for requesting consent, and the participants' rights. The group allocation (experimental vs. control) was not disclosed to avoid potential bias. This study involved the collection of questionnaire data from secondary school students in Flanders as part of a school-based educational intervention. All participants were thoroughly informed about the purpose and scope of the research prior to participation, and written informed consent was obtained from each student. Participation was entirely voluntary, and students had the right to withdraw at any time without consequence.

Because the majority of participants were under the age of 16, formal parental consent would typically be required under the General Data Protection Regulation (GDPR) for the processing of personal data. However, due to time constraints related to the academic deadlines and the logistical difficulty of reaching all parents individually, obtaining such consent was not feasible within the scope of this study. Importantly, the school's principal—acting as institutional gatekeeper and representative of the school community—granted explicit written permission for student participation. This was deemed acceptable given the nature of the research. The data collected contained no directly identifiable or sensitive information, and all responses were anonymised prior to analysis. Although the questionnaire initially included fields such as age and study track, these variables were removed from the dataset used in the final analysis to prevent potential re-identification. The intervention itself, involving a short VR-based lesson, posed no risk or psychological burden to participants and was closely aligned with regular curricular activities.

Participants were divided into two groups: an experimental group (EG) and a control group (CG). Both groups received three physical education (PE) sessions over three weeks—one session per week (35 minutes)—delivered by the research team. The EG received their PE lessons through virtual reality (VR) technology using Meta Quest 2 headsets (Meta Platforms, USA). Prior to each session, a five-minute briefing was provided to the EG to explain how to

use the headset and navigate the VR applications. In contrast, the CG participated in traditional PE lessons without the integration of any digital or technological tools. Importantly, the content and structure of the lessons were identical for both groups to ensure consistency across conditions, with the only distinction being the mode of delivery (VR vs. traditional). Each session addressed a different thematic content area: (1) table tennis via the “*Eleven Table Tennis*” VR app, (2) boxing via *Creed: Rise to Glory*, and (3) a recreational or “fun” lesson via “*Beat Saber*”. The CG performed comparable activities, including kickboxing, table tennis, and a recreational fun session, designed to meet the same learning objectives of each session, but without the use of immersive technology. Due to the limited availability of six VR headsets (provided by Vrije Universiteit Brussel), class sizes were capped at 20 students. A co-teaching approach was adopted to ensure smooth execution and adequate supervision. A standardized testing protocol was followed, as illustrated in Table 1.

Table 1: Weekly Intervention Schedule

Time		Week 1	
10'	Changing clothes		
10'	Informed consent + questionnaire		
35'	Group 1: VR or traditional table tennis		Group 2: Lesson delivered by the PE teacher
35'	Group 1: Lesson delivered by the PE teacher		Group 2: VR or traditional table tennis
10'	Changing clothes		
Time		Week 2	
15'	Changing clothes		
35'	Group 1: VR boxing or traditional boxing		Group 2: Lesson delivered by the PE teacher
35'	Group 1: Lesson delivered by the PE teacher		Group 2: VR boxing or traditional boxing
15'	Changing clothes		
Time		Week 3	
10'	Changing clothes		
35'	Group 1: VR Beat Saber or FUNlesson		Group 2: Lesson delivered by the PE teacher
35'	Group 1: Lesson delivered by the PE teacher		Group 2: VR Beat Saber or FUNlesson
10'	Questionnaire completion		
10'	Changing clothes		

### 3.3 Outcome measures & measurement procedure

To assess changes in motivation outcomes related to the intervention, both groups completed a questionnaire immediately before (pre-test) and after (post-test) the three-week intervention period. The online questionnaire was administered using the web-based software Qualtrics (Qualtrics, Provo, UT). Participants accessed the survey through QR codes. To assess students’ motivational regulation within the context of PE the Revised Perceived Locus of Causality in Physical Education (PLOC-R) Scale (Vlachopoulos et al., 2011) was administered. This instrument is widely used to evaluate the degree of self-determined motivation among students in PE settings and is grounded in Self-Determination Theory (SDT) (Deci & Ryan, 1985; Deci

& Ryan, 2000). The PLOC-R scale comprises 24 items, divided across five subscales that each represent a different form of motivational regulation:

- Intrinsic Regulation: reflects engaging in an activity for inherent enjoyment or interest (e.g., "Because PE is fun").
- Identified Regulation reflects a conscious valuing of PE and its outcomes (e.g., "Because I value the benefits of PE").
- Introjected Regulation: reflects internal pressures such as guilt or obligation (e.g., "Because I would feel bad about myself if I didn't").
- External Regulation: reflects engagement in PE due to external demands or rewards (e.g., "Because others push me to do it").
- Amotivation: reflects a lack of intention to act or a sense of incompetence or disinterest (e.g., "I don't see why I have to do PE").

Responses were recorded on a 7-point Likert scale ranging from 1 ("totally disagree") to 7 ("totally agree"). The English version of the PLOC-R scale was translated into Dutch by the research team using a structured translation approach. This translation was subsequently reviewed for linguistic accuracy, and discrepancies were discussed until consensus was reached. Artificial intelligence tools were employed to support both grammar correction and translation throughout the document. To evaluate the internal consistency of the translated version, Cronbach's alpha was calculated for each subscale.

### 3.4 Statistical analyses

A priori sample size calculation was conducted using the statistical software G\*Power 3.1. A sample size analysis was performed for a repeated measures ANOVA, assuming an alpha level of 0.05, a power of 0.80, and an effect size of 0.15. A sample size of at least 90 participants was estimated to provide sufficient power to detect meaningful effects, while minimizing the risk of Type I and Type II errors. Statistical analyses were performed using IBM SPSS Statistics version 29.0.1.0. First, descriptive statistics were computed to summarize the mean motivation scores and standard deviations within both groups. The normality of the data was assessed using the Kolmogorov-Smirnov test and the Shapiro-Wilk test. Since the assumption of normality was violated, non-parametric tests were conducted instead of the initially planned mixed repeated measures ANOVA. To examine changes over time within groups, Wilcoxon signed-rank tests were used. To assess group differences at pre- and post-intervention, Mann-Whitney

U tests were applied. The dependent variables consisted of five motivation subscales: intrinsic regulation, identified regulation, introjected motivation, external regulation, and amotivation. All analyses were conducted using a 95% confidence interval, and statistical significance was determined at an alpha level of 0.05.

## 4. Results

To examine the effects of the VR intervention on students' motivation in PE, we began by assessing the internal consistency of the Dutch PLOC-R subscales. Cronbach's alpha values ranged from .781 to .920, indicating good to excellent reliability (Lance et al., 2006). As shown in Table 1, the descriptive statistics provide an overview of the mean scores (M) and standard deviations (SD) for each motivation type across both groups, measured before and after the intervention. At baseline, the EG generally reported higher levels of more self-determined forms of motivation (intrinsic, identified, and introjected regulation) compared to the CG. After the intervention, the EG maintained or slightly increased their levels of intrinsic and identified motivation, while the CG showed minor decreases in these dimensions. Introjected motivation slightly increased in both groups. Furthermore, external regulation also increased slightly in both groups post-intervention, whereas amotivation decreased modestly in the EG and remained relatively stable in the CG.

To evaluate changes in motivation more precisely, delta scores (post minus pre) were computed for each participant. This approach allowed us to directly examine changes attributable to the intervention, while accounting for baseline differences between individuals.

**Table 1.** Descriptive statistics of motivation types (PRE and POST) for CG and EG

N	Variables	CG		EG	
		Pre X ± SD	Post X ± SD	Pre X ± SD	Post X ± SD
107 (n <sub>CG</sub> = 44) (n <sub>EG</sub> = 63)	Intrinsic	4.28 ± 1.48	4.10 ± 1.34	5.62 ± 1.26	5.74 ± 1.16
	Identified	4.32 ± 1.61	4.11 ± 1.49	5.23 ± 1.40	5.19 ± 1.24
	Introjected	2.65 ± 1.36	3.08 ± 1.39	3.16 ± 1.97	3.40 ± 1.82
	External	3.85 ± 1.67	4.33 ± 1.66	3.40 ± 1.73	3.57 ± 1.75
	Amotivation	3.30 ± 1.64	3.21 ± 1.06	2.56 ± 1.48	2.39 ± 1.41

Mann-Whitney U tests were used to compare the delta scores between the two groups (Table 2). The results revealed no statistically significant differences in motivation change between

the two groups for any of the subscales. Although the EG showed slightly greater increases in intrinsic and introjected regulation compared to the CG, and a larger decrease in amotivation, these differences did not reach statistical significance ( $p > .05$ ). Similarly, changes in identified and external regulation were not significantly different between the groups.

**Table 2.** Mann-Whitney U test results for differences in motivation change ( $\Delta$ ) between groups.

Variables	CG D M $\pm$ SD	EG D M $\pm$ SD	p-value	Z
Intrinsic	- 0.18 $\pm$ 1.41	0.12 $\pm$ 1.19	0.499	- 0.676
Identified	- 0.21 $\pm$ 1.24	- 0.03 $\pm$ 1.20	0.565	- 0.576
Introjected	0.43 $\pm$ 1.48	0.24 $\pm$ 1.63	0.196	- 1.293
External	0.48 $\pm$ 2.17	0.17 $\pm$ 1.45	0.140	- 1.474
Amotivation	- 0.09 $\pm$ 1.66	- 0.17 $\pm$ 0.98	0.393	- 0.853

The results of the Wilcoxon signed-rank test (Table 3) provide insight into within-group changes in motivation scores from pre- to post-measurement. In the CG, a statistically significant increase was found for introjected regulation ( $Z = -2.030$ ,  $p = .042$ ). No other motivation types showed significant changes within the CG. In the EG, none of the motivation variables showed statistically significant changes between pre- and post-intervention.

**Table 3.** Wilcoxon signed-rank test results for pre-post motivation scores within CG and EG

Variables	CG		EG	
	Z	p-value	Z	p-value
Intrinsic	- 0.638	0.524	- 0.333	0.739
Identified	- 1.273	0.203	- 0.516	0.606
Introjected	- 2.030	0.042	- 0.952	0.341
External	- 1.905	0.057	- 0.994	0.320
Amotivation	- 0.077	0.939	- 1.257	0.209

## 5. Discussion

The aim of this study was to investigate the impact of virtual reality (VR) applications during physical education (PE) lessons on the motivational experience of second-grade secondary school students. Although no statistically significant differences were found between the EG and the CG, descriptive suggest that immersive technology holds potential for stabilizing or slightly enhancing intrinsic motivation while reducing amotivation. These findings suggest that,

while the three-week VR intervention did not lead to significant motivational gains as measured by the PLOC-R scale, it may have contributed to the stabilization—or even slight improvement—of self-determined motivation compared to traditional instruction. Descriptive statistics also indicate that students in the experimental group already displayed relatively high levels of motivation at baseline, particularly in intrinsic and identified regulation. This may have limited the potential for further motivational gains in this group. In contrast, the CG appeared to show early signs of motivational decline. This divergence, though not statistically significant, aligns with the broader trend documented in the literature concerning motivational attrition in PE settings during adolescence (Deng et al., 2022). The results can be interpreted through the lens of SDT (Deci & Ryan, 2000), immersive VR experiences have the potential to enhance perceptions of autonomy, competence and relatedness. Although the current intervention did not produce measurable statistical effects, it is plausible that the use of VR in PE indirectly supported students' basic psychological needs—particularly autonomy and competence—as reflected in the observed decrease in amotivation during VR use. Previous research supports this interpretation: studies by Liu et al. (2019) and Fernández-Vázquez et al. (2024) reported motivational benefits linked to VR-based PA, particularly in terms of increased engagement, enjoyment, and reductions in amotivation. The significant increase in introjected regulation within the CG may point to an unintended shift toward less autonomous motivation, possibly driven by external pressures or feelings of obligation. This is consistent with research by Vasconcellos et al. (2020), who note that environments lacking novelty or personal relevance can lead to increased controlled forms of motivation.

One of the primary strengths of this study lies in its contribution to a relatively underexplored research area. The integration of digital tools into PE remains understudied particularly among secondary school populations, making this investigation both timely and relevant. Additionally, all participants were in the same educational stage—the second grade of secondary school—and of similar age, which reduced variability and made comparisons across groups more meaningful. The inclusion of four secondary schools geographically located across Flanders enhances the generalizability of the findings within the regional context. Despite a notable dropout rate, the final sample size remained sufficiently large to meet the statistical power requirements established in the a priori analysis.

Despite its strengths, this study also faced several limitations that should be acknowledged. Although the final sample size ( $N = 107$ ) and group distribution were deemed sufficient according to the a priori power analysis, they may have been inadequate to detect subtle differences between the EG and the CG, especially given the participant attrition due to absenteeism and data exclusion. It was notable that the dropout rate was higher in the CG (32 students) than in the EG (five students), which may indicate lower initial motivation among CG participants. Moreover, a nationwide train strike during the intervention period affected one of the participating schools, which probably contributed to the absence of at least 10 students in the CG. The short duration of the intervention, only three sessions across three weeks, may also have limited its impact on deeper motivational constructs such as intrinsic regulation. Additionally, three participants experienced symptoms of cybersickness (e.g. dizziness, headaches), requiring them to discontinue their participation. Such discomfort may have negatively influenced their motivation (Li et al. 2023).

From a methodological perspective, the use of convenience and cluster sampling limited the generalizability of the findings. Schools were selected based on accessibility and willingness to participate, which may have introduced selection bias. In addition, entire classes were allocated to conditions without random assignment at the individual level. As a result, group-level variables, such as class cohesion, teacher-student dynamics, or existing attitudes toward PE, could have influenced the motivational outcomes.

In evaluating the role of VR, the current study primarily utilized the SAMR framework (Puentedura, 2006), in which VR was implemented at the enhancement level (substitution and augmentation). While such applications are innovative, it remains questionable whether this use of VR was optimally aligned with motivational outcomes. Research by Hamilton et al. (2016) and Mulyana et al. (2025) suggests that technology may be more effectively utilized at the transformational level (modification and redefinition), where it enhances existing task with functional improvements. For example, providing real-time feedback in a VR table tennis simulation or a tactical positioning analysis in virtual football training. According to Puentedura (2006), progressing from the lower to the higher levels of technology integration within the SAMR model corresponds with increasingly advanced forms of teaching and learning, potentially leading to greater student engagement and deeper understanding.

These applications are more closely aligned with the TPACK framework (Technological Pedagogical Content Knowledge), which emphasizes the intersection of technological tools, pedagogical strategies, and content knowledge (Koehler, Mishra & Cain, 2013). Within the design of the VR-based physical education activity, deliberate attention was given to pedagogical strategies aligned with effective classroom management and learning enhancement. Organized formats such as station-based work and the buddy system (UCLan Cyprus, 2024) were implemented to ensure a clear and structured learning environment. A comprehensive introduction was provided at the start of the first session, covering game instructions, safety considerations, and role allocation (players versus buddy). Role-switching moments were clearly communicated, contributing to a predictable and supportive learning setting. From the perspective of the TPACK framework, this indicates that the pedagogical knowledge (PK) component was well integrated into the lessons design. However, certain limitations emerged in the technological (TK) and content knowledge (CK) domains. The use of VR remained relatively superficial, primarily serving as a tool for game-based engagement rather than as a means of delivering real-time feedback or facilitating movement corrections. Although the activity was engaging and motivating for students, the potential of VR as an interactive learning tool offering immediate, experience-based feedback was not fully realized. In particular, the use of VR to support tactical learning and provide feedback on decision-making was not explored. This is unfortunate, as Memmert and Harvey (2008) highlight that a tactical approach in physical education can significantly enhance students' motivation and understanding by creating a more meaningful learning experience.

In terms of content selection, the workshop focused on accessible sports such as table tennis, boxing and dance- activities that were already familiar to students through the regular physical education curriculum. From a CK perspective, the integration of VR could have had a greater impact if less commonly practiced sports—such as tennis or snowboarding—had been included. This might have offered students new, enriching experiences and demonstrated the unique affordance of VR in physical education.

While the implemented protocol was pedagogically sound, there remains room for improvement in terms of the meaningful integration of technology and the expansion of content variety. Achieving full alignment with TPACK framework requires further development across all three domains, particularly in leveraging the affordances of VR for targeted skill development and learning enhancement.

Another important consideration relates to contextual factors, particularly the socio-economic backgrounds of participating schools. Data on equal educational opportunities (GOK) revealed notable disparities across schools, with two institutions displaying high proportions of students with risk indicators such as non-Dutch home language and eligibility for school allowance (Vlaamse overheid, z.d.). Prior research has identified classroom support as a key predictor of student motivation and interest (Van Doren et al., 2021), while low socio-economic status (SES) has been linked to reduced self-confidence and classroom engagement (Atlay et al., 2019). Consequently, students from lower SES backgrounds may have struggled more with understanding the English-language VR interfaces, which in turn may have reduced their engagement and motivation (Jarar & Kurniawati, 2025).

Moreover, informal impressions during implementation of the VR sessions suggested that time-on-task was occasionally compromised due to technical difficulties and start-up delays. Although session durations were equivalent in theory, students in the EG may have experienced reduced effective learning time. We did not collect exact data on time-on-task per student, which limits our ability to determine whether all participants received comparable exposure to the intervention. This uncertainty should be taken into account when evaluating group differences in motivation. Additionally, the scheduling of PE lessons following a cognitive demanding subject (e.g. mathematics) may have led to mental fatigue, further diminishing student's motivation (Van Cutsem et al., 2017).

Finally, due to non-normal data distribution, non-parametric tests were used. While appropriate, these tests have lower statistical power, which—combined with the reduced sample size—may have limited the ability to detect subtle effects, even though no significant differences were found. Future research should explore the integration of VR within a TPACK framework that aligns technology with both pedagogical and content goals. Specifically, implementing VR at the transformation level—offering immediate feedback and performance analytics—may enhance learning outcomes and student motivation. Furthermore, longer intervention periods and the use of mixed methods (quantitative and qualitative) could provide richer insights into student experience. Future studies should consider incorporating structured observational tools as well as qualitative methods such as student interviews, reflection logs, or focus groups to capture learners' subjective experiences and contextual factors in more depth. Conducting student interviews on their perception, language comprehension, and feedback reception could

yield additional valuable data. In addition, future interventions may consider targeting student populations with low initial motivation toward PE, such as schools with low physical activity engagement or students at risk of reduced participation, as these groups may benefit more meaningfully from immersive and innovative learning approaches like VR.

The findings suggest that while VR holds promise for supporting motivation in PE, particularly by reducing amotivation, its pedagogical effectiveness depends heavily on its instructional alignment. A more deliberate integration of the TPACK framework and a thoughtful application of the SAMR model may lead to more impactful learning experiences. Socio-contextual variables such as language barriers, SES, and cognitive fatigue must also be accounted for in future implementations. These insights offer practical guidance for educators aiming to incorporate VR into a motivating and inclusive PE curriculum.

## **6. Conclusion**

This study explored whether the use of virtual reality (VR) apps during physical education (PE) classes could influence the learning motivation of secondary school students in the second grade. While no statistically significant effects were observed, the descriptive findings suggest that VR has the potential to sustain or even slightly improve intrinsic motivation and reduce amotivation. Several limiting factors may have influenced these results, including the short duration of the intervention and the use of non-parametric analyses. Additionally, technical challenges, language barriers, and a relatively high dropout rate—particularly in the control group—could have reduced the ability to detect meaningful effects. Despite the absence of statistical significance, the descriptive trends align with theoretical frameworks such as Self-Determination Theory, which suggest that environments supporting autonomy, competence, and relatedness can foster higher quality motivation. VR may contribute to these psychological needs by providing immersive and engaging experiences that differ from traditional PE lessons. To build on these early insights, future studies should explore longer, pedagogically grounded interventions using mixed methods to better capture VR's impact on both motivational outcomes and student experience.

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# Appendices

## Appendix 1: Informed Consent

### INFORMATIEFORMULIER EXPERIMENT

#### **Titel van het onderzoek:**

The effect of using VR apps during physical education classes on the learning motivation of second-grade secondary students: a quasi-experimental study

#### **Student onderzoeker:**

- Joke Vandergucht – [Joke.Vandergucht@vub.be](mailto:Joke.Vandergucht@vub.be)

Educatieve master lichamelijke opvoeding, Vrije Universiteit Brussel

- Luna Magis – [Luna.magis@vub.be](mailto:Luna.magis@vub.be)

Master Lichamelijke Opvoeding en Bewegingswetenschappen, Vrije Universiteit Brussel

#### **Promotor en begeleider:**

- Prof. Dr. Wouter Cools – [Wouter.Cools@vub.be](mailto:Wouter.Cools@vub.be)
- Hans Van Boven – [Hans.Van.Boven@vub.be](mailto:Hans.Van.Boven@vub.be)

#### **1. Doel van het onderzoek**

In deze studie onderzoeken we of het gebruik van virtual reality (VR) tijdens de lessen lichamelijke opvoeding een invloed heeft op de motivatie van leerlingen in de tweede graad van het secundair onderwijs.

#### **2. Praktische uitvoering**

- Deelnemers nemen deel aan drie lessen lichamelijke opvoeding verspreid over drie weken.
- Tijdens deze lessen wordt gebruikgemaakt van verschillende werkvormen die passen binnen het bestaande curriculum.
- Voor en na deze lessenreeks vullen de deelnemers een korte vragenlijst in over hun motivatie tijdens LO (duur:  $\pm$  10 minuten).
- Alle lessen worden begeleid door onderzoekers die ook gediplomeerde lesgevers zijn.

#### **3. Vrijwilligheid en stopzetting**

Jouw deelname aan dit onderzoek is vrijwillig. Je bent vrij om al dan niet deel te nemen en je kan op elk moment, zonder opgave van reden, beslissen om te stoppen met het onderzoek. Er zijn geen negatieve gevolgen verbonden aan een weigering of stopzetting.

#### **4. Mogelijke risico's en ongemakken**

Deelnemen aan dit onderzoek houdt geen noemenswaardige risico's in. In uitzonderlijke gevallen kan het gebruik van digitale toepassingen tijdens de lessen leiden tot lichte duizeligheid of vermoeidheid. Indien dit het geval is, mag je altijd stoppen of je bril afzetten. Fysieke belasting blijft binnen de normale grenzen van een les LO.

#### **5. Vertrouwelijkheid en gegevensbescherming**

Alle informatie die tijdens dit onderzoek wordt verzameld, wordt vertrouwelijk behandeld en verwerkt conform de Europese privacywetgeving (Algemene Verordening Gegevensbescherming – AVG of GDPR).

De gegevens worden volledig geanonimiseerd. Dit betekent dat jouw naam, school, klasgroep of andere persoonlijke informatie niet gelinkt wordt aan je antwoorden op de vragenlijsten of aan je deelname aan de lessen. Alleen een anonieme code wordt gebruikt om de gegevens te verwerken en analyseren. Deze code is niet terug te leiden naar jouw identiteit.

De digitale vragenlijsten worden afgenomen via een beveiligd online platform. De onderzoeksgegevens worden opgeslagen op een beveiligde server van de Vrije Universiteit Brussel en zijn uitsluitend toegankelijk voor de student-onderzoekers en hun promotor. De gegevens kunnen – indien geanonimiseerd – hergebruikt worden voor toekomstig wetenschappelijk onderzoek in het algemeen belang, mits bescherming van de gegevens gegarandeerd blijft.

Er worden geen individuele resultaten gerapporteerd aan de school of andere betrokkenen. De resultaten worden enkel op gegroepeerd niveau (bijvoorbeeld per klasgroep of werkvorm) geanalyseerd en voorgesteld.

Indien je je deelname stopzet, worden jouw gegevens uit het onderzoek verwijderd, tenzij ze al op anonieme wijze verwerkt zijn in de groepsresultaten.

## 6. Jouw recht als deelnemer

Je hebt het recht om:

- je gegevens in te zien, te laten verbeteren of te laten wissen;
- je toestemming op elk moment in te trekken zonder opgave van reden;
- bezwaar te maken tegen verwerking of overdracht;
- een kopie van je gegevens op te vragen.

Als je je toestemming intrekt, worden jouw gegevens uit het onderzoek verwijderd, tenzij ze al op anonieme wijze zijn verwerkt.

## 7. Contact voor klachten

Voor vragen over dit onderzoek of je privacyrechten kun je contact opnemen met de onderzoekers en promotor.

### Onderzoek naar het effect van VR-apps op motivatie tijdens LO-lessen

#### Geachte leerling,

We nodigen u uit om deel te nemen aan een onderzoek uitgevoerd door masterstudenten aan de Vrije Universiteit Brussel, onder begeleiding van Prof. Dr. Wouter Cools. Het doel van dit onderzoek is om het effect van VR-apps tijdens lessen Lichamelijke Opvoeding (LO) te onderzoeken op de motivatie van middelbare schoolleerlingen.

#### Wat houdt het onderzoek in?

- Deelnemers zullen gedurende drie weken deelnemen aan lessen LO waarin verschillende lesmethoden worden gebruikt.
- Voor en na de interventieperiode zullen vragenlijsten worden afgenomen om de motivatie te meten.

#### Waarom vragen wij uw toestemming?

De verzamelde gegevens zullen uitsluitend worden gebruikt voor wetenschappelijke doeleinden. Om deel te nemen, vragen wij toestemming voor:

1. Het verzamelen van gegevens via vragenlijsten.
2. Het anoniem verwerken en analyseren van deze gegevens.
3. Het gebruik van de gegevens in publicaties en presentaties, zonder dat deelnemers identificeerbaar zijn.

**Uw rechten:**

- Deelname is vrijwillig, en u kunt op elk moment stoppen zonder opgaaf van reden.
- Uw gegevens worden vertrouwelijk behandeld en opgeslagen op een beveiligde server volgens de wetgeving.

**Contactinformatie:**

Als u vragen heeft over dit onderzoek, kunt u contact opnemen met:

- **Onderzoekers:** Joke Vandergucht ([Joke.Vandergucht@vub.be](mailto:Joke.Vandergucht@vub.be)) & Luna Magis ([Luna.magis@vub.be](mailto:Luna.magis@vub.be))
- **Promotors:** Prof. Dr. Wouter Cools ([Wouter.Cools@vub.be](mailto:Wouter.Cools@vub.be)) en Hans Van Boven ([Hans.Van.Boven@vub.be](mailto:Hans.Van.Boven@vub.be))

**Toestemming:**

Ik bevestig dat ik begrijp wat deelname aan dit onderzoek inhoudt en geef toestemming voor het gebruik van mijn gegevens voor wetenschappelijke doeleinden.

Naam        leerling: \_\_\_\_\_

Handtekening        leerling: \_\_\_\_\_

Datum: \_\_\_\_\_

## Appendix 2: Questionnaires

### Studie VR & motivatie Pre-Interventie

---

#### Start of Block: Identificatie

Q16 Instructie voor het invullen van je persoonlijke code. We vragen je om een code van 6 tekens in te vullen. Gebruik hiervoor de volgende stappen: 1) Neem de twee cijfers van je geboortedag. Als je dag een tiental is, schrijf dan beide cijfers op (bijvoorbeeld: 07 voor 7, of 15 voor 15). 2) Neem de eerste twee letters van je voornaam. Schrijf deze in kleine letters (bijvoorbeeld: "lu" als je voornaam Lucas is). 3) Neem de laatste twee cijfers van je geboortjaar (bijvoorbeeld: 05 als je geboren bent in 2005). Voorbeeld: - Je geboortedag is 7 oktober 2005. - Je voornaam is Lucas. - Je code wordt: 07lu05. Let op: Vul geen spaties in en zorg dat je de code precies volgens de stappen maakt.

---

#### End of Block: Identificatie

---

#### Start of Block: Algemeen

Q1 In welk jaar van het middelbaar zit je?

- 3de middelbaar (1)
  - 4de middelbaar (2)
  - 5de middelbaar (3)
  - 6de middelbaar (4)
- 

Q2 Wat is je leeftijd?

---

Q3 In welke finaliteit bevindt je richting zich?

- Doorstroomfinaliteit (1)
  - Dubbele finaliteit (2)
  - Arbeidsmarktgerichte finaliteit (3)
-

Q4 Hoe noemt de studierichting die je volgt?

---

Q5 Wat is je genderidentiteit?

- Man (1)
- Vrouw (2)
- Non-binair (3)
- Andere (4)
- Vertel ik liever niet. (5)

End of Block: Algemeen

---

Start of Block: Amotivatie

Q6 Ik doe mee aan LO...

	Helemaal oneens (1)	Enigszins oneens (2)	Licht oneens (3)	Neutraal (4)	Licht eens (5)	Enigszins eens (6)	Helemaal eens (7)
Maar ik weet eigenlijk niet waarom. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maar ik zie niet in waarom we LO zouden moeten hebben. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maar ik heb echt het gevoel dat ik mijn tijd verspil met LO. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maar ik zie niet wat ik uit LO haal. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Amotivatie

---

Start of Block: Externe regulatie

Q7 Ik doe mee aan LO...

	Helemaal oneens (1)	Enigszins oneens (2)	Licht oneens (3)	Neutraal (4)	Licht eens (5)	Enigszins eens (6)	Helemaal eens (7)
Omdat ik op deze manier geen laag cijfer krijg. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Zodat de leraar niet tegen me schreeuwt. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Omdat dat nu eenmaal de regel is. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Externe regulatie

Start of Block: Introjectieve regulatie

Q8 Ik doe mee aan LO...

	Helemaal oneens (1)	Enigszins oneens (2)	Licht oneens (3)	Neutraal (4)	Licht eens (5)	Enigszins eens (6)	Helemaal eens (7)
Omdat ik me slecht zou voelen als de leraar zou denken dat ik niet goed ben in LO. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Omdat ik me slecht over mezelf zou voelen als ik het niet zou doen. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Omdat ik me slecht zou voelen als de andere leerlingen zouden denken dat ik niet goed ben in LO. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Omdat het me zou dwarszitten als ik het niet zou doen. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Introjectieve regulatie

Start of Block: Geïdentificeerde regulatie

Q9 Ik doe mee aan LO...

	Helemaal oneens (1)	Enigszins oneens (2)	Licht oneens (3)	Neutraal (4)	Licht eens (5)	Enigszins eens (6)	Helemaal eens (7)
Omdat ik het belangrijk vind om goed te presteren in LO. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Omdat ik het belangrijk vind om beter te worden in de oefeningen die we doen in LO. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Omdat ik het belangrijk vind om goed te zijn in de sporten die we in LO oefenen. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Omdat ik het belangrijk vind om mijn best te doen in LO. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Geïdentificeerde regulatie

Start of Block: Intrinsieke motivatie

Q10 Ik doe mee aan LO...

	Helemaal oneens (1)	Enigszins oneens (2)	Licht oneens (3)	Neutraal (4)	Licht eens (5)	Enigszins eens (6)	Helemaal eens (7)
Omdat LO leuk is. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Omdat LO spannend is. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Omdat ik het leuk vind om nieuwe vaardigheden te leren. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Omdat LO plezierig is. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

End of Block: Intrinsieke motivatie

Appendix 3: QR Codes Linking to Pre- and Post-Intervention Motivation Surveys

3.1 Pre-test: experimental group



3.2 Pre-test: control group



3.3 Post-test: experimental group



3.4 Post-test: control group



## Appendix 4: VR Introduction



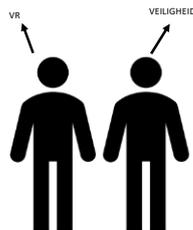
### WAT IS VR?

- Virtual Reality (VR)
- Een computertechniek waarbij het lijkt alsof je in een andere werkelijkheid/wereld bent
- Wie al eens gebruikt?
- In sport?



### HOE?

- DUO
- 1 persoon VR
- 1 persoon voor veiligheid
- In zone (potjes)



### META QUEST 2 - HEADSET

- Vastzetten onderaan hoofd
- Lenzen niet tegen bril
- Batterij
- Geluid aanpassen
  - Rechts onderaan
- Voorzichtig
  - DUUR



### META QUEST 2 - CONSOLLER



DANK U

## Appendix 5: Samenwerking

### *Samenwerking (enkel indien duo- of triothesis)*

In dit onderdeel geef je weer hoe de auteurs hebben samengewerkt tijdens dit onderzoeksproces. Net als in andere wetenschappelijke projecten is het belangrijk om transparant te zijn over de samenwerking (Brand et al. 2015). Deze tool geeft aan de opleiding de mogelijkheid na te gaan of elke auteur evenwaardig heeft bijgedragen tot dit masterproefproces. We nemen deze informatie mee in de holistische evaluatie van de masterproef.

#### **Je kan als volgt te werk gaan om de samenwerking in kaart te brengen:**

- Vul zo waarheidsgetrouw mogelijk in wie de verantwoordelijkheid nam voor elk onderdeel van het masterproefproces.
- Vul enkel de onderdelen aan die voor jullie proces van toepassing zijn. Eventueel kan je onderaan in het overzicht nog rollen toevoegen indien ze nog niet werden opgelijst.
- Zet een kruisje in het overzicht wanneer de activiteit binnen het masterproefproces door één of meerdere auteurs werd uitgevoerd.

	Auteur 1	Auteur 2	Auteur 3
<b>VOORBEREIDING</b>			
Probleemstelling - Verkennen beginsituatie, brede literatuur,...	X	X	
Onderzoeksvragen afbakenen	X	X	
Dataverzameling bepalen en beschrijven (veldonderzoek, deskonderzoek, welke data, data-analyse,...)	X	X	
<b>THEORETISCH KADER</b>			
Bronnenonderzoek (verzamelen, beoordelen, selecteren en verwerken)	X	X	
Methodologische literatuur lezen	X	X	
Bronvermelding steeds bijhouden	X	X	
<b>DATA verzameling en - analyse</b>			
Meetinstrument verzamelen of opstellen	X	X	
Dataverzameling uitvoeren	X		
Data-analyse uitvoeren		X	
Resultaten ordenen en bevindingen uitwerken		X	
Update literatuur lezen	X	X	
<b>SCHRIJFFASE</b>			
Richtlijnen bekijken	X		
Inleiding schrijven		X	
Theoretisch kader uitschrijven (literatuuronderzoek)	X	X	
Methoden en onderzoeksopzet uitschrijven	X	X	
Resultaten opschrijven		X	
Conclusie schrijven	X	X	

Discussie schrijven	X	X	
Aanbevelingen voor het onderwijs (maatschappelijke aanbevelingen)	X		
Aanbevelingen voor verder onderzoek	X		
Abstract schrijven	X		
Referentielijst nakijken		X	
Samenhang en coherentie nagaan			
Nalezen op taal en stijl		X	
Bijlage toevoegen (informed consent, vragenlijst, analyse-instrument,...)		X	
Vorm en lay-out masterproef		X	
<b>MAATSCHAPPELIJKE VALORISATIE</b>			
Presentatie maken voor brede onderwijspubliek	X?		
<b>EXTRA</b>			
Communicatie met de promotor		X	
Voorzittersrol			
..... (vul taken aan indien nodig)			
<b>EVENTUELE toelichting bij deze taakverdeling</b>			

## Appendix 6: Consent form for disclosing Master's thesis

### Consent form for disclosing Master's thesis

Student: **Luna Magis**

Enrolment number: **0578879**

Study program: **Master of Science in Movement and Sport Sciences**

Academic year: **2024-2025**

Student: **Joke Vandergucht**

Enrolment number: **0576787**

Study program: **Educatieve Master Lichamelijke Opvoeding**

Academic year: **2024-2025**

Master's thesis Title:

Supervisor: **Prof. Dr. Wouter Cools**

Any Master's thesis for which the student has obtained a result of 10/20 or more, and for which no non-disclosure agreement (NDA) was drawn up, can be included at no charge in the Vubis catalogue of the University Library as long as the student has given their prior explicit consent.

In the context of the possibility of making their Master's thesis available free of charge, the student chooses one of the following options:

- OPEN ACCESS: worldwide access to the full text of the Master's thesis
- ONLY ON THE CAMPUS: access to the full text of the Master's thesis is only possible from the VUB network
- EMBARGO FOLLOWED BY OPEN ACCESS: worldwide access to the full text of the Master's thesis only after a specific date, namely .....
- **EMBARGO FOLLOWED BY ACCESS ONLY ON THE CAMPUS**: access to the full text of the Master's thesis only on the campus using the VUB network and only after a specific date, namely .....
- FULL TEXT NEVER ACCESSIBLE: no access to the full text of the Master's thesis

The supervisor confirms acknowledgement of the intention of the student to make the Master's thesis available in the Vubis catalogue of the University Library.

Date:

Signature of supervisor:



Any student who fails to include the document in their Master's thesis and/or has failed to indicate a choice and/or has failed to sign the document and/or has failed to inform the supervisor will be considered as not having granted permission to make their thesis public; in that event, the Master's thesis will only be archived and will not be accessible to the public.

Drawn up **online** on .....



Signature of student



## Appendix 7: SPSS output

### Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
PRE_Amotivatie	63	1.00	7.00	2.5595	1.47883
PRE_Externe_Regulatie	63	1.00	7.00	3.3968	1.73397
PRE_Introjectieve_Regulatie	63	1.00	7.00	3.1627	1.97319
PRE_Geïdentificeerde_Regulatie	63	1.00	7.00	5.2262	1.40184
PRE_Intrinsieke_Regulatie	63	1.00	7.00	5.6230	1.26433
POST_Amotivatie	63	1.00	7.00	2.3889	1.41334
POST_Externe_Regulatie	63	1.00	7.00	3.5661	1.75225
POST_Introjectieve_Regulatie	63	1.00	7.00	3.4048	1.81638
POST_Geïdentificeerde_Regulatie	63	1.00	7.00	5.1944	1.24470
POST_Intrinsieke_Regulatie	63	2.50	7.00	5.7421	1.15613
Valid N (listwise)	63				

### Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
PRE_Amotivatie	44	1.00	7.00	3.3011	1.64386
PRE_Externe_Regulatie	44	1.00	7.00	3.8485	1.67124
PRE_Introjectieve_Regulatie	44	1.00	5.50	2.6534	1.36422
PRE_Geïdentificeerde_Regulatie	44	1.00	7.00	4.3239	1.60629
PRE_Intrinsieke_Regulatie	44	1.00	7.00	4.2784	1.48463
POST_Amotivatie	44	1.00	4.75	3.2102	1.06332
POST_Externe_Regulatie	44	1.00	7.00	4.3258	1.65732
POST_Introjectieve_Regulatie	44	1.00	5.25	3.0795	1.39223
POST_Geïdentificeerde_Regulatie	44	1.00	7.00	4.1136	1.49462
POST_Intrinsieke_Regulatie	44	1.00	7.00	4.0966	1.34490
Valid N (listwise)	44				

## NPar Tests

### ➔ Mann-Whitney Test

itney Tes  
s  
Statistics

Ranks				
	groep	N	Mean Rank	Sum of Ranks
verschil_Amotivatie	Interventie	63	51.87	3268.00
	Controle	44	57.05	2510.00
	Total	107		
verschil_Externe_Regulatie	Interventie	63	50.32	3170.00
	Controle	44	59.27	2608.00
	Total	107		
verschil_Introjectieve_Regulatie	Interventie	63	50.79	3199.50
	Controle	44	58.60	2578.50
	Total	107		
verschil_Geïdentificeerde_Regulatie	Interventie	63	55.43	3492.00
	Controle	44	51.95	2286.00
	Total	107		
verschil_Intrinsieke_Regulatie	Interventie	63	55.67	3507.50
	Controle	44	51.60	2270.50
	Total	107		

Test Statistics <sup>a</sup>					
	verschil_Amotivatie	verschil_Externe_Regulatie	verschil_Introjectieve_Regulatie	verschil_Geïdentificeerde_Regulatie	verschil_Intrinsieke_Regulatie
Mann-Whitney U	1252.000	1154.000	1183.500	1296.000	1280.500
Wilcoxon W	3268.000	3170.000	3199.500	2286.000	2270.500
Z	-.853	-1.474	-1.293	-.576	-.676
Asymp. Sig. (2-tailed)	.393	.140	.196	.565	.499

a. Grouping Variable: groep

## Descriptives

### Descriptive Statistics

	N	Mean	Std. Deviation
verschil_Amotivatie	63	-.1706	.98458
verschil_Externe_Regulatie	63	.1693	1.44787
verschil_Introjectieve_Regulatie	63	.2421	1.62823
verschil_Geïdentificeerde_Regulatie	63	-.0317	1.19853
verschil_Intrinsieke_Regulatie	63	.1190	1.19209
Valid N (listwise)	63		

### ➔ Descriptives

### Descriptive Statistics

	N	Mean	Std. Deviation
verschil_Amotivatie	44	-.0909	1.66014
verschil_Externe_Regulatie	44	.4773	2.17384
verschil_Introjectieve_Regulatie	44	.4261	1.47713
verschil_Geïdentificeerde_Regulatie	44	-.2102	1.23531
verschil_Intrinsieke_Regulatie	44	-.1818	1.40634
Valid N (listwise)	44		

## amotivatie

### Reliability Statistics

Cronbach's Alpha	N of Items
.814	4

Extern: 0,781

### Reliability Statistics

Cronbach's Alpha	N of Items
.781	3

### Item Statistics

	Mean	Std. Deviation	N
EXT: Ik doe mee aan LO... - Omdat ik op deze manier geen laag cijfer krijg.	3.52	2.080	107
EXT: Ik doe mee aan LO... - Zodat de leraar niet tegen me schreeuwt.	2.85	1.961	107
EXT: Ik doe mee aan LO... - Omdat dat nu eenmaal de regel is.	4.37	2.126	107

## Introjected

### Reliability Statistics

Cronbach's Alpha	N of Items
.920	4

### Item Statistics

	Mean	Std. Deviation	N
INTR: Ik doe mee aan LO... - Omdat ik me slecht zou voelen als de leraar zou denken dat ik niet goed ben in LO.	2.64	1.829	107
IINTR: Ik doe mee aan LO... - Omdat ik me slecht over mezelf zou voelen als ik het niet zou doen.	3.00	2.000	107
INTR: Ik doe mee aan LO... - Omdat ik me slecht zou voelen als de andere leerlingen zouden denken dat ik niet goed ben in LO.	3.00	2.042	107

Ident:

a. Listwise deletion based on all variables in the procedure.

### Reliability Statistics

Cronbach's Alpha	N of Items
.914	4

### Item Statistics

	Mean	Std. Deviation	N
IDEN: Ik doe mee aan LO... - Omdat ik het belangrijk vind om goed te presteren in LO.	4.65	1.807	107
IDEN: Ik doe mee aan LO... - Omdat ik het belangrijk vind om beter te worden in de oefeningen die we doen in LO.	4.71	1.812	107
IDEN: Ik doe mee aan	4.76	1.726	107

## Instr

### Case Processing Summary

		N	%
Cases	Valid	107	100.0
	Excluded <sup>a</sup>	0	.0
	Total	107	100.0

a. Listwise deletion based on all variables in the procedure.

### Reliability Statistics

Cronbach's Alpha	N of Items
.918	4

### Item Statistics

	Mean	Std. Deviation	N
INST: Ik doe mee aan LO... - Omdat LO leuk is.	5.40	1.693	107
INST: Ik doe mee aan LO... - Omdat LO spannend is	4.56	1.787	107

### Test Statistics<sup>a</sup>

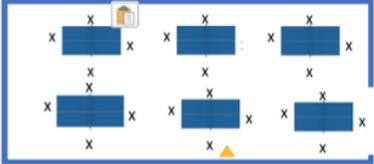
	POST_Amotivatie - PRE_Amotivatie	POST_Externe_Regulatie - PRE_Externe_Regulatie	POST_Introjectieve_Regulatie - PRE_Introjectieve_Regulatie	POST_Geïdentificeerde_Regulatie - PRE_Geïdentificeerde_Regulatie	POST_Intrinsieke_Regulatie - PRE_Intrinsieke_Regulatie
Z	-1.257 <sup>b</sup>	-.994 <sup>c</sup>	-.952 <sup>c</sup>	-.516 <sup>b</sup>	-.333 <sup>c</sup>
Asymp. Sig. (2-tailed)	.209	.320	.341	.606	.739

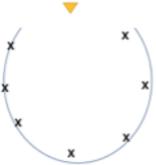
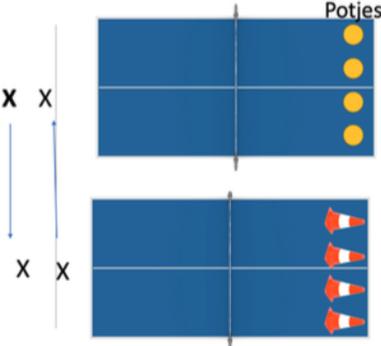
a. Wilcoxon Signed Ranks Test

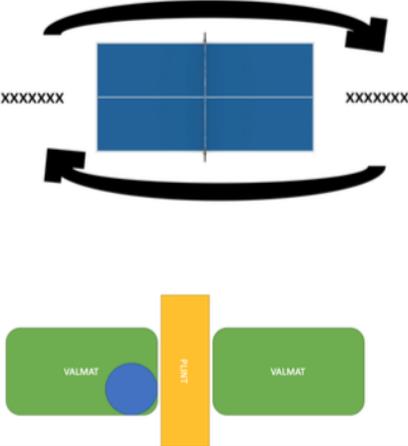
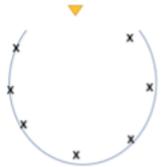
b. Based on positive ranks.

c. Based on negative ranks.

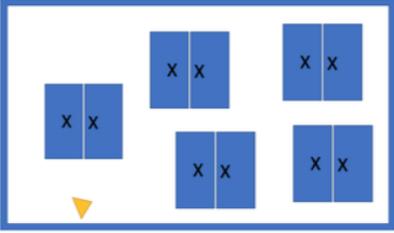
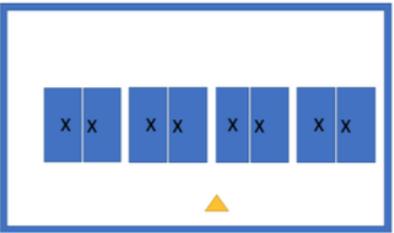
Appendix 8: lesson preparation – table tennis

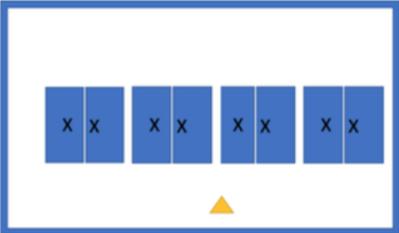
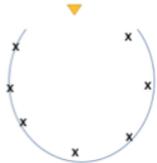
TIMING	SPECIFIEKE DOELSTELLINGEN	OEFENSTOF	ORGANISATIE	DIDACTISCH HANDELEN
5'	<p><b>OPWARMING:</b></p> <ul style="list-style-type: none"> <li>- Hartslag omhoog laten gaan</li> <li>- Spieren opwarmen</li> <li>- Gewrichten beweeglijker maken</li> </ul>	<p><b>Oefening 1:</b></p> <p>De leerlingen voeren als stappend doorheen de zaal balgewenningsoefeningen uit.</p> <ul style="list-style-type: none"> <li>- De bal stuiten op forehand/backhand bewegingen</li> <li>- Bal proberen stuiten op zijkant</li> <li>- Bal afwisselend laten stuiten op u palet en op tafel laten stuiten</li> <li>- Probeer de bal vanuit hoge slag 'stil' te leggen op palletje</li> </ul>	 <p><b>Veiligheid:</b> Te weinig plaats = tafels nog toegeklapt houden</p>	<p><b>Voor de oefening:</b></p> <ul style="list-style-type: none"> <li>- Bij elkaar roepen en oefening uitleggen</li> <li>- Vragen of ze het begrijpen</li> <li>- Juiste greep vermelden</li> <li>- Zeggen dat tafeltennis geen stilstaande sport is</li> </ul> <p><b>Materiaal:</b></p> <ul style="list-style-type: none"> <li>- 20 balletjes + paletten/ Bat</li> <li>- 6 tafels</li> </ul> <p><b>Juiste greep tafeltennis:</b></p> <ul style="list-style-type: none"> <li>- Alsof je een hand geeft</li> <li>- Tussen duim en wijsvinger</li> <li>- Wijsvinger leg je op het rubber</li> <li>- Andere vingers rond het hout</li> <li>- Ontspannen</li> </ul>
4'	<ul style="list-style-type: none"> <li>- Aandacht richten op concentratie en reactievermogen</li> <li>- Bevorderen van oriëntatie en ruimtelijk bewustzijn in de zaal</li> </ul>	<p><b>Oefening 2:</b></p> <p>Zijwaarts bewegen over tafel: slidesteps</p> <p>De leerlingen verdelen zich met 4 rond een tafel. Wanneer ik links zeg, voeren ze naar links de bijtrekbeweging uit. Idem als ik rechts zeg.</p> <p>Eventueel zonder tafels</p>		<p><b>Bijtrekpas:</b></p> <ul style="list-style-type: none"> <li>- Kleine sprongtjes in zijwaartse richting</li> <li>- Afstand tussen voeten blijven gelijk</li> </ul> <p><b>Aandachtspunten:</b></p> <ul style="list-style-type: none"> <li>- Vragen of iedereen het begrijpt</li> </ul> <p><b>Materiaal:</b></p> <ul style="list-style-type: none"> <li>6 pingpongtafels</li> </ul>

<p>2'</p> <p>8'</p>	<p><b>KERN:</b></p> <ul style="list-style-type: none"> <li>- Kennis laten maken met de sport</li> </ul> <ul style="list-style-type: none"> <li>- Kennis laten maken met de service</li> <li>- Leren toepassen van de juiste basishouding en greep</li> </ul>	<p><b>Oefening 1</b> Een kort filmpje tonen van hoe een pingpong match eraan toe gaat</p> <p><b>Oefening 2: oefenen van service</b> Op het einde van de tafels liggen verschillende soorten voorwerpen. De leerlingen worden in groepen verdeeld. Per groep zijn er 2 tafels voorzien. Op de eerste tafel liggen potjes als uiteinde en op de tweede tafel liggen kegels. Wanneer je een kegel raakt met een correcte service krijg je 1 punt. Wanneer je een potje raakt met een correcte service dan krijg je 2 punten. De leerlingen wisselen altijd af van tafel.</p>	 	<p>Iedereen kan het zien</p> <p><b>Vragen:</b></p> <ul style="list-style-type: none"> <li>- Wat valt er u op -&gt; staan nooit stil</li> </ul> <p><b>Service:</b></p> <ul style="list-style-type: none"> <li>- Op eigen tafelhelft stuiten</li> <li>- diagonaal naar tegenstander gespeeld worden</li> </ul> <p><b>Basishouding:</b></p> <ul style="list-style-type: none"> <li>- Voeten schouderbreedte</li> <li>- Knieen gebogen</li> <li>- Voeten evenwijdig van tafel</li> <li>- Forehand -&gt; rechtersvoet iets naar achter</li> </ul> <p><b>Aandachtspunten:</b></p> <ul style="list-style-type: none"> <li>- Op het einde bij een roepen en vragen hoeveel punten ze hebben gescoord</li> </ul> <p><b>Materiaal:</b></p> <ul style="list-style-type: none"> <li>- Potjes</li> <li>- 12 kegels</li> <li>- Ieder 2 balletjes + bat</li> </ul>
<p>5'</p>	<ul style="list-style-type: none"> <li>- Leren sturen van de bal via aangepaste kracht en richting</li> </ul>	<p><b>Oefening 3:</b> De leerlingen voeren per 2 een rally uit. Met een service. De service moet nog niet diagonaal gespeeld worden. Ze staan per 4 aan een tafel, om de 2 min wisselen ze. Wanneer de 2 leerlingen aan het wachten zijn, geven ze feedback op de spelers die bezig zijn.</p>		

10'	<ul style="list-style-type: none"> <li>- Aandacht ontwikkelen voor fair play en respect tijdens competitie-elementen</li> </ul>	<p><b>Oefening 4:</b> Rond de tafel. Alle lln lopen rond de tafel en om de beurt slaan ze op de bal. Wie mist of niet op tijd bij de bal is, ligt uit. Het spel gaat door tot er één winnaar overblijft.</p> <p><b>Te weinig pingpongtafels:</b> Pingpong met 2 valmatten, plint en fitnessbal.</p>		<p><u>Tijdens oefening:</u></p> <ul style="list-style-type: none"> <li>- Feedback geven</li> <li>- Aanmoedigen</li> </ul> <p><u>Gekwetsten:</u></p> <ul style="list-style-type: none"> <li>- Houden scores bij</li> </ul> <p>Overgebleven leerlingen wachten aan hun tafel</p>
<b>TIMING</b>	<b>SPECIFIEKE DOELSTELLINGEN</b>	<b>OEFENSTOF</b>	<b>ORGANISATIE</b>	<b>DIDACTISCH HANDELEN</b>
2'	<p><u>COOLING DOWN:</u></p> <ul style="list-style-type: none"> <li>• Hartslag laten dalen</li> </ul>	- Bespreking over de les	<p>Bij elkaar roepen</p> 	<ul style="list-style-type: none"> <li>- 'vonden jullie het leuk'</li> <li>- 'wat hebben we zo net geleerd?'</li> <li>- Wat zijn de aandachtspunten</li> </ul>

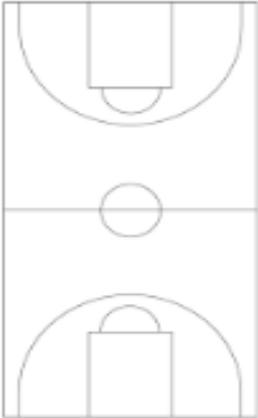
## Appendix 9: lesson preparation – kickboxing

TIMING	SPECIFIEKE DOELSTELLINGEN	OEFENSTOF	ORGANISATIE	DIDACTISCH HANDELEN
5'	<p><u>OPWARMING:</u> Hartslag naar omhoog</p>	<p>Leerlingen lopen in een cirkel. Wanneer leerling in de handen klapt dan voeren de leerlingen een oefening uit.</p> <p><b>1x klappen:</b> 10 jumping jack  <b>2x klappen:</b> 20x touwtjespringen zonder touw  <b>3x klappen:</b> 5x pompen</p>		<ul style="list-style-type: none"> <li>- LK overloopt alle oefeningen met duidelijke instructies.</li> <li>- LK doet mee</li> <li>- Tempo en intensiteit aanpassen aan niveau van de groep.</li> <li>- FB geven op houding en uitvoering.</li> <li>- Actief mee opwarmen ter motivatie.</li> </ul>
5'		<p>2 leerlingen op matje</p> <ul style="list-style-type: none"> <li>- Pompsteun recht over elkaar en proberen de polsen te pakken</li> <li>- Rechtstaan en andere persoon van het matje duwen</li> <li>- Idem maar op 1 been</li> <li>- Rug aan rug (duwen + opstaan)</li> <li>- Reactiespelletjes tikken</li> </ul>		<ul style="list-style-type: none"> <li>- Stopwoord uitleggen</li> <li>- 1' per oefening</li> <li>- Veranderen van tegenstander</li> </ul>
10'	<p><u>KERN OEFENING 1:</u> Technieken leren</p>	<p>1. Houding voeten op schouderbreedte, lichte buiging in de knieën, handen op ooghoogte, ellebogen dicht bij het lichaam.</p>		<ul style="list-style-type: none"> <li>- Uitleggen hoe vechtershouding eruitziet</li> <li>- Aandacht voor veiligheid bij duw- en tikspellen.</li> <li>- Observatie op fair play en samenwerking.</li> </ul>

5'	<u>KERN OEFENING 2:</u>	<p>2. Jab (rechte stoot) Demonstreren en laten oefenen van de voorste handstoot.</p> <p>3. Cross (rechte stoot) Demonstreren en laten oefenen van de achterste handstoot.</p> <p>4. Uppercut Demonstreren en laten oefenen van de opwaartse stoot.</p>	<p>Wisselen van partner</p> 	<ul style="list-style-type: none"> <li>- Aansturen op duidelijke start- en stopsignalen.</li> <li>- Variatie aanbieden: bv. op 1 been, ogen dicht, met tijdsdruk.</li> <li>- Coachende vragen stellen: "Hoe blijf je stabiel?", "Wat werkte goed?"</li> </ul>
5'	<u>KERN OEFENING 3:</u> Combinaties maken	<p>1. Voetenwerk</p> <p>2. Voetenwerk en combinatie technieken op het liedje 'rocky balboa'</p> <p>Schaduwboksen met twee op het liedje 'eye of the tiger'</p> <ul style="list-style-type: none"> <li>- Alle combinaties maken</li> </ul>		<ul style="list-style-type: none"> <li>- Timing en ritme meegeven op muziek.</li> <li>- Meedoen en model staan (co-teaching).</li> <li>- Combinaties op het bord/projector tonen.</li> <li>- Feedback op coördinatie, tempo en controle.</li> <li>- Indien nodig vertragen en opnieuw opbouwen.</li> </ul>
<b>TIMING</b>	<b>SPECIFIEKE DOELSTELLINGEN</b>	<b>OEFENSTOF</b>	<b>ORGANISATIE</b>	<b>DIDACTISCH HANDELEN</b>
2'	<u>COOLING DOWN:</u> Hartslag laten dalen	Bespreking over de les Stretchen: iedere leerling geeft een statische stretchoefening	<p>Bij elkaar roepen</p> 	<ul style="list-style-type: none"> <li>- Leerlingen betrekken bij reflectie ("Wat vond je leuk?")</li> <li>- Feedback op correcte uitvoering stretchhoudingen.</li> </ul>

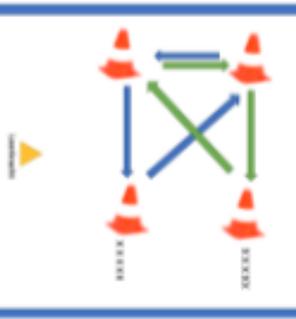
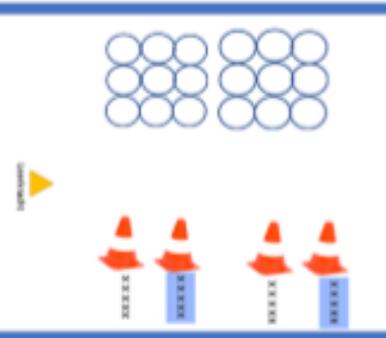
Appendix 10: lesson preparation – fun lesson

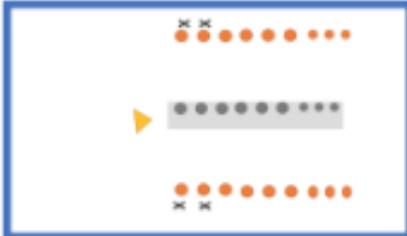
TIMING	SPECIFIEKE DOELSTELLINGEN	OEFENSTOF	ORGANISATIE	DIDACTISCH HANDELEN
5'	<p><b>INTRODUCTIE + OPWARMING</b></p> <p>Uitleg spel:</p>	<p>We worden terug gekatapulteerd in de tijd ontdekkingsreizigers Christoffel Columbus en James Cook willen te weten komen wie de beste ontdekkingsreiziger is. Daarom organiseren ze een wedstrijd, om in een bepaalde tijd, zo veel mogelijk landen te ontdekken.</p>		
5'	<p>Indeling teams:</p>	<p><u>L</u>in verspreiden zich over twee banken. Op elke bank moeten evenveel leerlingen staan. Eens iedereen op de bank staat moeten de leerlingen zich in alfabetische rangorden plaatsen, zonder van de bank te komen. Op het einde van de rit moeten de leerlingen dus in alfabetische orde staan en gelijk verdeeld zijn over de banken. De leerlingen die</p>		

TIMING	SPECIFIEKE DOELSTELLINGEN	OEFENSTOF	ORGANISATIE	DIDACTISCH HANDELEN
40'	Kern:			
5'	Land Japan – estafette	<p>Jan-Ken-Pon (schaar steen papier):</p> <ul style="list-style-type: none"> <li>- één ploeg staat aan een hoek en een andere ploeg staat aan een hoek van dezelfde zijde.</li> <li>- Van elke ploeg start 1 speler door voorwaarts te lopen en aan de hoek af te slaan, zo komen ze elkaar tegen.</li> <li>- Ze houden handen achter de rug en zeggen jan-ken-pon. En laten één van de dingen zien. Jan-ken-pon= steen-papier-schaar.</li> <li>- Wie wint loopt verder, ondertussen is er van de verliezende ploeg iemand vertrokken en die komt de winnaar weer tegen.</li> <li>- De ploeg die eerst bij de andere geraakt is gewonnen.</li> </ul>		<ul style="list-style-type: none"> <li>- Duidelijke instructies geven</li> <li>- Duidelijk start en eindsignaal -&gt; fluitje meenemen</li> <li>- Geven van een DEMO</li> <li>- Duidelijk afspreken -&gt; aftellen 1,2,3 of direct schaar/steen/papier tonen?</li> </ul>

5'	Land Canada – estafette	International Shopping: - Twee ploegen moeten aan de overkant een boodschappenlijstje gaan lezen. - Wanneer ze iets gelezen hebben, moeten ze teruglopen en het opschrijven.		- Ploeg 1 min overlegtijd, hoe gaan ze het aanpakken? - Ploeg die als eerste zit krijgt als eerste de kans om boodschappenlijstje te laten controleren
5'	Land Australië – Estafette	Kangoeroe Hop: - Elke speler heeft een bal onder zijn t-shirt. - De eerste speler vertrekt met een tennisbal tussen zijn knieën. - Hij springt een bepaald parcours tot aan de volgende speler en die neemt de tennisbal over. - Wanneer de tennisbal of de ballon onderweg valt, moet de speler terug starten van in het begin.		- Regel: Bal laten vallen is opnieuw beginnen -> consequent en bij iedereen toevoegen.

5'	Land Rusland – <u>Tikspel</u>	<p>Vlaggenhoekspel:</p> <ul style="list-style-type: none"> <li>- Er zijn twee ploegen. Het terrein is een vierkant, met aan de ene kant de 2 ploegen op een hoek, en aan de andere kant voor elke ploeg een vlag, maar zodat elke ploeg recht voor zich de vlag van de andere partij heeft.</li> <li>- Een van de ploegen stuurt nu een speler het veld op, die probeert de vlag te halen en naar zijn kamp terug te brengen. De volledige andere ploeg probeert hem te tikken.</li> <li>- Als hij getikt is, blijft hij staan op de plaats waar hij getikt is. <u>Dan</u> is het aan de andere ploeg om iemand uit te sturen.</li> <li>- Het afwisselen gaat door tot één van de ploegen zijn vlag in zijn kamp gekregen heeft of iedereen van een ploeg in het veld staat. Je kan je ploegmaats bevrijden door ze aan te tikken.</li> </ul> <p><a href="https://youtu.be/n0fBfyprw9A">https://youtu.be/n0fBfyprw9A</a></p>		
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5'	Land Duitsland – estafette	<p><u>Oefening :</u></p> <p>We verdelen de leerlingen in twee teams. Zij stellen zich op in twee rijen. Op 10m van elke rij staat een stoel. De leerlingen lopen schuin naar de stoel die voor de rij van de tegenstanders staan en duwen deze omver. Daarna lopen ze zo snel mogelijk naar hun eigen stoel en proberen op deze te gaan zitten voor de tegenstander deze kan omverduwen. Als een team op zijn stoel kan gaan zitten is dat team gewonnen.</p>		<p><u>Aandachtspunten:</u></p> <ul style="list-style-type: none"> <li>- Mochten er geen stoelen zijn = idem oefening maar met kegels. Deze duw je omver en wanneer deze niet omver geduwd is dan zet je hem op je hoofd</li> </ul> <p><u>Materiaal:</u></p> <ul style="list-style-type: none"> <li>- 2 stoelen of 2 kegels</li> </ul>
5'	Land Engeland – Estafette	<p><u>Oefening :</u></p> <p>3 op een rij: Er zijn 4 ploegen waarvan er altijd 2 ploegen tegen elkaar spelen.</p> <p>Op het einde liggen er 9 hoepels. Er zijn twee teams. De eerste twee lopers van het team rennen naar de hoepels toe en leggen hun kleur hesje in één van de hoepels, daarna rennen ze zo snel mogelijk terug en tikken ze de volgende loper aan. De volgende lopers leggen ook weer</p>		<p><u>Materiaal:</u></p> <ul style="list-style-type: none"> <li>- 6 hesjes kleur rood</li> <li>- 6 hesjes kleur groen</li> <li>- 18 hoepels of ruiten maken met potjes  </li> </ul> <p><u>Regels:</u></p> <ul style="list-style-type: none"> <li>- In elke hoepel mag maar 1 hesje liggen</li> <li>- 3 op een rij geldt zowel verticaal, horizontaal als diagonaal</li> </ul>

5'	Land Costa Rica – Reactie snelheid	<p>een hesje in één van de hoepels. Enzovoort. De ploeg die als eerst 3 op een rij heeft wint het spel en krijgt een punt.</p> <p>Oefening: Er liggen potjes in het midden en voor elk potje staat er een leerling. De leerlingen voeren oefeningen uit en wanneer ik 'ja' roep dan zullen ze zo snel mogelijk het potje moeten halen. Wie het eerste het potje heeft, steekt dit in de lucht. De rij met <u>de meeste potjes</u> heeft een punt.</p> <p>Oefeningen die ze ter plaatse uitvoeren:</p> <ul style="list-style-type: none"> <li>Hoofd tikken</li> <li>Knie tikken</li> <li>Draaien</li> <li>Tenen tikken</li> <li>Springen</li> </ul>	 <p>The diagram shows a rectangular area representing the game field. At the top left, there is a small yellow triangle with the text 'leertijd' and 'x. leertijd' below it. In the center, there is a horizontal grey bar with a yellow arrow pointing to the right. Above and below this bar are two rows of orange dots, representing the 'potjes' (pots). Each row has 10 dots. Above the top row, there are two 'x' marks above the first two dots. Below the bottom row, there are two 'x' marks below the first two dots.</p>	<p>- Als alle 3 de lintjes in de hoepels liggen moet je één van je lintjes verplaatsen</p> <p>Voor de oefening:</p> <ul style="list-style-type: none"> <li>- Bij elkaar roepen en uitleggen</li> <li>- Demo geven</li> <li>- Vragen of iedereen het begrepen heeft</li> </ul> <p>Tijdens de oefening:</p> <ul style="list-style-type: none"> <li>- Aanmoedigen</li> <li>- Feedback geven</li> </ul> <p>Materiaal:</p> <ul style="list-style-type: none"> <li>- Potjes</li> </ul>
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