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LEARNING THROUGH MOVEMENT IN THE TEACHING OF GERMAN AS A FOREIGN LANGUAGE IN SECONDARY SCHOOLS. A PRACTICAL SCHOOL CASE STUDY

EL APRENDIZAJE A TRAVÉS DEL MOVIMIENTO EN LA ENSEÑANZA DEL ALEMÁN COMO LENGUA EXTRANJERA EN LA EDUCACIÓN SECUNDARIA OBLIGATORIA. UN ESTUDIO DE UN CASO PRÁCTICO

Susanne Remane
Universidad Autónoma de Madrid, Spain

Abstract
Learning through movement is a teaching method in which physical movement is considered a central teaching and learning tool. It is intended to support the learning process and lead to better information processing and retention in learners of all ages. Despite this, however, physical activity is primarily used at the preschool and primary levels. At the secondary level, where concentrated learning and grades are usually the primary focus, movement activities often lose importance. This article presents findings from a school-based case study aimed at investigating whether the use of *learning through movement* can lead to measurable performance gains in adolescents.
Key Words: learning through movement, foreign language didactics, German as a foreign language in secondary schools

Resumen
El *aprendizaje a través del movimiento* es un método de enseñanza en el que el movimiento físico se considera una herramienta central de enseñanza y aprendizaje. Su objetivo es apoyar el proceso de aprendizaje y conducir a un mejor procesamiento y retención de la información en alumnos de todas las edades. Sin embargo, la actividad física se utiliza principalmente en la educación infantil y primaria. En el nivel secundario, donde el aprendizaje concentrado y las calificaciones están en primer plano, las actividades de movimiento suelen perder importancia. Este artículo presenta los resultados de un estudio de caso en un instituto de educación secundaria, cuyo objetivo es investigar si el uso del *aprendizaje a través del movimiento* puede conducir a un aumento mensurable del rendimiento entre los adolescentes.
Palabras clave: aprendizaje a través del movimiento, didácticas de las lenguas extranjeras, alemán como lengua extranjera en la enseñanza secundaria

1. INTRODUCTION

Learning through movement is a form of subject or foreign language teaching in which physical movement is used as a didactic principle to enhance performance or to motivate and activate learners.

Today, *learning through movement* is integrated into lessons using a mix of methods as needed. Although the focus seems to be especially on children of primary school age, *learning through movement* is a didactic approach that can be used in all age groups and teaching phases, since movement has a positive effect on various neurobiological and psycholinguistic aspects of foreign language learning.

In this context, adolescent students represent a special group of learners with concrete characteristics and needs that can be clearly distinguished from younger and adult learners, and who are going through a phase of life in which enormous changes are taking place that also have a significant impact on learning. Nevertheless, there is comparatively little literature for the use of *learning through movement* specifically in this age group.

For this reason, a case study was designed to investigate whether the use of *learning through movement* in the teaching of German as a foreign language with adolescent learners at secondary level can lead to a measurable increase in performance.

2. STATE OF THE RESEARCH

2.1 What is learning through movement?

Learning through movement is a form of subject teaching and thus of foreign language teaching in which physical movement is considered a central element of school learning and teaching. (Surkamp 2017, p. 19). The learning theory basis for this is the assumption that movement supports and enriches the learning process and leads to improved information processing and anchoring. In addition, stress is to be reduced and demotivated learners are to be encouraged to participate in lessons.

In modern foreign language teaching, *learning through movement* is integrated into the classroom as needed in a mix of methods, since movement has a positive effect on various neurobiological and psycholinguistic aspects of foreign language learning, as will be shown below.

2.2 The Limbic System and the influence of movement

The limbic system plays a fundamental role in learning. It is located in the center of the brain and outlines neural structures that, among other things, have a key role in memory formation and learning. Of particular interest is the hippocampus, which is responsible for declarative and non-declarative memory and therefore plays an indispensable role in remembering knowledge. (Buchner/Brandt 2002, p. 49 ff, quoted from Walk 2011, p. 28). It also possesses an astonishing ability that was first demonstrated in humans in 1998, namely that it is capable of forming new neurons (Eriksson et al. 1998, cited in Walk 2011, p. 27ff). Until then, it had been assumed that the number of nerve cells in the brain steadily decreased from the time of birth. In 2000, however, studies were able to show that newly formed neurons in the hippocampus would be integrated into existing neuron assemblies and could thus improve learning processes (Walk 2011, p.28). Hippocampal neurogenesis could be enhanced by

exercise, according to Ameri (2001, as cited in Walk 2011, p. 28), with physical activity in the form of endurance training doubling the number of newly formed neurons. But even if endurance training were not practiced, it can be assumed that physical activity at least positively influences cognitive functions.

This is presumably due to an increase in cerebral blood flow (Colcombre and Kramer, 2003; Bherer et al., 2013; Bondell et al., 2014, cited in Folta-Schoofs and Ostermann, 2019, p. 204). However, this does not necessarily have to involve sports or other strenuous activities. In a study published in 1987, Herholz et al. were able to show that even slow walking resulted in a important increase in cerebral blood flow of 13.5% on average (Herholz et al., 1987, cited in Folta-Schoofs and Ostermann, 2019, p. 204). For Schart and Legutke (2018, p. 79), even alternating between standing, sitting, and walking is useful, no matter what the learners are actually doing, because it leads to a physical dynamic that has a positive effect on attention because it brings variety into the classroom. Hernández (2018) notes:

> Although the research shows that twenty to thirty minutes of cardiovascular movement is necessary for new cell growth, that does not preclude us from using smaller doses of exercise in the classroom to effectively boost our students' ability to focus on and process new or complex information. […] The data indicate that we can boost cognitive activity simply by increasing oxygen supply to the brain. To do that, we just need to get ourselves and our students out of chairs moving about. (p. 22)

In addition to increased brain circulation, Walk (2011, p.28) sees the advantage of learning with movement in the fact that the brain releases various neurotransmitters involved in the learning process when movements are performed, which has a positive effect on brain processes and makes it clear what a great influence movement has on emotional processes, memory and learning performance, and Sambanis (2013, p. 94) comes to the conclusion that movement not only brings variety to the teaching and learning process and increases enjoyment, but that content is also retained better and longer and can be recalled more quickly and reliably.

2.3 The Limbic System as controller of emotions and motivation

As briefly mentioned above, the limbic system also plays an important role with regard to motivation in language learning. Decke-Cornhill and Küster (2015, p. 43) note that any learning process is characterized by an interplay of cognitive and affective-emotional factors, and consequently these factors cannot be separated from each other in practice. During the processing and emotional evaluation of sensory impressions, the brain releases neurotransmitters. These are chemical messengers that transmit nerve impulses within the brain. These neurotransmitters, which the brain releases when one feels anxiety, fear, anger, joy, surprise, etc. - in short, emotions - are also significantly involved in learning processes. According to Müsseler and Rieger, emotions generated certain motivations and readiness to act (2017, p. 190), which is why they play a decisive role in learning success, because they influence memory performance, concentration and creativity and increase intrinsic motivation through the release of neurotransmitters (e.g., dopamine). According to Decke-Cornhill and Küster, not only the initiation of learning processes, but also their very course was highly dependent on the influence of emotionality. (2015, p. 49).

Brand and Markowitsch (2006, p. 71)[1] also rate pleasant emotions as conducive to learning:

> Positive Emotionen während des Lernens wirken sich auf verschiedenen (Hirn-) Ebenen vorteilhaft für den Lernerfolg aus: erstens werden – […] emotionale Inhalte […] leichter eingespeichert und erinnert; zweitens dienen emotionale Aspekte der Lernsituation als Abrufhinweise (Quellengedächtnis); drittens aktivieren positive Emotionen während des Lernens das so genannte Belohnungssystem im Gehirn, das verhaltensverstärkend wirkt.

Therefore, according to Caballero (2017, p. 153), there should be a relaxed learning environment in the classroom where learners feel safe and where stressful situations are avoided.

3. Adolescents as learners in GAFL[2] lessons

Stangl (2021) defines adolescence as a transitional period between childhood and adulthood. It begins with puberty, which is the process of sexual maturity. Exactly when puberty begins is controlled by hormones and is genetically determined. For girls, it begins somewhat earlier (around age 9) than for boys (around age 11) and ends around age 14 for girls and age 16 for boys. Adolescents are those in the 12 to 19 age group. They go through a phase of life in which enormous changes take place, which also have a considerable influence on learning, which is why their learning behavior shows clear differences from that of children and adults in terms of enthusiasm and conscious attention control, among other things. Although adolescents have the best cognitive prerequisites for learning, they often pose a special challenge for teachers. Among the reasons given by teaching staff were discipline problems, a lack of attention, and a lack of motivation in their learners.

3.1 Cognitive development of adolescents

According to Salomo and Mohr (2018, p. 13), major remodeling takes place in the brain during puberty. The brain of a child becomes the brain of an adult in a few years. The brain of adolescents is very plastic, because at the beginning of this developmental phase, the amount of gray matter in the brain increases significantly, according to Salomo and Mohr. In addition, countless connections are formed between the nerve cells that are responsible for the transmission of information and are therefore also relevant for learning processes. In the long term, however, only those connections (synapses) that are used are retained (2018, p. 15).

In principle, this neuronal plasticity could represent an optimal starting situation for teachers. Nevertheless, especially learners in this age group are often a challenge for teachers. According to Salomo and Mohr (2018, p. 16ff), this is due to the fact that the executive brain functions, for which the prefrontal cortex, a brain region at the level of the forehead, is responsible, are not fully mature until the beginning of adulthood. According to Salomo and Mohr (2018, p. 17), the prefrontal cortex is responsible for the ability:

[1] Positive emotions during learning have a beneficial effect on learning success on various (brain) levels: firstly, [...] emotional content [...] is more easily stored and remembered; secondly, emotional aspects of the learning situation serve as recall cues (source memory); thirdly, positive emotions during learning activate the so-called reward system in the brain, which has a behavior-reinforcing effect. (Translated by the author)
[2] German as a foreign language

- To consciously control attention,
- to be able to set priorities (e.g., to prioritize between homework and leisure activities),
- of being able to suppress impulses (e.g., not getting distracted),
- of being able to make and follow plans (e.g., figuring out when to start studying before an exam and what to review),
- to manage and control emotions, and
- to act in a generally goal-oriented manner.

However, this brain area does not reach full functionality until between the ages of 20 and 25, which paradoxically also represents an advantage for learning at the same time. Before the prefrontal cortex is fully mature, it is still very plastic, which according to Salomo and Mohr (2018, p. 17ff) has the advantage that the brain of adolescents can react quickly to changing conditions and adapt to new challenges. Moreover, according to Sousa (2014, p. 59), the brains of young people are particularly receptive to new things.

3.2 Physical development of adolescents

Apart from the visible physical changes such as the growth spurt, the adolescent phase is also characterized by morning fatigue, passivity and listlessness, which challenge teachers of this age group, especially during the first lessons. The reason for this listlessness is a sleep deficit in adolescents that, according to Salomo and Mohr (2018, p. 28), is due to an approximately 2-hour later release of the sleep hormone melatonin. This sleep deficit is then noticeable in the morning in class. In addition, self-confidence drops sharply during this developmental phase due to physiological changes. Salomo and Mohr (2018, p. 24) note that in no other phase of life does self-confidence drop as sharply within a very short time as in the adolescent phase. Additionally, low self-confidence had a negative effect on academic performance. (208, p. 25). Often adolescents in this phase of life also suffer from speech anxiety, which is directly linked to self-confidence. They avoid acting linguistically in front of the class, which is not an ideal condition for learning in a modern, action-oriented foreign language classroom.

3.3 Social development of adolescents

During adolescence, students become emotionally detached from their parents. The relationship with teachers also changes, and their authority is questioned. Relationships with peers, the first girlfriend or boyfriend are now the focus of adolescent life. As a result, according to Salomo and Mohr (2018, p. 32), adolescents preferred cooperative forms of learning in class, such as partner or group work or group discussions, and became bored when lessons were presented in the classic frontal style, with the teacher speaking alone.

3.4 Adolescents and movement in the classroom

So, can *learning through movement* help adolescents learn? Certainly, it represents an alternative to the traditional memorization of vocabulary or cramming of grammar. Ideally, foreign language instruction should include an alternation of mental and physical activity, and receptive phases should be replaced by active phases. This can be achieved by linking movements and language as well as through movement games, because according to Heckmair and Michl (2011, p. 38), movement usually also had

a playful component. In addition, games have the advantage that they are usually fun for learners and thus arouse positive emotions, which in turn increase motivation and thus support learning. For Grein (2017, p. 35), games were basically helpful in the memorization process. Ruiz Ariza et al. (2022, p. 252) also advocate for physically active teaching, combining active games or tasks with subject matter, and refer to Mullender-Wijnsma et al. (2015, 2016), who recommend 10-30 minutes per class, 3-5 times per week, for this purpose.

However, Grein (2017, p. 70) points out that these forms of exercise were not suitable for all types of learners, as the limbic system of some learner's switched to irrelevant during games and action-oriented tasks triggered distress in particularly introverted, shy learners. Insisting on tasks that are classified as conducive to learning and involve movement (e.g., throwing a ball, playing games) may therefore be counterproductive for some learners (Grein 2017, p. 26). Schiffler notes that adolescents were often skeptical to dismissive of learning through movement. There is a possibility that they see such learning as childish o clowning around. (2012, p. 47). On the other hand, Sambanis notes that since many social forms that bring variety to classroom activities were linked to movement, movement also contributed in this way to the richness of variety in the classroom. (Sambanis 2013, p. 93). In addition, according to Schiffler (2012, p. 47), performing movements would also have a disinhibiting effect, which could benefit shy, inhibited learners. High-performing students, on the other hand, would not need movement, relaxation, or social form or exercise form changes, as they learned just as well on their own. For everyone else, however, *learning through movement* could be beneficial, he added. (2012, p. 47).

4. Learning through movement in secondary education

4.1 Contextualization and description of the case study

The present study was conducted at the public secondary school IES Cardenal Cisneros, a bilingual (Spanish/German) school in Madrid (Spain), where girls and boys complete their schooling from the 7th to the 12th grade.

For the study in the subject German as a foreign language (target level: B1), two class groups with approximately equal class sizes (about 30 learners per class) were selected from the three 9th grade classes (3º ESO).

Then, four lessons were given in both groups of learners, during which vocabulary relevant to the topic of the lesson was taught. One group was taught using traditional frontal instruction and classical vocabulary exercises, while the other group was taught using a movement-inclusive form of exercise. Each group received instruction without movement and with movement twice. Afterwards, both groups completed an identical vocabulary test to assess retention of the newly introduced vocabulary.

4.2 Lesson planning and implementation

A test run was conducted in both classes at the beginning, which consisted of conventional instruction without movement, in order to get an overview of the general performance level of the groups. This was to determine if these class groups were comparable in terms of achievement profile and consequently suitable for participation in the study.

The lessons were planned as follows:

	group 1	**group 2**
test run	without movement	without movement
	vocabulary test	
test 1	without movement	with movement
	vocabulary test	
test 2	with movement	without movement
	vocabulary test	
test 3	without movement	with movement
	vocabulary test	
test 4	with movement	without movement
	vocabulary test	

Table 1. Lesson planning
Source: own elaboration

For the lessons with movement, different movement activities based on the books by Piel (2016, 2019) and Böschel (2015, 2017) with different movement intensity[3] were chosen. Care was taken to ensure that the intensity of movement was balanced between groups:

	group 1	**group 2**
test 1	without movement	intensity 2
test 2	intensity 2	without movement
test 3	without movement	intensity 1
test 4	intensity 1	without movement

Table 2. Distribution of movement intensity per group
Source: own elaboration

The movement games were the following activities:

- Game 1:

For each noun, the matching verb had to be found. Cards were laid out face down in the classroom and the learners had to find matching pairs of cards in several rounds.

Materials used: set of cards with noun-verb connections.

- Game 2:

Learners lined up in a row of two, one behind the other, in front of the teacher's desk. The first two people took a flyswatter in their hands. The teacher placed 2 cards on the desk in front of each learner and named the Spanish term for one of the German adjectives. The learners clapped the fly swatters on the correct German adjective. In subsequent rounds, the teacher again placed two cards on the desk and

[3] The indication of the movement intensity was taken from the books of the two authors.

named the antonym of one of the two German adjectives in German. The students clapped on the corresponding adjective.

Materials used: two fly swatters and a set of cards with German adjectives and their antonyms.

- Game 3:

Learners lined up in a circle. Each learner received a card from the German card set. As long as music was playing, learners passed the cards around the circle. After the music stopped, everyone read their card aloud and named the corresponding Spanish term from memory. The game was then repeated with the Spanish vocabulary cards. In the last round, the Spanish and German cards were mixed.

Materials used: vocabulary cards in German and Spanish.

Game 4:

The game consisted of cards with an object on one card and the German word with article and plural ending on the matching card. The learners were divided into groups of 4 and played the memory game according to the classic memory rules with the addition that for each pair of cards found correctly, the term with article and plural ending was to be said aloud by the person who had found the pair.

Material used: Memory game with objects.

4.3. Evaluation instruments

The following evaluation instruments were used to collect results:

a) Vocabulary test: Following each lesson, learners completed a vocabulary test to assess the retention performance of the vocabulary taught by each learning method.

The tests were only used to check the retention of short-term memory, i.e., what the learners remembered immediately after the exercises, since a later performance measurement could have been distorted by different learning behaviors of the students (e.g., vocabulary learning at home), which would have made it impossible to clearly determine whether a good test result was due to a particular teaching method or rather to additional learning after the lesson.

b) Informal evaluation by the teacher: The teacher conducted an informal evaluation during the lesson to observe the behavior of the adolescents during the lesson.

4.4. Procedure

The groups participating in the study should have as similar a level of learning as possible so that the test results can be attributed as much as possible to the teaching method used and not to group-specific factors. In order to check whether the two groups had a comparable level of performance, a test run was first carried out in both groups. This consisted of a classical frontal teaching with written exercises. Subsequently, all students in both groups completed an identical test. The evaluation of the test run showed that both groups had a similar level of performance. Group one achieved an average score of 6.0, while group two achieved a 6.1.

5. Presentation of the results

5.1 Results Group 1

Learner group 1 achieved the following results[4] in the four vocabulary tests:

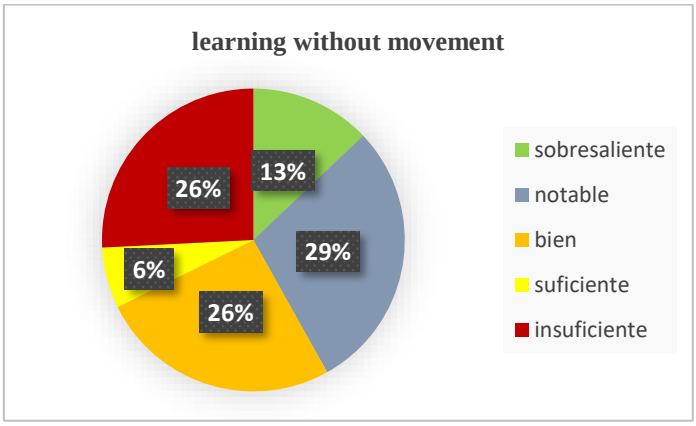

Figure 1. Test results without movement group 1,
Source: own elaboration

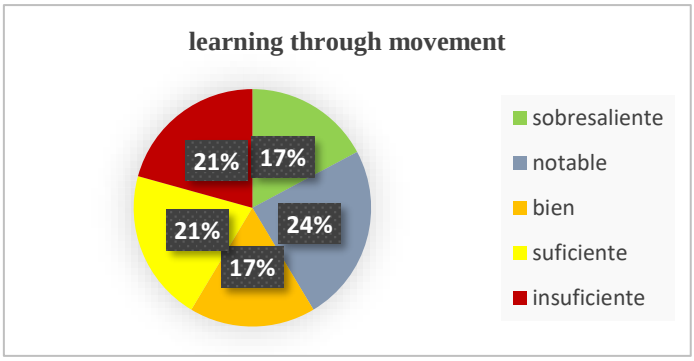

Figure 2. Test results with movement group 1
Source: own elaboration

Looking at the performance of the learners, the results are heterogeneous. A large proportion of learners in group 1 (45%) showed consistent performance regardless of the teaching method used. Just under one-third (29%) performed worse with movement-containing instruction, and the smallest group (19.5%) improved their performance with movement, including one individual who improved from 0% to 78% with movement instruction.

Results with a difference of at least 10% between the compared grade values are considered an improvement or deterioration, since minor deviations could also be attributed to other factors, such as daily form, and an increase or decrease in performance in the decimal range or by a few percentage points would not represent a significant improvement or deterioration.

[4] Table to compare European grades: https://www.studyineurope.eu/grades

5.2 Results group 2

Learner group 2 achieved the following results in the four vocabulary tests:

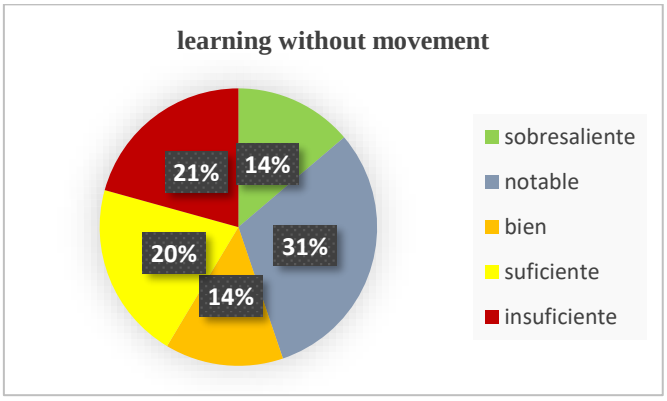

Figure 3. Test results without movement group 2
Source: own elaboration

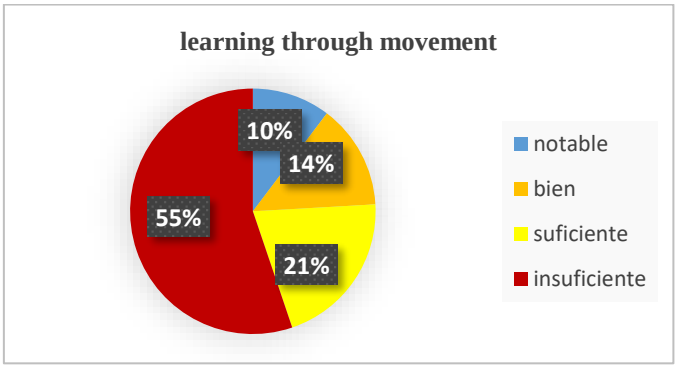

Figure 4. Test results with movement group 2
Source: own elaboration

The results in group 2 show that the vast majority of students either worsened (62%) or remained constant in their performance (35%) when taught with movement. The deterioration affected all grade segments.

In instruction with movement, the proportion of learners scoring sobresaliente decreased from 14% to 0%. The percentage of learners scoring notable decreased from 31% to 10%. Consequently, the score segments sobresaliente and notable represented only 10% of the learners, compared to 45% in the lessons without movement. The percentage of learners scoring bien remained constant at 14%, as did those scoring suficiente, which increased only slightly from 20% to 21% in the lessons with movement.

However, there was a significant increase in the number of learners who failed the tests after instruction with movement. Their proportion increased by a remarkable 34% from 21% to 55%.

5.3 Comparison of the test results of groups 1 and 2

The results of both groups in the four vocabulary tests are as follows in direct comparison:

	group 1	group 2
test 1	6,5	4,9
test 2	7,4	7
test 3	6,6	4,8
test 4	6,1	6,1

without movement

learning through movement

Table 3. comparison group results
Source: own elaboration

The following average scores were calculated from the results of the individual vocabulary tests presented above:

	without movement	learning through movement	test run
group 1	6,5	6,7	6
group 2	6,6	4,9	6,1

Table 4. Average scores per group
Source: own elaboration

These results show that both groups of learners achieved almost identical scores in the lessons without movement and minimally improved their scores from the test run. In both the test run and the lessons without movement, both groups achieved the average grade of *bien*.

However, in the lessons with movement, a striking difference in the class average was evident. While group 1 continued to receive the rating *bien* and was even able to increase its score by an insignificant 0.1%, the performance of group 2 dropped from 6.6 to 4.9. This group thus worsened its overall score by 2 grades from *bien* to *insuficiente* and narrowly failed the lessons with movement.

5.4 Informal evaluation

The behavior of the learners during the lessons with movement was observed by the author of the present work in an informal evaluation. In general, it could be observed that in both groups, in contrast to the classical frontal teaching, where there were a few students who did not cooperate, all students participated in the teaching with movement. The lively participation of all students, including those who were difficult to motivate, suggests that movement games have an activating and motivating effect on learners through the positive emotions generated. Regarding the compliance with the work instructions, it was found that they were followed slightly less in the lessons with movement than in the lessons without movement. As far as attention was concerned, it could be observed in all four movement games that the learners were very easily distracted and the overall attention was lower than in frontal teaching. From these observations, it can be concluded that movement games have an activating and motivating effect on learners, but at the same time they can distract learners, especially if they are not used to this

form of exercise. They also pose a great challenge to the teacher in terms of discipline and correct execution of the exercises.

6. Final considerations

The available literature on *learning through movement* suggested an increase in performance when this form of instruction was used, but this could not be confirmed in the present study. The influences of emotions on learning described by Heckmair and Michel (2011) as well as Grein (2017) could only be confirmed insofar as the movement games certainly seemed to generate positive emotions in the learners and functioned as motivators for participation in the lessons. Thus, informal evaluation by the instructional leader revealed learner activation, which had a positive effect on the performance of individual students and also motivated learners who refused to participate in conventional instruction to participate in the activities.

A positive influence of emotions on memory performance was also not clearly demonstrated. Although group 1 did not show any improvement in grade point average, individual students were able to significantly improve their performance, although this is put into perspective by the deterioration in results among other learners. In group 2, even about two thirds of the students were affected by a drop in performance, which is why learning through movement improved the performance of individual students, but no general positive trend could be identified for learners in this age group.

Also, the assumption that positive emotions directed the focus of the learners' attention to what was happening in class and increased their ability to concentrate could not be confirmed. On the contrary, a sharp drop in attention was observed in activities involving movement. The focus in adolescents is much stronger on social aspects than in younger or older learners. It can be assumed that this was also a reason for the fact that the students were very busy with interpersonal things during the movement activities and consequently were strongly distracted during the lessons, which was reflected in the test results especially in group 2.

Regarding the question of how *learning through movement* is accepted by adolescents, Schiffler's (2012, p. 47) assumption that adolescents were often skeptical about or even rejected learning with movement activities could not be confirmed in the present study. The extent to which his statement that adolescents might view this form of exercise as childish and clowning around, was true could not be verified, but in general the teacher's impression during the informal evaluation was that the adolescents took *learning through movement* less seriously and viewed it more as a kind of break from regular instruction.

Maintaining discipline in both groups in lessons with movement at all times proved difficult, except for test 4, where group 1 sat at tables as in conventional lessons. This probably represents an important difference to younger or older learners, as they are more willing than adolescents to follow the teacher's instructions, which is why it can be assumed that the discipline problems would have been less glaring in learning groups of other age groups. It can be concluded that the age factor probably played an important role in this point as well. However, it is possible that a group accustomed to movement games might react less agitated and distracted if movement activities are an integral part of the GAFL lessons. This could then possibly also lead to different results in the performance tests.

Although the results of the study did not show an increase in performance for either group, individual students were nevertheless able to improve their results with *learning through movement*, in some cases significantly. There were promising individual results for learners who, in contrast to frontal instruction, could be motivated to participate in class with movement activities. For these learners, this form of exercise appears ideal for re-engaging in class or sharing a positive learning experience with other learners.

Based on the results obtained in the present study, an improvement of performance in GAFL classes with adolescent learners t*hrough learning through movement* cannot be confirmed, except for some isolated cases.

Nevertheless, *learning through movement* should be used in a mix of methods for teaching German as a foreign language to adolescents, since this way a variety of different forms of exercises and didactic aids can be used, which appeal to many different learning types.

What the study does not show is to what extent the vocabulary taught was stored in long-term memory. It would certainly be an interesting topic for a follow-up study to investigate this aspect in more detail.

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