Feature Article

Using Physical Exercise to Boost L2 Reading Comprehension and Fluency

Joshua Cohen

Kindai University

Previous research has revealed that as little as 10 minutes of physical activity can enhance cognitive performance, boost motivation and energy levels, and help to reduce stress. However, the majority of these studies were conducted using specialized equipment or with children as participants, which limits the generalizability of their findings. Studies investigating the effects of exercise on second language learning, while promising, have primarily focused on vocabulary acquisition rather than other areas of language acquisition, such as literacy. To address these gaps in the literature and build on evidence that suggests exercise can positively affect brain function, the study reported here used a paired-samples, multiple trial design to test the efficacy of a brief stair climbing protocol as a means of improving reading speed and comprehension. Twenty-six lower intermediate-level EFL students took part in the (11-week) study which measured their ability to comprehend a reading passage after an active or sedentary treatment. The results suggest that engaging in acute bursts of movement and exercise prior to reading can significantly impact comprehension and reading speed. The discussion section considers the findings and concludes by addressing some of the limitations associated with this small study.

先行研究では、わずか10分程度の身体活動であっても、認知的パフォーマンスの向上、動機づけや活力の増大、ストレスの軽減に寄与し得ることが示されている。しかし、これらの研究の多くは、専用の測定機器を用いた条件下、あるいは児童を対象として実施されており、知見の一般化可能性には制約がある。運動が第二言語学習に及ぼす影響を検討した研究は有望な結果を示しているものの、その焦点は主として語彙習得に置かれており、リテラシーなど、言語習得の他領域に関する検討は十分とは言い難い。こうした研究上の空白を補い、運動が脳機能に肯定的な影響を及ぼし得るというエビデンスを踏まえて、本研究では、短時間の階段昇降プロトコルが読解速度および読解理解の向上に資するかを検証した。研究デザインとして、対応のあるサンプルを用いた複数試行（paired-samples, multiple trial）デザインを採用し、低中級レベルのEFL学習者26名を対象に、11週間にわたり、活

動的条件（運動）または座位条件（非活動）後に読解課題を行わせ、その理解度を測定した。結果は、読解前に短時間の身体活動・運動を行うことが、読解理解および読解速度に有意な影響を及ぼし得ることを示唆した。考察ではこれらの知見を検討するとともに、本研究が小規模であることに伴ういくつかの限界点についても論じる。

The notion that exercise is good for the head and for the heart is not new. As far back as the 5th century B.C.E., Hippocrates recognized there was a connection between the brain and the body. Since then, other physicians, philosophers, and scholars have asserted that physical activity and mental well-being are intertwined. Plato felt it necessary for youth to be trained in gymnastics as well as literary and artistic matters (Young, 2005), and Maimonides suggested that a person's mental well-being depends on their physical well-being and vice-versa (Rosner, 1984). More recently, developmental molecular biologist John Medina (2009) called exercise *cognitive candy*, and neuropsychiatrist John Ratey (2008) claimed that the effect of physical activity on the mind is so profound that we ought to prioritize the benefits to our brains over the benefits on our bodies.

However, according to the World Health Organization, over 80% of adolescents and 31% of adults worldwide do not meet the recommended levels of physical activity (World Health Organization, 2024). These numbers are discouraging when one considers the affordability and ease with which exercise can be done relative to the rewards of doing it regularly. In addition to conditioning the body, motion and movement have been shown to positively affect mental processes like planning, scheduling, problem-solving, inhibition, and working memory (Ratey & Loehr, 2011), and to reduce symptoms of anxiety and depression (Centers for Disease Control and Prevention, 2025). Physical activity is also believed to contribute to neuroplasticity by increasing blood flow to the brain, facilitating the release of various neurochemicals, and stimulating the production of new neurons and synapses (Ratey & Hagerman, 2008). It stands to reason that other cognitive functions may be influenced by physical activity, too.

Reading, for example, is intricately connected to cognition. It involves the orchestration of complex mental processes like decoding, prediction, comprehension, visualization, and recall, as well as other higher-order thinking strategies like inferencing and strategy use (Van den Broek & Espin, 2012). When good readers read, they exhibit the attributes commonly associated with fluency: speed, accuracy, and prosody (Kuhn et al., 2010).

For students learning a second or foreign language (L2) the importance of reading fluency cannot be overstated. Developing adequate speed, accuracy, and comprehension is an essential first step toward proficiency (Gorsuch & Taguchi, 2010) and language mastery (Geva, 2006; Koda, 2007; Richards, 2006). Reading has also been shown to help learners increase their vocabulary (Webb & Nation, 2017) and to improve their critical thinking and memory capacity (McVay & Kane, 2012). Proficient readers may also experience greater academic success (Lesnick et al., 2010) and may have more career opportunities later in life (Barton, 1999). Although the ability to read can vary among individuals, it can be improved with practice and therefore deserves more attention in language learning classrooms and curriculums.

Studies examining the impact of physical activity on executive function, a general cognitive construct, have produced fairly consistent results. Regardless of whether exercise is acute or chronic or the subjects are young or mature, the literature overwhelmingly suggests motion and movement can have a substantial beneficial effect on healthy individuals' cognitive capacity (Best, 2007; Guiney & Machado, 2013). For example, a landmark study by Winter et al. (2007), investigated whether high-impact running prior to vocabulary training could influence word retention in 27 physically active German young men. Participants' learning performance was observed in three conditions: high-impact anaerobic sprints, low-impact aerobic running, and a period of rest. The researchers found that subjects who engaged in two sprints lasting less than three minutes each exhibited a 20% faster learning rate compared to groups who had exercised moderately or remained sedentary. The behavior change was accompanied by rises in peripheral levels of brain-derived neurotrophic factor (BDNF) and monoamines (including dopamine, norepinephrine, and epinephrine), suggesting enhanced retention of acquired knowledge. Winter et al. (2007) concluded that incorporating high-impact physical activity into study routines could be a promising way to boost learning outcomes.

Building on Winter et al.'s (2007) findings, Schmidt-Kassow et al. (2010, 2013, 2014) conducted a series of experiments examining the influence of aerobic activity on brain function and language learning. In one such study, Schmidt-Kassow et al., (2010) tested whether physical activity during vocabulary encoding improved subsequent recall. The study featured two conditions: a spinning protocol, where participants cycled while learning vocabulary and a seated protocol, where participants learned passively. Twelve native German speakers (four males, age 19-33) studied 80 French vocabulary words over three weeks, with three learning sessions per week. In each session participants were presented 80 French-German word pairs twice. At the end of every third session, researchers conducted vocabulary tests as well as electroencephalogram tests which measured brain activity. The spinning group exhibited stronger brain responses and had significantly better vocabulary retention ($p < .01$), indicating that simultaneous physical activity during vocabulary learning could lead to enhanced memorization and may promote greater semantic processing.

In a subsequent study, Schmidt-Kassow et al. (2013) sought to replicate and expand on her earlier findings by measuring physiological markers and BDNF levels in female participants engaged in stationary cycling or sitting still. The study involved 81 monolingual German women (18-33 years old), divided into three groups ($n = 27$ per group). Participants learned 80 Polish-German word pairs in two sessions, and then took two vocabulary tests. The first treatment group cycled before learning, whereas the second group cycled during the memory encoding stage. Both of these groups outperformed the control group, with the simultaneous cycling group showing the most significant improvement. This suggests that physical activity may enhance L2 learning when it occurs in close proximity to exercise. Despite subjects' improved recall, serum BDNF levels did not significantly correlate with their learning performance, and the authors emphasized that differences in BDNF levels did not account for the learning effects. Thus, although physiological measures were collected, they did not explain the observed vocabulary learning differences.

The following year, Schmidt-Kassow and her colleagues again investigated the effects of exercise on vocabulary learning (Schmidt-Kassow et al., 2014). Forty-nine German young, healthy subjects were tested on their ability to remember 40 Polish words using a crossover design that compared learning while seated versus learning while simultaneously walking on a treadmill. Vocabulary pairs were presented audibly and were randomized and normalized for intensity. In addition to monitoring participants' heart rate, blood and saliva samples were taken for BDNF and cortisol analysis to confirm whether they had influenced learning. A follow-up online vocabulary test was conducted 24 hours after each learning session. According to the results, the researchers found that word recall following moderate exercise was superior and credited participants' enhanced performance to the exercise regimen they had participated in.

Research by Liu et al. (2017) has also found a positive effect of exercise on L2 vocabulary acquisition. Their study involved 40 Chinese young adults, who were divided into two groups: one who exercised on an ergometer while learning words, and another who remained sedentary. Over eight sessions, both groups were exposed to picture-word pairs and subsequently tested on word pairing discernment and semantic judgment of learned vocabulary within sentences. The exercise group exhibited significantly faster reaction times and higher accuracy in verifying L2 words during the word-picture verification task, as well as better performance in sentence semantic judgment. These benefits were consistently observed across sessions. Additionally, in a follow-up test one month later, the exercise group significantly outperformed the control group demonstrating sustained comprehension of the vocabulary learned at the sentence level and indicating that exercise may facilitate quicker processing in L2 tasks.

More recently, Birdsell (2023) examined the effects of light physical activity on the cognitive functioning and emotional well-being of college students. His work investigated how brief bouts of exercise influenced the retention of English phrasal verbs among Japanese university students. Using a pre-, post-, and delayed post-test design, 37 participants were assigned to either a sedentary condition, in which they sat and read, or an active condition in which they walked on a treadmill before studying target vocabulary. While immediate post-test scores showed no significant difference between groups, the delayed post-test revealed that students in the exercise condition retained more phrasal verbs (effect size: Cohen's $d = 0.42$), suggesting a small-to-medium benefit for long-term memory consolidation. Additionally, participants in the active condition reported improved mood, which may have contributed to their enhanced retention. These findings support the idea that brief physical activity before learning can facilitate long-term memory encoding and promote positive affect, offering practical implications for language instruction at the tertiary level.

Although most studies in this field have concentrated on the acquisition of foreign vocabulary, there is promising work being done on how movement and exercise impact reading in native (L1) and foreign language contexts. Mead et al. (2013) demonstrated that acute physical activity significantly influenced the reading comprehension of 258 sixth- to eighth-grade students. Prior to participating in the study, students were evaluated for reading skill, and baseline measurements for weight, body fat, and blood pressure were taken. The researchers then randomly placed participants into an experimental group that completed a 10-minute synchronized stepping regimen (stepping up and down for 10 minutes on an exercise platform) or a control group that did not. Both groups read a passage and answered questions afterward. The exercise group outperformed the control group significantly in reading comprehension, with an ANCOVA $F(1, 281) = 83.1$, $p < .001$, confirming the significance of the findings.

Fernández Barrionuevo et al. (2023) also investigated the effects of exercise on reading comprehension with a two-month study on 50 Spanish secondary school students reading in a foreign language. Participants were divided into two groups: a control group, which maintained regular classroom routines before taking a reading assessment, and an active-break (AB) group, in which students engaged in 10 minutes of structured, Tabata-style (high intensity) physical activity before completing a reading comprehension test. The test measured literal, inferential, and evaluative comprehension. Results showed the active group outperformed the control group in inferential comprehension ($p = 0.03$, $d = 0.38$; $p = 0.001$, $d = 0.11$) and literal comprehension ($p = 0.003$, $d = 0.35$; $p = 0.03$, $d = 0.47$), while no significant differences were found in evaluative comprehension (p= 0.26, d = 0.20; p = 0.41, d = 0.40). Overall, the AB group had a higher mean score out of 10 (8.10 ± 1.63) compared to the control group (6.77 ± 2.32, p = 0.001, d=0.76) indicating that incorporating short physical activity sessions can enhance reading comprehension, particularly in tasks requiring direct text understanding and inference-making, potentially benefiting the study of foreign language.

A recent study by Cohen (2023) also looked at the influence of physical activity on L2 reading fluency. His work examined whether short bursts of exercise could enhance reading speed and comprehension in L2 among Japanese university students. Over 10 weeks, an experimental group (n = 6) engaged in stair climbing before timed reading activities, while a control group (n = 6) performed journaling instead. Although no significant differences were found in TOEFL iBT reading comprehension scores between groups (p = .8797), the experimental group showed significantly greater improvements in reading speed (p = .04) and comprehension scores (p = .0423) in speed-reading tasks. These findings suggest that exercise may support fluency development, potentially through increased cognitive engagement and mood enhancement. However, the study's small sample size and lack of direct cognitive measurements highlight the need for further research.

Despite evidence supporting the impact of physical activity on the brain's capacity to learn, not all studies have established a direct link between cognition or brain structure and physical activity in human trials. For instance, Dwyer et al. (1983) conducted a two-phase study with 10-year-old schoolchildren in southern Australia. In Phase 1, over 500 students from seven primary schools participated in a 14-week randomized trial comparing three conditions: a daily endurance-fitness program, a skill development program, and the standard physical education program. While improved fitness was observed, no academic differences among the three groups were found. In Phase 2 of the study, a separate cohort of 216 children who had completed two full years of the adopted activity programs was compared with the original (Phase 1) group. These children exhibited the same overall pattern of observed health improvements while scholastic performance again remained unchanged. Based on the lack of evidence for exercise's direct impact on grades or learning, the authors concluded that school physical activity programs benefit children's health without compromising or improving academic performance.

Tremblay et al. (2000) explored how increased physical activity related to self-worth, academic performance, and body mass index in approximately 7,000 sixth-grade Canadian children. Although no relationship between physical activity and academic achievement was discovered, the study did find that increased physical activity significantly correlated with self-esteem, regardless of socioeconomic factors and that intense physical activity gradually boosted self-esteem for both genders. However, the authors did not find a correlation between the students' self-reported physical activity and their scores on standardized tests in reading, math, science, and writing.

Building on previous research that suggests movement and acute physical activity can positively influence L2 learning, this study aimed to assess the efficacy of exercise, specifically stair climbing, in enhancing reading speed and comprehension. Additionally, it sought to evaluate the practicality of using a readily available, widely accessible, and cost-effective exercise apparatus. Unlike previous studies conducted in laboratory settings with sophisticated testing equipment, this study used a common stairwell to examine how light physical activity might influence learning in a real-world environment. While many studies have focused on the cognitive benefits of physical activity, they have primarily focused on word learning, leaving a gap in understanding how exercise can impact other areas of L2 acquisition like reading skill. This study addresses this gap by exploring a simple activity that can easily be replicated or integrated into educational settings and that seeks to answer the following two research questions:

1. Does engagement in 10 minutes of sedentary activity versus 10 minutes of physical activity lead to a statistically significant difference in participants' L2 reading comprehension scores?
2. Does engagement in 10 minutes of sedentary activity versus 10 minutes of physical activity lead to a statistically significant difference in participants' L2 reading speed?

Methods

Participants

Twenty-six second-year students (16 female) attending a large, private university in western Japan took part in the study. The students belonged to two intact classes and ranged in age from 19 to 20 years old. Based on their placement test scores, they were considered lower-intermediate level users of English. All of the students provided written consent to participate in the research and were made aware that neither their participation nor their performance in the study would affect their grades. All data were collected on the campus. Any student who missed a class when data were collected was requested to make it up within 14 days or at their earliest convenience.

At the onset of the study, participants sat the reading section of the TOEFL iBT (ETS, 2013) as a baseline measure. A two-sample, two-tailed t-test was conducted to examine the relationship between the two classes' scores. No significant difference was found in the scores between Group 1 ($M = 14.75$, $SD = 5.64$) and Group 2 ($M = 13.93$, $SD = 4.01$); $t(24) = 0.432$, $p = .669$. Thus, the two groups were considered equivalent in accordance with their reading proficiency. After completion of the reading test, all participants then watched a 14-minute video in Japanese demonstrating how movement, motion, and physical activity can benefit the brain and the body. Following the video, the researcher detailed the procedures associated with the study and explained the benefits and challenges associated with voluntarily participating in it.

Operationalization of Variables

The independent variable was the type of activity (sedentary or active) the participants engaged in prior to the reading comprehension task. The active condition was operationalized as a short period of exercise where students climbed stairs continuously for 10 minutes (ascending and descending). The sedentary condition was operationalized as a journaling task, in which participants remained seated and made a journal entry for roughly the same duration of time.

The dependent variables were reading comprehension and speed. Participants completed 10 multiple-choice questions following each reading passage. In total, there were 10 passages per condition. Each participant's comprehension score for the two conditions was calculated as the sum of correct responses across all 10 passages. This resulted in a single comprehension score per condition for each participant (ranging from 0 to 100), rather than a separate score for each individual test. Thus, the analysis was based on two comprehension scores per participant - one for each condition.

For each passage, participants timed their own reading using a stopwatch on the whiteboard, recorded how long the passage took to complete, and then answered the comprehension questions. A participant's reading-speed score for a given condition was calculated as the average reading time across the 10 passages. This ensured each participant had one reading-speed score per condition. The selection of a 2x2 mixed-factorial ANOVA was based on each participant's 2 comprehension scores (1 per condition) and 2 reading-speed scores (1 per condition).

The study employed a within-subjects experimental design involving multiple trials comparing two treatments and groups. This design method was selected because it allows for stronger causal conclusions and has more statistical power (Meuleman, 2023). Its convenience as a sampling approach also enabled the two participating classes to remain intact. Concern regarding using non-random samples was addressed by utilizing a crossover design, where the two groups alternated between treatments consisting of stair climbing or journaling prior to engaging in the day's reading task.

Smart watches (equipped with a heart monitor, stopwatch, and timer) were used to record participants' progress, and a common stairwell served as the climbing apparatus. Each stair was 17 centimeters high and each staircase contained 22 stairs between floors. Participants also received a ruled, B5-size (182mm×257mm) notebook to record their thoughts and respond to writing prompts on the day when they were not engaged in the climbing protocol.

The study used 20 reading passages and corresponding comprehension questions taken from Millet (2017). Each reading was between 300-450 words and covered topics such as science, history, and health. Readability analyses showed that the 20 texts fell within the grade 6-9 range across standard indices

(Flesh-Kincaid, Gunning Fog, and Coleman-Liau), with Flesch Reading Ease values typically falling between 55-70, suggesting that the passages did not differ meaningfully in complexity. These texts were written expressly for L2 learners to improve their reading speed and comprehension and are freely available for download. Although participants were timed on their reading speed, they worked at their own pace to answer the 10 multiple-choice questions following the reading passage with no pressure of time. After all students finished the questions, the researcher shared the answers for students to check and mark their scores.

Scheduling of the study activities

Group compatibility testing, video screening, and study explanation occurred during Week 1 of the study. During the subsequent 10 weeks, the two groups underwent two alternating treatments: a sedentary treatment (journaling) and an active treatment (stair climbing) prior to engaging in the reading task as displayed in Table 1. To minimize the possibility of a practice effect influencing the results, the researcher assigned Group 1 to begin with Reading 1 and progress sequentially to Reading 20, while Group 2 started with Reading 20 and proceeded backward to Reading 1. Consequently, each reading passage was completed by both groups, with one group journaling while the other climbed. For example, on the first day of the intervention, Group 1 climbed stairs prior to completing Reading 1, whereas Group 2 underwent the journaling treatment before completing Reading 20.

On days when participants were scheduled for an active treatment, they came to class, set down their belongings, and prepared themselves to begin the stair-climbing protocol. All participants then descended and ascended six flights of stairs, three times before beginning the day's reading task. Students were instructed to walk at a self-selected light-moderate pace using a 5-point Likert scale to guide them (1 = extremely light; 2 = light; 3 = moderate; 4 = hard; 5 = extremely hard), although some chose to proceed at a much faster rate. The average climb time for each group was approximately 10 minutes, the average heart rate was approximately 100 beats per minute, and the average distance

Table 1

Experimental Design

Week	Group 1 reading	Group 1 treatment	Group 2 reading	Group 2 treatment
1	R = 1	S	R = 20	S
1	R = 2	J	R = 19	J
2	R = 3	S	R = 18	S
2	R = 4	J	R = 17	J
3	R = 5	S	R = 16	S
3	R = 6	J	R = 15	J
4	R = 7	S	R = 14	S
4	R = 8	J	R = 13	J
5	R = 9	S	R = 12	S
5	R = 10	J	R = 11	J
6	R = 11	S	R = 10	S
6	R = 12	J	R = 9	J
7	R = 13	S	R = 8	S
7	R = 14	J	R = 7	J
8	R = 15	S	R = 6	S
8	R = 16	J	R = 5	J
9	R = 17	S	R = 4	S
9	R = 18	J	R = 3	J
10	R = 19	S	R = 2	S
10	R = 20	J	R = 1	J

Note: R = reading passage number; S = stair climbing; J = journaling walked was 750 meters. For context, climbing stairs has a gross energy cost of 9.6 metabolic equivalents (METs), while going down stairs uses 4.9 METs (Teh & Aziz, 2002).

On sedentary days, participants came to class, picked up their journals, and began the writing activity. Like the stair climbing regimen, journal keeping lasted roughly 10 minutes and was done prior to engaging in the day's reading task. Although journal keeping can be considered challenging intellectually (Schoonen et al., 2009), its sedentary nature made it suitable as a placebo activity in lieu of physical activity. Journal keeping has a MET value of ≤ 1.5 (Mansoubi et al., 2015) and was selected as an in-class activity because of its minimal energy expenditure. (It also served as a place-holder activity to fill class time when students would otherwise be engaged in the stair climbing protocol.) Students were encouraged to write continuously in their journals for the duration of the activity without worrying about grammar or spelling. They were also discouraged from using a dictionary or an eraser, to help maximize their production. An optional writing prompt was offered at the start of each journaling activity; however, students were free to choose any topic they wished to write about.

Results

Analysis

A 2x2 mixed-design factorial analysis of variance (ANOVA) was conducted to determine differences in reading passage scores and times (dependent variables) between the two treatments, journaling versus stair climbing (independent variable) for each reading passage. This approach enabled a robust examination of the treatment effects while accommodating both within-individual variations and between-group differences.

Prior to conducting statistical analysis, the assumption of normality was assessed for both speed and time. Skewness values for time were -0.45 (Group 1) and 0.78 (Group 2), and for score, values were 0.12 (Group 1) and -0.35 (Group 2). As all values fell within the commonly accepted range of -1.00 to +1.00 (Field, 2018), normality was assumed, supporting the use of parametric tests.

Comprehension

As noted previously, participants had two comprehension scores (one per condition), derived from the sum of their correct responses across the 10 passages per condition. Post hoc descriptive statistics indicated that participants in Group 1 achieved a mean reading comprehension score of 7.28 (SD = 0.53) for the stair climbing condition and 6.48 (SD = 0.46) for the journaling condition. Similarly, participants in Group 2 attained a mean reading comprehension score of 6.95 (SD = .61) for the stair-climbing condition and 6.22 (SD = 0.55) for the journaling condition. This suggests a potential benefit of physical activity on reading comprehension, though further statistical analysis is needed to determine the significance of this effect.

Tests of between-subjects effects revealed a non-significant main effect of group affiliation on average reading comprehension scores, $F(1, 24) = 2.269$, $p = .145$. These outcomes collectively suggest a substantial influence of treatment type on participants' reading comprehension scores, irrespective of their group allocation.

Time

Analysis by group indicated that participants in Group 1 read passages at an average pace of 127.25 seconds (SD = 24.94) following the stair climbing treatment and 131.92 seconds (SD = 28.16) after the journaling treatment. Meanwhile, participants in Group 2 took an average of 133.57 seconds (SD = 25.62) to read a passage after the stair-climbing treatment and 137.29 seconds (SD = 23.13) after the journaling treatment.

A repeated measures analysis of variance (ANOVA) was also calculated to assess the effects of the treatments on participants' reading times, with Group as the between-subjects factor. The ANOVA yielded a significant main effect of treatment on the pace at which the readings were completed, $F(1, 24) = 8.356$, $p = .008$, $\eta^2 = .258$. However, no significant interaction between treatment and group was observed, $F(1, 24) = .108$, $p = .745$, $\eta^2 = .004$.

Discussion

The goal of this study was to investigate the efficacy of utilizing exercise as an alternative approach to traditional methods of improving L2 reading fluency. The findings revealed that participants' reading comprehension scores increased significantly after engaging in a brief stair-climbing condition compared to their engagement in a sedentary journaling condition. Participants also read demonstrably faster following exercise, suggesting that motion and movement may have contributed positively to improving their reading fluency overall. The results also contribute to a growing body of literature supporting the use of physical activity to enhance cognitive performance and language learning. Notably, studies by Bidzan-Bluma and Lipowska (2018), Padial-Ruz et al. (2022), and Scudder et al. (2014) have similarly emphasized the potential of incorporating exercise into educational settings. By utilizing a structure found commonly on school campuses, this study addresses a need for practical and cost-effective interventions that can be easily integrated into various educational contexts.

While the outcomes are promising, it is important to acknowledge the limitations of this research. This study focused solely on reading comprehension and speed. Future investigations should explore the effects of physical activity on other aspects of language learning, such as communicative competence, listening, and writing fluency. Understanding the underlying mechanisms through which physical activity influences cognitive functioning in language learners could also provide valuable insights for designing targeted interventions. Additionally, the data collected in the study was limited. Future research could use a more comprehensive approach to confirming the efficacy of using physical activity to augment language learning, including tests for neuronal and cerebrovascular activity. Employing a different instrument, such as material better suited to measuring changes in overall language acuity might also produce results with greater consistency and accuracy. Increasing the sample size and diversifying the pool of participants would further enhance the reliability and generalizability of the results and extending the period of observation beyond 10 weeks could also provide more insight into the sustained effects of physical activity on language learning outcomes. Another issue worth noting is that the video participants watched may have influenced their willingness to participate in the study and the effort they made while participating in it. Replicating this study without screening the video could be informative with regard to how beneficial exercise is for acquiring language.

Despite these limitations, the findings have important implications for teachers, curriculum designers, and educational researchers. Integrating physical activity breaks such as stair climbing into language learning programs offers a simple, affordable, yet effective strategy for improving academic performance. For example, in primary education settings, introducing brief periods of stair climbing throughout the day could improve learners' focus and attention, leading to better comprehension and retention. At the middle and high school level, incorporating more daily physical activity like stair climbing could promote cognitive performance and overall health and well-being. At the collegiate level, students could be encouraged to take the stairs more frequently between classes as a kind of life hack that boosts their learning capacity and facilitates better memory retention.

In summary, this study suggests that short bouts of physical activity may have had an impact on L2 reading comprehension and speed among one cohort of participants. The findings appear to reinforce the results of previous research and offer new insight into the way language can be taught to best maximize student achievement.

Looking ahead, educators and researchers should continue exploring the potential of using motion, movement, and light physical activity as interventions in language learning contexts and work toward informed strategies that encourage the development of language acuity by developing evidence-based strategies that support the holistic development of learners.

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Author Bio

Joshua Cohen *helps coordinate the Intensive International Program in the Faculty of Business Administration at Kinki University. His research interests include reading fluency development and the influence of motion, movement, and physical activity on the brain and cognition. Currently on sabbatical leave at Thompson Rivers University in British Columbia, he can be reached at: jcohen@kindai.ac.jp or jcohen@tru.ca*

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