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TEACHING STRATEGIES AND INCLUSION DIDACTIC METHODS TO IMPROVE FOREIGN LANGUAGE VOCABULARY LEARNING THROUGH THE EMBODIED EXPERIENCE

STRATEGIE DI INSEGNAMENTO E METODOLOGIE DIDATTICHE INCLUSIVE PER MIGLIORARE L'APPRENDIMENTO DEL LESSICO DELLE LINGUE STRANIERE ATTRAVERSO L'ESPERIENZA INCARNATA

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Abstract

The purpose of this study was to investigate the effectiveness of an 8-week curricular English program integrated with physical activity on primary school children's foreign language vocabulary learning.
40 school-aged children (9-10 years) were randomly assigned to an experimental group (EG, n=20) who received English lessons integrated with physical activity, or a control group (CG, n=20) who participated in regular English classes (~60 min., two times a week).
To test children's memory performance, a cued Recall memory test and the Verbal Paired Associates, a subtest of the Wechsler Memory Scale – IV were administrated.
The results suggested that after 8-week students were able to increase their ability to recall new words, and that this program might improve cognitive functions and, consequently, academic performance.

Lo scopo di questo studio era quello di indagare l'efficacia di un programma curricolare di 8 settimane di lezioni di inglese integrate con l'attività fisica, sull'apprendimento del lessico delle lingue straniere nei bambini della scuola primaria.
40 bambini in età scolare (9-10 anni) sono stati assegnati in modo casuale a un gruppo sperimentale (EG, n=20) che ha ricevuto lezioni di inglese integrate con attività fisica, o a un gruppo di controllo (CG, n=20) che ha partecipato a regolari lezioni di inglese (~60 min., due volte a settimana).
Per testare le prestazioni della memoria dei bambini, sono stati somministrati un Test di memoria di richiamo e il Verbal Paired Associates, un subtest della Wechsler Memory Scale - IV.
I risultati hanno suggerito che dopo 8 settimane gli studenti sono stati in grado di aumentare la loro capacità di ricordare nuove parole e che questo programma potrebbe migliorare il funzionamento cognitivo e, di conseguenza, la performance scolastica.

Key words: academic performance, school-based physical activity, learning outcomes.

Parole chiave: prestazione scolastica, attività fisica, risultati di apprendimento.

Introduction

The scientific interest for the relationship between learning and embodied experience is at the heart of the pedagogical theoretical debate and the intervention strategies and methods in the field of education (Lavega, 2014; Parlebas, 2010). The corporeal dimension as a possible learning tool is representative of a big wide multidisciplinary space that requires an impressive reimagining of alternative routes compared to a new vision of corporeity. This perspective of learning is closely connected to the theory of embodied cognition. The embodied cognition, namely the notion according to which our knowledge and representations of concepts are a direct result of our physical experience with the environment (Wellsby, & Pexman 2014), has changed the way we interpret the children's learning of language. According to this theory, physical experience with the surrounding environment

helps children to develop their vocabulary skills because sensorimotor experiences are the building blocks of language and cognition. This happens due to the fact that words that are associated with mental imagery are more easily recognize and remember (Reggin, & Pexman, 2019).

The school plays a crucial role in offering different experiential opportunities considering that "the richer it is the individual experience the more abundant will be the material which it may have its disposal" (Vygotskij, 1972). The need to equip children of these *information packages* (Gardner, 1993) implies a remake of the classic school's *modus operandi*. In the Italian school context, the call to emphasize the relationship between learning and embodied experience has been accepted only partially, continuing to reveal a strong didactic rigidity by the teachers. In the ministerial guidelines of 2012, it is clarified that, starting from primary school, teachers are the responsible for promoting the ability of students to give meaning of their experience (Miur, 2012). From this comes the necessity of a reevaluation of most significant didactic choice and the search of most appropriate strategies, paying particular attention in combining different field of experience and interconnection between the disciplines, in order to ensure well developed educational pathways.

In the curriculum of primary school, a strategic role is assigned to the direct experience, which allows children, if properly guided, to acquire knowledge in a deeper way. The primary school recognizes this plurality of elements which create different emotional and cognitive growth opportunities (Miur, 2012). Therefore, it is clear that an educational program which result in a didactic proposal based on the embodied experience principles meet the training needs of school.

The activities based on bodily and kinesthetic aspects fully faces this educational challenge, pacing itself as the perfect tool to didactically testing flexible, efficient, and alternative itineraries which are complementary to traditional teaching (Staccioli, 2010). Thus, the embodied experience helps the construction of the individual image of the person and promote the body awareness through the relationship with the surrounding environment.

The school needs to be able to present the corporeality not as an end in itself, but in such a way that pupils are aware that their body has to be educate as well as their mind. This is correlates to the knowing that motor and cognitive abilities are strongly interrelated, and together predict academic achievement in school-aged children (Donnelly et al., 2016; Oberer, Gashaj, & Roebers, 2018; de Bruijn, Hartman, Kostons, Visscher, & Bosker, 2018).

The acquisition of motor skills, as defined by MIUR (2012) regarding the educational goals at the end of each school cycle, represents a very complex field, which is enriched with personal inclinations, allowing the achievement of results able to promote versatility and environmental adaptation. Thus, there is an urgent need to encourage the reassessment of the educational practice through the renovation of educational pathways that can rediscover in body and movement valuable tools providing access to knowledge, breeding grounds for learning and human relations, ideal contexts for expression and communication of one's inner world and the structuring of empathic relationships (Colella, & d'Arando, 2021).

Considering this, programs introducing embodied experience into different learning curricula, with the shared goal of promoting daily physical experience and the cognitive performance, are the most effective methodological approaches (Cox, Schofield, & Kolt, 2010; Naylor & McKay, 2009). Moreover, in a perspective of an inclusive approach, it is of fundamental importance that each activity was design to be affordable for everyone, in order to organize a learning process, which include pupils with and without deficiencies.

Classroom-based physical activity interventions seem to be effective at influencing academic-related outcomes (Erwin, Fedewa, Beighle, & Ahn, 2012; Watson, Timperio, Brown, Best, & Hesketh, 2017). Specifically, integrated physical activity, which incorporating physical activity during academic foreign language lessons (Webster, Russ, Vazou, Goh, & Erwin, 2015) seem to be the best way to contributes to the construction of higher-quality mental representations, facilitating recall, and enhancing memory and learning (Madan & Singhal, 2012).

This way of experiencing the learning through the body is at the heart of this study, which had the ambition to determine whether children who participated to an English curriculum based on physical experience reported an improvement of their vocabulary skills.

1. Method

1.1 Study design

A randomized controlled study design was used to investigate the effects of an 8-week curricular English program integrated with physical activity on primary school children's foreign language vocabulary learning. The study was conducted in a local primary school and consisted of 16 English lessons integrated with supervised aerobic exercises. The interventions were performed for 60 minutes 2 days per week during the daily school lessons.

1.2 Participants

Participants of the study were 40 children (24 males and 16 females; *M* age =9.42; *SD* = ±0.50) recruited from a primary school, placed in the south of Italy. Two experimental conditions were set up to engage children in improving English vocabulary, either combined with meaningful physical activity (embodied learning), or without physical activity included.

Participation in the research study was voluntary and all children were eligible to participate in this study. The study was conducted from March to May 2022. All participants and their parents received a complete explanation in advance about the purpose of the experiment, its contents, and safety issues based on the Declaration of Helsinki, and parents of all participants provided their written informed consent before the study. All data were treated confidentially.

1.3 Procedures

The intervention program was administered in a local school during the daily school lessons. Each session of the intervention program involved the following stages: 5 minutes of warm-up, 50 minutes of embodied learning condition, and 5 minutes of cool down. Children wore clothing appropriate to physical activity and sport shoes throughout the intervention. The intervention program was instructed, supervised and performed by one experienced physical education teacher and one English teacher, both certified by Italian Ministry of Education.

During the learning sessions all the new words were presented both auditory and visually to the children. After being presented, the children had to repeat each word three times and the process was identical for the two experimental conditions. However, in the embodied learning condition (EG), children had to enact the movements indicated by the teacher, while in the English class without physical activity (CG), all new words were repeated without being related to any movement. In a perspective of an inclusive approach, each activity was design to be affordable for everyone in order to organize a learning process with mixed teams, which include pupils with and without deficiencies

Before the beginning of the first learning session and at the end of it, children performed a cued recall memory test and the Verbal Paired Associates, a subtest of the Wechsler Memory Scale – IV. The participants were tested individually and carried out the test at the same time of the day and under the same experimental conditions.

1.4 Measures

To test children's memory performance, an individual paper-and pencil cued recall test was used. In this test, all 20 words were displayed in Italian and the children had to write down the correspondent English word. Testing time was between 5 and 15 minutes, including the instruction and practice phase. For each correctly recalled word, children received 1 point, with a minimum score of 0 and a maximum of 20. The recalled words were also considered correct when minor spelling errors or singular-plural substitutions had occurred.

Moreover, a modified version of the Wechsler Memory Scale fourth edition (WMS-IV, 2009) was used to assess relational memory of word pairs. It is made up of seven subtests: Brief Cognitive Status Exam, Spatial Addition, Symbol Span, Design Memory (I & II), Logical Memory (I & II), Verbal Paired Associates (I & II), and Visual Reproduction (I & II). The operator can choose to use all of them, some specific or just one. In this study, Authors decided to use the Verbal Paired Associates I & II. It measures relational memory of word pairs over repeated learning trials. The scale was slightly modified by anchoring the words to movements to render them easily understandable by children. In VPA I the tester read aloud a list of 14 word-pairs to the participant. After the presentation of the list of pairs, the tester said the first word of each pair and the respondent was required to provide its associate. After completing VPA I, VPA II was administered. In this trial the tester read out the first word of each pair and the examinee was to recall which word was paired with it without hearing the word-pairs again. The system for calculating the score was the number of correctly recalled words. It includes 1 point for each correct answer and 0 for each incorrect answer. The test took between 30 and 45 minutes.

Statistical Analysis

Statistical analyses was carried out using SAS JMP® Statistics (Version <14.3>, SAS Institute Inc., Cary, NC, USA, 2018). Data were presented as group mean (*M*) values and standard deviations (*SD*) and checked for assumptions of normality (i.e. Shapiro-Wilk test) and homogeneity of variances (i.e. Levene test). An independent sample *t*-test was conduct to evaluate group differences at baseline and a two-way ANOVA (group (experimental/control) × time (pre/post-intervention), with repeated measures on the time dimension, was performed to examine the effect of the Embodied learning condition on all dependent variables. When 'Group x Time' interactions reached significance, group-specific post hoc tests (i.e., paired *t*-tests) were conducted to identify the significant comparisons. Partial eta squared (η^2_p) was used to estimate the magnitude of the significant 'Time x Group' interaction and interpreted using the following criteria: small ($\eta^2_p < 0.06$), medium ($0.06 \leq \eta^2_p < 0.14$), large ($\eta^2_p \geq 0.14$). Effect sizes for the pairwise comparisons were determined by Cohen's *d* and interpreted as small ($0.20 \leq d < 0.50$), moderate ($0.50 \leq d < 0.79$) and large ($d \geq 0.80$) (Cohen, 1992). Statistical significance was set at $p < 0.05$.

2. Results

The experimental and control groups did not differ significantly at baseline in age, anthropometric characteristics, as well as in psychological measures ($p > 0.05$) (Table 1). Pre and post-intervention results for all dependent measures are presented in Table 1.

Table 1 - Changes in long-term memory after an 8-week intervention program.

	Experimental Group (n = 15)			**Control Group (n = 15)**		
	Baseline	**Post-test**	**Δ**	**Baseline**	**Post-test**	**Δ**
Recall Memory Test	9.35 (1.49)	15.50 (2.58) †*	6.15 (2.94)	9.15 (1.75)	8.60 (3.85)	-0.55 (0.82)
Wechsler Memory Scale – IV						
Verbal Paired Associates I	28.35 (4.42)	32.80 (4.29) †*	4.45 (1.39)	26.75 (4.08)	25.40 (3.85)	-1.35 (1.46)
Verbal Paired Associates II	8.00 (2.49)	10.95 (2.06) †*	2.95 (1.27)	7.60 (2.30)	6.25 (2.17)	-1.35 (1.59)

Note: values are presented as mean (± SD); Δ: pre- to post-training changes; †Significant 'Group x Time' interaction: significant effect of the intervention ($p < 0.001$). *Significantly different from pre-test ($p < 0.001$).

Recall Memory Test

Statistical analysis revealed significant 'Time x Group' interaction for *Generalized self-efficacy scale* ($F_{1,38}$ = 103.79, p < 0.001, η^2_p = 0.73, large effect size). The post-hoc analysis revealed a significant improvement in the score for this cognitive skill (t = 9.34, p < 0.001, d = 2.08, large effect size) in the intervention group. No significant changes were found for the control group (p > 0.05).

Verbal Paired Associates I

Statistical analysis revealed significant 'Time x Group' interaction for *Generalized self-efficacy scale* ($F_{1,38}$ = 164.94, p < 0.001, η^2_p = 0.81, large effect size). The post-hoc analysis revealed a significant improvement in the score for this cognitive skill (t = 14.27, p < 0.001, d = 3.18, large effect size) in the intervention group. No significant changes were found for the control group (p > 0.05).

Verbal Paired Associates II

Statistical analysis revealed significant 'Time x Group' interaction for *Generalized self-efficacy scale* ($F_{1,38}$ = 88.38, p < 0.001, η^2_p = 0.69, large effect size). The post-hoc analysis revealed a significant improvement in the score for this cognitive skill (t = 10.33, p < 0.001, d = 2.31, large effect size) in the intervention group. No significant changes were found for the control group (p > 0.05).

3. **Discussion**

The purpose of this study was to investigate the relationship between learning and embodied experience among school-aged children engaged in improving English vocabulary trough meaningful physical activity (embodied learning).

In this research, the results indicate that a brief curricular English program integrated with physical activity was effective in improving primary school children's foreign language vocabulary learning. In particular, the findings of this study suggested that the association of movement to English lessons has a direct and positive impact on the words recall ability previously acquired.

The most important finding was that the embodied learning condition yielded better memory performance than the sedentary control condition, emphasizing the importance of including physical activity in the learning of a foreign language. In fact, children showed better ability to recall words as much in immediate trials (PVA I) as during deffered trial (PVA II). The current study replicated the results of the studies of Mavilidi et al. (2020) by showing that embodied learning of a new language vocabulary is more powerful than the traditional sedentary way of learning.

It reflects the importance of physical experience during the learning process that allows the transformation of abstract information into concrete and meaningful concepts (Hostetter & Alibali, 2008; Macedonia, 2014). An explanation for the positive effects on learning through physical and movements exeperience, regards the way by which the information is coded. movements, in fact, allow a visuospatial rapresentation that results in the construction of higher quality cognitive schemas (Goldin-Meadow et al., 2001; Paas & Sweller, 2012). This is aligned with the embodied theory according to which when new learned words are encoded with movements, the motor image created is linked with the underlying mental representation of these words (Macedonia, Muller, & Friederici, 2011). It is even more true when it comes to significant movements that can potentially create a richer trace in the long-term memory, and subsequently improve the process of memory retrieval, with a consequent better recall (Madan & Singhal, 2012).

In connection with this, previously research suggested that body and their movements are the medium where and through which memory processes can be manipulated. Researchers indicated that memory retrieval is related to the body movements due to the fact that significant sensorimotor

aspects of the event and details on what it was about are reconstructed and packed together (Tellier, 2008). Moreover, gestures integrated into the learning task are effective when they are meaningful for or congruent with the learning task (Kelly, McDevitt, & Esch, 2009; Macedonia & Klimesch, 2014; Trofatter, Kontra, Beilock, & Goldin-Meadow, 2015). Rüschemeyer et al. (2010) in their study, outlined that motor experiences activate the brain resources, influencing the way we learn words and the way we later think about and remember certain concepts. Similarly, Pesce, Crova, Cereatti, Casella, and Bellucci (2009) explored the effects of physical activity on children's memorization of vocabulary words from a foreign language. The authors concluded that acute bouts of physical activity promote memory storage minimizing rehearsal and shortening consolidation time. Those impacts were greatly increased when there was engaging in complex physical activity (Donnelly & Lambourne, 2011; Tomporoskji and Pesce, 2019). In fact, physical activity can elicit brain changes that facilitate learning and memory (Hillman, Erickson, & Kramer, 2008; Liu-Ambrose, Nagamatsu, Voss, Khan, & Handy, 2012). Erickson, Hillman, and Kramer (2015) concluded that fitter and more active children performed better on tasks that require executive control and associative memory, and showed higher academic achievement, as well as a range of physiological benefits (e.g., greater grey matter volume in the hippocampus, more effective brain activity patterns) (Mavilidi et al., 2015).

Likewise, the inclusive approach used in this study, designed to be affordable for everyone (children with and without disabilities), allowed the solicitation of cognitive and social skills of the most fragile students. Likewise, the inclusive approach used in this study, designed to be affordable for everyone (children with and without disabilities), allowed the solicitation of cognitive and social skills of the most fragile students. Exercising with mixed teams seems to be significant because peers represent a resource of significant potential to facilitate the process of learning of the pupil with disabilities. It, structuring in a shared environment overcoming the gap between self and the other, allows to accept the weaknesses and fragility the encounter with the disability can bring out (Latino, 2022). In this regard, Damiani (2012) argued that sensory experiences (e.g., vision, balance, gravity) and feelings or emotional experiences, as well as the relationship with teachers and classmates (in their role as secondary caregivers) are able to enhance memory process, including that procedural or implicit ones, in children with disabilities.

Based on what was discussed, this finding reflects what has been found in previously studies that underlined the deep connection between embodied learning and the integration of physical activity lessons (Mullender-Wijnsma et al., 2016; Vazou & Smiley-Oyen, 2014). Results of this and previous research emphasized the higher values recorded in children's episodic long-term memory. Therefore, the classroom-based physical activity appears to be relevant for cognition as well as for the physical and relational domains, since it provides positive changes in children's behavior meaningful for cognitive processing (Forgas & Eich, 2012).

Despite the contribution regarding the significant relationship between embodied learning and long-term memory some limitations were present within this study. Firstly, the duration of the intervention was relatively short. A second limitation concerned the small sample size (N=40) generated to the difficulties in recruiting students to participate in the study, memory and the lack of psychosocial measures, such as the assessment of participants' enjoyment, and motivation. Thus, future research would need to examine these outcomes in more detail and explore their role in enhancing children's cognitive performance by means of acute or chronic bouts of classroom-based physical activity. However, the results obtained could provide important indications for future studies. In fact, the strengths of this study were represented by the effective approach that this simple program brings for the improvement of learning ability and consequently for all students (with and without disabilities). Therefore, school must acknowledge the importance of embodied learning in order to promotes strategies that facilitate learning and inclusion.

Conclusions

The expansive and ever-growing literature in the field of embodied cognition does support the view that physical experience is a significant approach that allows to improve cognitive functions and academic performance among school-aged children. Through the physical experience learning contents are embodied in and with individuals' minds and adopt changing, varied and different configurations, because children's bodies and minds are different and unique too, but at the same time, rich of meaning. The embodied didactics is able to redefines, differentiates and enhances the "education for all", by restoring the individualization and personalization processes in their broadest, more inclusive and authentic meanings.

This study suggests that the embodied learning in the form of relevant movements appears to be of greater effects in producing higher learning performance. Thereby, schools should offer the opportunity for children to meet the physical activity practice as an evidence-based strategy to improve the educational development of the youngest.

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