Original Research

Walk'n'Talk: Effects of a communicative strategy

by Heiner Böttger and Deborah Költzsch

Heiner Böttger Catholic University of Eichstätt-Ingolstadt, Germany heiner.boettger@ku.de
Deborah Költzsch Catholic University of Eichstätt-Ingolstadt, Germany deborah.koeltzsch@ku.de
Article history Received October 11, 2020 | Revised September 12, 2021 | Accepted November 29, 2021
Conflicts of interest The authors declared no conflicts of interest
Research funding No funding was reported for this research
doi 10.22363/2521-442X-2021-5-4-9-21
For citation Böttger, H., & Költzsch, D. (2021). Walk'n'Talk: Effects of a communicative strategy. *Training, Language and Culture, 5*(4), 9-21.

The article focuses on the synergy effects of walking and talking simultaneously and the resulting conclusions on didactical practices regarding foreign language teaching. The study therefore consists of two different sections. On the one hand, the aim of this work is to conduct a cross-science analysis in order to transfer significant findings of the reference sciences, including neurobiology, to the field of foreign language didactics. On the other hand, task formats are developed on a methodological level that reflect a practical implementation of the previous finding. The aim of these transfer considerations is to make use of the biological predispositions in humans regarding movement and to apply them to communicative areas in foreign language teaching. As this research area is still mostly unexplored, the article functions as an exploratory approach to the matter as well as fundamental research work in order to generate new research questions and to expand the potential of the topic. It sets out to employ common neurobiological effects of Walk'n'Talk to create general as well as specific task formats, which in turn require future evaluations. Therefore, while the results of this work show potential opportunities within this context, they are equally limited due to the lack of a scientific basis. Going forward, this means that methodological testing of the aforementioned transfer efforts and task formats is necessary.

KEYWORDS: *communicative strategy, neurobiological effects, language learning, didactical intervention*

1. INTRODUCTION

When philosophers stroll around in column halls or take lonely walks in the woods musing on the meaning of life, neuroscientists can explain best what happens beneath the surface: walking is beneficial for thinking because brains are activated most effectively by movement. Purely anecdotally, the connection between walking and thinking, or walking and learning, is suggested not only by antique walkways, but also by many other phenomena: actors who walk around learning their parts, authors moving away from their desk due to a writer's block, chess players who jump up and walk around to think a problem through analytically, or students learning vocabulary while pacing through a room. Hence, again from purely anecdotal observation, walking on the one hand helps with daydreaming – disordered creative thinking that has to do with imagination – and on the other hand with analytical thinking that tries to solve a problem. Additionally, sensory impressions, which arise while moving around, are subjective but at the same time play a great role for the entire experience: everyone who goes for a walk has sensitive experiences with pleasant influences from the outside. Weather conditions, temperature, floor conditions, smells, and viewing distances are perceived differently than e.g. in vehicles, where they seem to be more intense.

Unfortunately, there are no broad empirical studies specifically on walking. What the overwhelming part of the empirical studies shows, however, is that surprisingly little additional activity already helps tremendously, from which one can certainly deduce that regular walking shows to be beneficial. This shows that the benefits of movement have been recognised in fundamental terms but have not yet been transferred to other areas. In particular, the connection and expansion of these findings is important for the field of (language) didactics. The inclusion of simple movement sequences, such as walking, expands didactic possibilities that previously included merely sitting or standing. The connection of mind and body – also known under the term 'embodiment' – therefore seems to play a role for learning and thinking. How this connection between walking and thinking exactly works and what the benefits for communicative processes are – especially between different individuals – will be the focus of this article.

2. IMPLICATIONS OF MOVEMENT ON THE BRAIN

2.1. General observations

Initially, it is important to give an overview of the neurobiological aspects of movement. Only the understanding of these processes can lead to possible didactic implementations of the physical requirements in possible learning scenarios. Movement is a constant, self-evident companion of humans: it is through motor skills that people can act, react, communicate, and interact. The human body is constantly in motion. Behind every single movement is the complex, vital interaction and coordination of special motor systems in the brain, spinal cord, and musculature with approximately 650 bundled muscles. This not only affects the skeletal muscles and organs, but also, for example, linguistically relevant small muscle groups for facial expression and lip movements as well as breathing. Only when a part of the muscular system is restricted or even fails, the intuitive control, which is increasingly automated over the years of life, is consciously perceived. While in the first few years, basal movements such as running or jumping still have to be learned, increasingly detailed processes are then related to each other and constantly coordinated. Playing a musical instrument, controlling a means of transportation, performing a craft – there are no physical and psychological limits to the specialisation of movements if there are no clinical findings that functionally inhibit or prevent them.

2.2. Metabolism and movement

As the basis of our life, the concept of metabolism is inevitably linked to the subject of health. For this in particular, it is necessary not only to understand how it works, but also to know how to optimise it in a targeted manner. Metabolism is the entirety of all biochemical processes in the body that are necessary to ensure that all substances, such as oxygen, get to the body or brain cells in which they are most needed. Apart from blood metabolism, there are various other types of metabolism, which are in general named after the substances (carbohydrates, protein, fat, minerals) that are processed.

By reducing, rebuilding, or assembling (anabolism) only the usable substances are filtered, whereas waste products or unusable substances can leave the body again (catabolism). Hence, metabolism is mainly understood as the delivery of substances to the cells.

Muscle contractions through body movement are necessary to ensure this process. These muscular actions compress the veins, causing the blood to flow further towards the heart through valve action: therefore, diverse and multiple movements are particularly important. The blood and oxygen flow, which leads through the larger arteries all the way to the peripheral hair thin capillaries – a distance of approximately 160.000 kilometres – and back through the veins is only possible due to a permanent and slightly increased heartbeat rate.

Only regular body movement ensures that this network is free of tangles and that all substances can reach the muscular as well as neural cells unimpededly. Persistent and stable movements such as running, cycling and walking are especially effective. Two other important effects of a slightly increased metabolism concerning this paper's topic are: (1) even low and occasional physical activity such as a going for a walk can have positive effects on our mood (Miller & Krizan, 2016; Schulz et al., 2012); (2) the release of happiness hormones (endorphins) is stimulated, which relieves stress and tiredness after just about ten minutes (Hunter et al., 2019).

2.3. Metabolism and the brain

All voluntary movements are controlled by the central motor system: neural pathways in the brainstem and spinal cord, the cerebellum and the motor cortex. The latter is associated with the control and execution of movement. Motor brain cells in the motor cortex (upper motor neurons) form long nerve connections (axons) from there into the spinal cord. However, they do not reach the muscles themselves, but activate the lower or spinal motor neurons in the spinal cord (medulla spinalis). These in turn transmit the movement impulses very quickly via axons to the muscle fibres, which then contract or relax. What sounds like a long way is actually a process that happens quickly at a speed of up to 400km/h between the neurons.

Almost the same brain areas are responsible for imagined, i.e. planned, but not executed actions as for executed ones: the prefrontal cortex evaluates the situational context and decides on the type of action. It also suppresses or prevents movement sequences and reactions to sensory stimuli as required. The basal ganglia, which act like a filter, do the same. The posterior parietal cortex directs the human body towards the goal of movement, which also includes turning towards conversation partners. For example, regarding reflexes that are essential for survival, the lower motor neurons act autonomously: sensory nerve impulses without involving the brain are then sufficient to trigger reactions (escape, protection, etc.).

'Only regular body movement ensures that this network is free of tangles and that all substances can reach the muscular as well as neural cells unimpededly. Persistent and stable movements such as running, cycling and walking are especially effective'

All these metabolic effects at the neuronal level are ancient processes that are important for human communication: the brain automatically ensures a positive communicative posture in that interlocutors usually turn toward each other, on the one hand to be able to recognise the intentions of the other person and, on the other hand, to connect quickly.

2.4. Effect 1: Neuronal metabolism through movement

The human brain is capable of adapting to external requirements of the environment as well as internal requirements of the body (Spitzer, 1996, p. 148). Flexibility and neuroplasticity (Ratey & Hagermann, 2013, p. 50; Kubesch, 2002), as well as formative psychological experiences (Ardila, 2020) make this possible, depending on use, throughout a lifetime (Spitzer, 2003, p. 94). Physical exercise also leads to an increase in blood circulation within brain areas, which in turn leads to a load-induced increase in neurotrophic growth factors (Walk, 2011, p. 27). This supports the structural and functional regeneration (neurogenesis) and networking of neurons, leading to a new spectrum of behavioural responses and promoting

doi: 10.22363/2521-442X-2021-5-4-9-21
Volume 5 Issue 4, 2021, pp. 9-21
https://rudn.tlcjournal.org

‘On the level of the neurons themselves, more precisely in the transmission of stimuli, movement also has a positive effect. Neurons communicate without touching each other. Special hormones at the interfaces, the synapses, ensure this. As chemical substances, they function in the body’s metabolism as messengers, as so-called neurotransmitters’

general intelligence, more precisely the formation of cognitive capacities through neuronal growth not only in the prefrontal cortex. This happens throughout the life span, over the life span from birth, possibly even prenatally (Eliot & Schaden, 2017). It is logically deducible that this has a positive influence on the psychological and physical situation and makes learning processes possible in the first place (Ratey & Hagerman, 2013, p. 49).

It is the hippocampus in the limbic system that plays a special role in neurogenesis through movement. It stores, among other things, a large number of episodic and declarative memories (Buchner & Brandt, 2017, p. 48). The number of newly formed neurons almost doubles with persistent movement (Ameri, 2001), although this effect decreases with age.

On the level of the neurons themselves, more precisely in the transmission of stimuli, movement also has a positive effect. Neurons communicate without touching each other. Special hormones at the interfaces, the synapses, ensure this. As chemical substances, they function in the body’s metabolism as messengers, as so-called neurotransmitters. In particular, serotonin (for information processing, among other things), dopamine (‘happiness hormone’) and noradrenalin (‘stress hormone’) and the associated neuronal processes are functionally promoted by movement.

A third neural field on which movement has a positive influence is that of executive functions. The frontal brain, the prefrontal cortex, enables the control, evaluation, execution, and inhibition of actions of any kind (Elnikova & Merenkova, 2019). Thus, it activates flexible changes in behaviour. In addition, it stores important sensory influences in a kind of working memory for a short time, is selectively alert, can process errors and solve problems. In the context of physical activity, it particularly perseveres physical demands that have a positive influence on executive functions at an early stage through the strain on the musculature (e.g. increased demand for oxygen) and the resulting adaptation of performance capacity (Hillman et al., 2009). Coordination tasks have a beneficial effect on selective attention (Budde et al., 2008), which helps to block out distraction and disturbing stimuli.

Like the muscles, the brain reacts to demands triggered by motor activity, adapts, and develops. It is therefore not surprising that the resulting improved physical performance is accompanied by cognitive developments that can lead to improved emotional regulation, frustration tolerance, and social behaviour.

In conclusion, it becomes clear that regular walking can have a beneficial effect on neuronal processes as a subliminal endurance load: the formation of neurons, the general metabolism benefits from better blood circulation and increased release of messenger substances, as does the psychological and emotional state of mind. In addition, walking is easy and requires little planning.

2.5. Effect 2: Movement activates the Default Mode Network

This last characteristic of walking – its simplicity and little planning effort – makes this exercise significantly important when it comes to another effect initiated by movement. This is due to the fact that walking is in general a very automatised activity which requires scarcely any attention and hence activates a certain neural network in the human brain – the Default-Mode Network (DMN). This network, first described by Raichle et al. (2001), is a special brain network that is enabled through non-demanding tasks such as listening to music or staring out of the window which in turn lead to inward cognition. The brain is then not in-active but in contrast actually performs various different types of cognitive processes unconsciously. What these cognitive activities all have in common is that they can be described as stimulus-independent thoughts alluding to the fact that the mind strays from an attention-demanding activity, e.g. solving a specific problem, and focusses on unrelated and unconscious thoughts. Speaking in less theoretical terms, this type of thinking can also be referred to as daydreaming and consumes more time of our day than we might actually be aware of. In a study performed by Killingsworth and Gilbert (2010), it was shown that the activation of the DMN occurs throughout the day and takes up almost all of our waking hours.

This high form of activity is only feasible due to the mobilisation of many different brain areas such as the medial prefrontal cortex, the posterior cingulum, the precuneus, parts of the parietal lobe and medial temporal lobe (Böttger, 2018a; Havlík, 2017; Davey et al., 2016), all working together simultaneously (Figure 1).

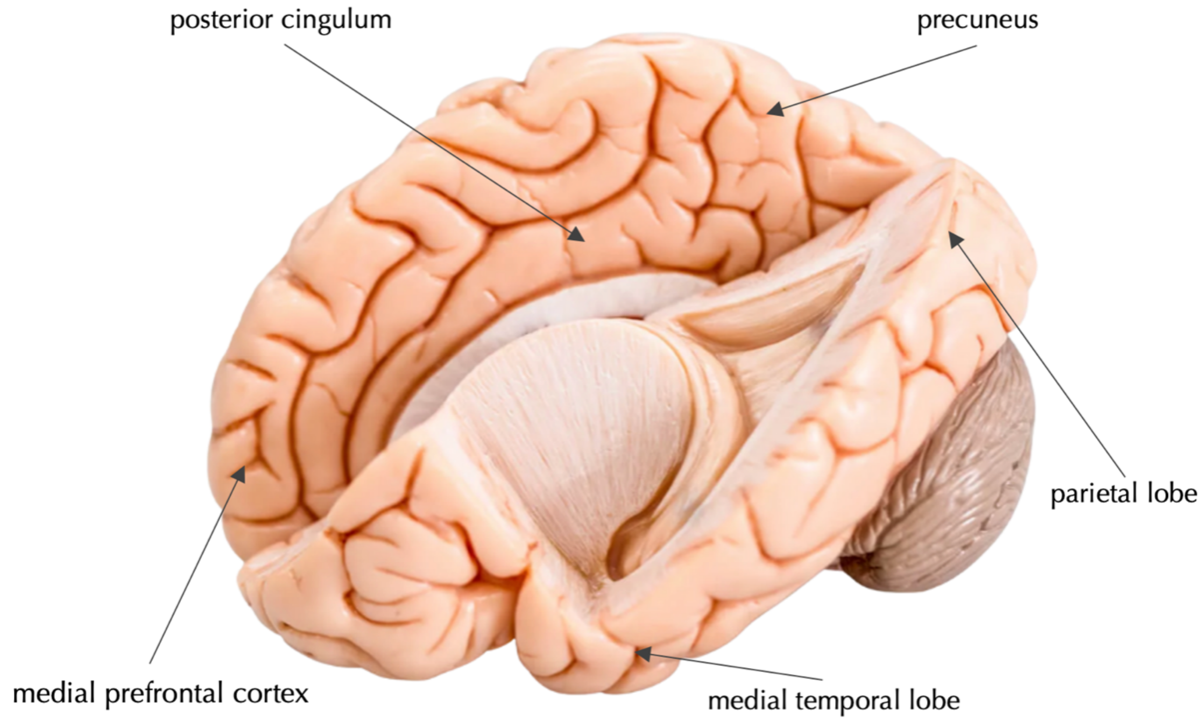

Figure 1. Components of the Default Mode Network

This type of collaboration within the brain, i.e. the DMN, is of course not inconsequential but instead entails numerous advantages ranging from positive effects on mental health (Immordino-Yang, 2016; Immordino-Yang et al., 2012) to improvement of performance and motivation (Medea et al., 2018; Immordino-Yang, 2016). These benefits do not arise out of nowhere but rather trace back to several cognitive processes such as introspective or self-referential thought, emotional processing, decision making, or the prediction of possible actions. Furthermore, the DMN is also an effective way to enhance idea generation and thus creativity itself (Böttger & Költzsch, 2019). This is especially true for previously encountered problems which do not require even more focused deliberation but instead incubation phases with intentional distraction. Research has shown that such incubation phases are even more successful if additional, completely unrelated and – more importantly – simple tasks, such as walking, are performed during the break times (Sio & Ormerod, *'Certain forms of movement, also certain speeds, and above all the regularity of these movements, i.e. the rhythm, have an effect on brain activity. This can be proven in experiments with electroencephalography (EEG), which show that certain rhythms are obviously necessary for different functions in the brain'*

2009; Smallwood et al., 2009; Mason et al., 2007). Hence, the individual benefits not only from the movement itself but also from the underlying mental processes at work during such an automatised activity as walking.

3. FURTHER EFFECTS BY WALKING TOGETHER IN COMPANY

3.1. Effect 3: Human rhythm tendency

Rhythm, more specifically biorhythm, is implemented in various situations and throughout human life. This fact can be clarified going from general to specific, from the chronobiological circadian rhythm of sleep and wake to the functional rhythm of the heart's sinus rhythm. It is much more than a whim or an accidental expression of nature. Additionally, the human tendency towards frequency synchronisation turns out to be of particular relevance for the topic presented.

Certain forms of movement, also certain speeds, and above all the regularity of these movements, i.e. the rhythm, have an effect on brain activity. This can be proven in experiments with electroencephalography (EEG) (Kotz, 2020), which show that certain rhythms are obviously necessary for different functions in the brain. For example, the hippocampus – the region of the brain that is known as the gateway to memory, because the transfer of information into long-term memory seems to take place there – reacts very sensitively to rhythms. This is mainly true for regular and medium speed. While observing people learning while walking, it becomes evident that they have a relatively brisk pace rather than a slow one. This can be described as a type of resonance. The fact that a certain beat is important for brain functions, equals computers which are also clocked and have a specific frequency when performing their arithmetic tasks. In the brain, at least in analogy, rhythms favour certain functions. Walking, therefore, is possibly the simplest, most direct way of making these frequencies available to the brain.

3.2. Effect 4: Joint attention & brain-to-brain synchrony

However, the aspect of walking and talking in combination with each other – subject of the present study – is not an act pursued by an individual on its own but by a couple coming together and focusing not only on their personal interests and goals but on each other, as well. Precisely this aspect of working together as a couple leads to another effect which can in turn be used for numerous advantages.

In general, working together is one of the key characteristics of human society and one of the driving forces of social progress. Moreover, it occurs on a daily basis, as well as intentionally or unintentionally. During simple collaborative tasks such as carrying heavy weight or changing the sheets of a bed, people connect with each other intentionally to reach a common goal. However, there are also unconscious instances, viz. situations of unintentional joint action, in which humans connect without wanting to reach a specific goal. To varying degrees, this applies to actions such as engaging in a conversation (Pérez et al., 2017) or playing certain games together (Liu et al., 2016). This type of connection is also explicit in another unintentional but collaborative task leading back to simply walking together. The connection made in this kind of activity can be seen quite overtly through the aligning of one's own footsteps with those of one's counterpart, especially while engaging in a mutual conversation (Hayward, 2009).

Interestingly enough, modern imaging techniques, such as EEG of fMRI, have been able to give new insights into the human brain and were able to show that people do not only connect on a physical but also on a mental level during such moments of intentional joint action. Walking and talking together, therefore, not only ensures that brain regions in one single brain function together but alignment among both brains of the participants occurs. This phenomenon is called brain-to-brain synchrony. Similarly to aligning one's footsteps with each other while walking along with each other, the neural processes seem to align with each other as well, resulting not only in attentive and thoughtful conversations as both partners are focused on each other but also in aligning one's opinions and beliefs throughout the dialogue.

This can be illustrated by findings of a study from Pérez et al. (2017) that explicitly showed the synchronisation of different brain regions during oral interaction. In addition, brain-to-brain synchrony also promotes memory retention, collaborative decision making (Hu et al., 2018), and thus finding a common consensus. A prominent study done by Dikker et al. (2019) collected electroencephalogram data over the course of five years in which participants engaged in face-to-face interactions. The study showed a strong link between brain-to-brain synchrony and traits such as empathy, social closeness, engagement and social behaviour.

With regard to educational settings, another study performed by Dikker et al. (2017) was also able to account for brain-to-brain synchrony being a neural marker for dynamic social interactions and hence a meaningful possibility of enhancing learning and improving learning environments. A follow-up study (Bevilacqua et al., 2019) additionally described how brain-to-brain synchrony entailed positive effects on students' academic performance based on the fact that students reported greater social closeness to the teacher which correlated with higher brain-to-brain synchrony, as well.

Consequently, brain-to-brain synchrony and joint attention – especially in connection with movement – can lead to numerous benefits regarding the individual as well as both partners engaging in such an activity together.

4. APPLYING THE BENEFITS OF WALKING IN LEARNING CONTEXTS

4.1. Communicative settings

The aim of the second part of the present study is a didactic implementation of relevant (neuro-) biological predispositions in humans with regard to movement and rhythm in communicative areas of application, in particular foreign language teaching. It is important to move from general contexts to more specific formats in order to arrive at concrete task formats, which in turn still have to be evaluated. This is for the research area still largely unresearched territory.

In general, the benefits mentioned above and thus the success of Walk'n'Talk strongly hinge on the situations they are applied to as of course walking – even more than its counter-part talking – simply cannot be applied in every situation. Fortunately, there are numerous areas of application, which range from creative fields to learning as well as business contexts. As Walk'n'Talk enhances the alignment of neural functioning in both participants, it is highly suitable for communicative settings, in particular conversations aiming for a common consensus. This can cover meetings, briefings, discussions, negotiations, communication among colleagues or with customers. In general, all forms of conversations depending on collaborating together, listening to each other, or thinking alike. But also, conversations aiming for new ideas, e.g. brainstorming sessions, can be promoted with the help of walking and talking together. In situations like these participants are required to think in different ways instead of agreeing with one another. Luckily, the non-demanding activity of walking along with each other enables as stated previously the DMN, a network in charge of generating new ideas. By carrying out an automatised activity, such as simply moving along, requiring no attention, cognition can turn inward and produce new concepts based on previous knowledge. These new ideas in turn can then be discussed with one's partner in order to come up with an appropriate solution to a problem. Therefore, these types of creative conversations again become conversations designed for reaching a mutual goal.

4.2. Business settings

Naturally, increasing the value and efficiency of communicative situations is of high importance regarding business contexts. Areas of expertise such as retail or marketing but also leadership or professional development are dependent on functioning and above all successful communication. For example, in order to sell products or negotiate conditions it is essential to keep one's own goal in mind but at the same time be in synch with one's counterpart. As a result, misunderstandings can be avoided and working as a team or collaborating on projects is facilitated. To guarantee a rise of quality in communicational settings and hence to synchronise even better, there are certain aspects to keep in mind. These include with special regard to the Walk'n'Talk process the following aspects.

1. Firstly, preparing for a conversation prior to the walk concerning topic, strategy, and conversational details like personal information about interlocutor's family, is crucial for further successful communication. This special information appears reliable, is often surprising for the interlocutor and signals interest in the counterpart.

2. Then, maintaining eye contact by turning to each other while walking every once in a while, helps to enable the other person to hear what is being said in advance via synchronisation. For this reason, every conversation becomes more fluent and connected in the literal sense of the word.

3. Thirdly, paying attention to the adequate usage of one's own language and the interlocutor's in order to be able to better adapt to the communicative partner (e.g. similar speaking habits in order to create empathy), is of major importance. The choice of words and linguistic variety adapted to the situation and the interlocutor is essential to avoid misunderstandings and misinterpretation.

4. Generally and fourthly, being an active listener by e.g. nodding the head or making approving sounds emphasises the attentiveness and the exclusive concentration on the counterpart.

5. Lastly, moving to increase the intensity of the communication is related to the increased biodata due to exercise. For example, fatigue is prevented, among other things (Böttger, 2018b).

Therefore, Walk'n'Talk is a suitable, simple, and feasible way to enhance communicative settings in everyday business settings. To reinforce the point: it can be assumed, subject to empirical verification, that mobile communication situations may be superior to static ones in their depth of content, communicative efficiency, and personal commitment.

4.3. General educational settings

The same holds true for educational settings. The DMN itself has already proven to be useful in fostering creativity – in terms of creating language – in the classroom. For example, parts of the DMN appeared to be responsible for language-learning processes such as self-correction and self-reflection during conversations or the unconscious planning of language actions in oral communication. In addition, brain areas of the DMN and implicit learning were found to overlap. This suggests that the DMN also seems to be important for the unconscious learning of language, its rules and utilisation (Böttger & Költzsch, 2019).

However, by adding the notion of walking to the equation, the DMN not simply becomes activated but movement itself brings completely new benefits to the learning process on its own.

In addition to the effects on linguistic creative performance through the involvement of the DMN, it is the stronger activation of the hippocampus as a powerful place for storing specific memories that makes Walk'n'Talk so convenient for educational environments. Consequentially, movement, especially slow and continuous, is beneficial for memory building.

The connection of walking to the episodic memory enables the learner to recall experiences that were formed in a particular situation at a particular point in time. Such events or past processes, for example, can be told or presented to the conversation partner in a structured manner. Monologues or audio recordings while walking practice such structuring in advance and prepare for the actual conversation. A specific form of self-evaluation of one's own memory performance is therefore also possible and efficient.

4.4. Task formats for language learning

Ultimately, all considerations in this paper should be directed towards the establishment and promotion of language skills in institutionalised language educational contexts. Movement can be carried out on one's own or in company with others, so all the corresponding task formats suggested may be divided into individual and partner tasks (Table 1):

Table 1
Task formats based on Walk'n'Talk

INDIVIDUAL TASK FORMATS	PARTNER TASK FORMATS
Cognitive learning processes – memory exercises – practice of speech parts for presentations – reciting texts and dialogues – pronunciation training – vocabulary learning – learning by rules – meditating	Communicative task formats – dialogues (guided, semi-guided, open) – discussions – mutual presentation of facts without interruption/alternating monologues – improvisations – interviews – reporting
Rhythmisation of speech – reciting something learnt by heart loudly to oneself – speaking along with audio files – adapting lyrics to walking rhythm – rapping, singing while walking	Collaborative rehearsals – practicing speech parts in role plays, scenic plays, theatre plays, etc. – practicing changing parts of the speech in presentations – rapping together or singing duets – listening to texts of any kind while walking together
Listening comprehension – listening to texts of any kind while walking – listening to music and singing along – speaking along during the second listening	

Together with the neurophysiological benefits of exercise and especially of walking, these language-related task formats create opportunities for all ages and school levels to use language productively, especially foreign languages.

Movements support the pronunciation of a foreign language that is still unfamiliar during the learning process, e.g. individual sounds and the intonation of sentences, as well as the general flow of speech. Something similar can be ascertained, for example, in people who stutter pathologically and who, in connection with gestures or the rhythm of music, achieve fluent speech production (Nemanič & Mihelac, 2018).

There are also positive effects on the limiting aspects of xenoglossophobia (Böttger & Költzsch, 2020) to be taken into consideration, due to the release of endorphins associated with physical activity as well as the supporting effect on the recall memory. This is important to ensure the availability of suitable vocabulary while communicating.

5. OUTLINE OF A WALK'N'TALK TRACK

As a starting point for future research and practical applications, Figure 2 depicts a prototype of such a Walk'n'Talk track. The prototype portrays an idealised version of the track. In reality, Walk'n'Talk tracks may be built differently, adapting to their specific environments. For example, tracks built in a busy city centre differ to a version built in a suburb. However, there are certain aspects that all Walk'n'Talk tracks should contain.

doi: 10.22363/2521-442X-2021-5-4-9-21
Volume 5 Issue 4, 2021, pp. 9-21
https://rudn.tlcjournal.org

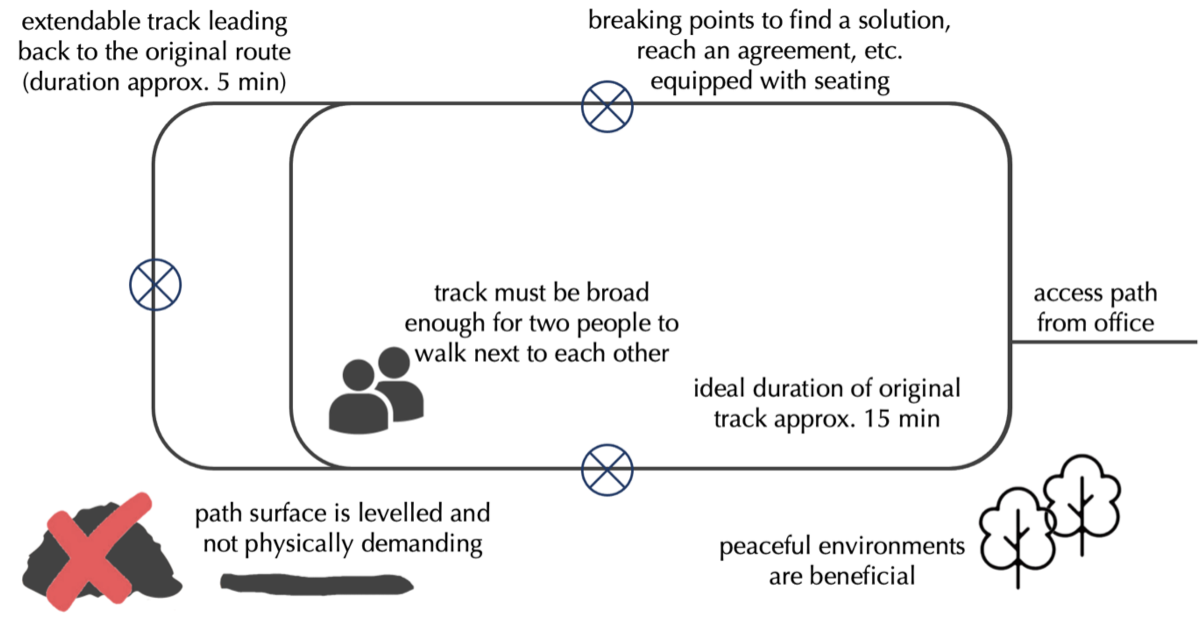

Figure 2. Prototype of a Walk'n'Talk track

Walk'n'Talk routes should be arranged in a circular form with a clear starting point. By doing this, participants are able to pursue their Walk'n'Talk activity as long as necessary without reaching an end of the path. At best, the circular form is even extendable through additional tracks that intersect with the original route. This enables the participants to choose how long the Walk'n'Talk conversation will last but at the same time makes a short dialogue possible, as well. The amount of time spent on the longer version track should be around 15min with a shorter version available at around 5min. Likewise, it is important to include several breaking points at which the participants are able to reach an agreement, come to a compromise, or even end the Walk'n'Talk session. These breaking points ideally contain some kind of seating accommodation, which must not be luxurious but should make it possible to take a quick break or write down a spontaneous thought or done deal.

In regard to the path itself, it is important that the surface is levelled and more importantly even, e.g. asphalted. Participants should be able to walk the route without paying any attention to the path itself and hence being able to focus on the conversation or letting their mind wander respectively. Slight inclines of the route are doable as long as they are not physically demanding. Moreover, the path must be broad enough to allow for two people to walk next to each other comfortably as this is an essential part of walking and talking together.

The surroundings are in general not as pivotal. Nevertheless, peaceful and open spaces that enable the mind to wander are of course more beneficial for participants to engage in a conversation and come up with new ideas. This is simply due to the fact that they can understand each other more easily and are not distracted by external factors. Yet, the beauty of a Walk'n'Talk track lies in the fact that it can be applied to every situation, setting and context.

6. CONCLUSION

Taken together, the results of the cross-science analysis show that linking walking and communication seems to be beneficial in many ways. Positive side effects include neuronal metabolism, activation of specific networks in the brain, promotion of creativity and resourcefulness, and neuronal synchrony and joint attention as just a few examples. Regarding the didactic implementation and the developed task formats it seems to be relevant to classify the corresponding situation accurately.

Is it a purely communicative, professional or educational situation? However, it also appears that in all three areas the use of Walk'n'Talk formats is valuable, considering a communicative setting that strives for a common consensus or a common goal. Furthermore, the present work could offer important indications for the language learning context in terms of individual and task formats. It also shows that the methodology presented can be used regardless of age. Finally, the outline of a possible Walk'n'Talk track provides a starting point for both future research and practical applications.

Certainly, there remains much to be explored in this research field. It should be noted that this contribution is a completely new and highly exploratory development. The connection between movement and language learning has hardly been investigated so far, especially with regard to its neuroscientific background. Therefore, the results of this work are to be considered limited in the sense that the present analysis is dependent on the currently existing literature. Therefore, the results of the transfer work only represent conjectures, which are, however, relevant for the further development of this field of research. In addition, two other specific limitations need to be addressed. Firstly, individuals, especially older people, tend to stop when something becomes too difficult to think about. The counterpart to this is also known from everyday life: when old people – or even philosophers – are walking and are deeply involved in a conversation, they sometimes stop to get a particularly difficult thought right. This points to a kind of resource conflict: at certain moments walking seems to draw too much energy from clarifying a thought. Walking and talking may be counterproductive in this case. Secondly, as far as relevant research is concerned, the genesis of data material via neuroscience imaging processes is still substantially limited. Portable electroencephalograms are subject to severe interference from artefacts, and movements make measurements very difficult. The same is the case with large radiological equipment. Therefore, empirical approach, e.g. observation, still remains the main observation tool.

However, further detailed investigation in the proposed research field is worthwhile: there is consensus on the fact that exercise leads to better memory performance, increased attention, heightened concentration, and creativity potential as well as an improvement in executive functions such as planning and decision-making. This makes it clear that Walk'n'Talk can at least help to facilitate and support foreign language learning.

References

Ameri, A. (2001). Neue Nervenzellen in alten Gehirnen. Eine mögliche Rolle bei Reparatur und Lernprozessen. *Extracta Psychiatrica/Neurologica, 1*(2), 12-16. (In German)

Ardila, A. (2020). Cross-cultural neuropsychology: History and prospects. *RUDN Journal of Psychology and Pedagogics, 17*(1), 64-78. http://doi.org/10.22363/2313-1683-2020-17-1-64-78

Bevilacqua, D., Davidesco, I., Wan, L., Chaloner, K., Rowland, J., Ding, M., ... & Dikker, S. (2019). Brain-to-brain synchrony and learning outcomes vary by student-teacher dynamics: Evidence from a real-world classroom electroencephalography study. *Journal of Cognitive Neuroscience, 31*(3), 401-411. https://doi.org/10.1162/jocn_a_01274

Böttger, H. (2018a). Home of mindfulness: Neuroscientific evidence in contemplative pedagogy. In H. Böttger, K. Jensen, & T. Jensen (Eds.), *Mindful evolution* (pp. 39-52). Julius Klinkhardt.

Böttger, H. (2018b, September 18). Synchronize your brains to improve performance. *GamePlan A*. https://goo-gl.me/95ITg

Böttger, H., & Költzsch, D. (2019). Neural foundations of creativity in foreign language acquisition. *Training, Language and Culture, 3*(2), 8-21. https://doi.org/10.29366/2019tlc.3.2.1

Böttger, H., & Költzsch, D. (2020). The fear factor: Xenoglossophobia or how to overcome the anxiety of speaking foreign languages. *Training, Language and Culture, 4*(2), 43-55. https://doi.org/10.22363/2521-442X-2020-4-2-43-55

Buchner, A., & Brandt, M. (2017). Gedächtniskonzeptionen und Wissensrepräsentationen. In J. Müsseler & M. Rieger (Eds.), *Allgemeine Psychologie* (pp. 401-434). Springer. https://dx.doi.org/10.1007/978-3-642-53898-8_12 (In German)

Budde, H., Voelcker-Rehage, C., Pietraßyk-Kendziorra, S., Ribeiro, P., & Tidow, G. (2008). Acute coordinative exercise improves attentional performance in adolescents. *Neuroscience Letters, 441*(2), 219-223. https://dx.doi.org/10.1016/j.neulet.2008.06.024

Davey, C. G., Pujol, J., & Harrison, B. J. (2016). Mapping the self in the brain's default mode network. *NeuroImage, 132,* 390-397. https://doi.org/10.1016/j.neuroimage.2016.02.022

Dikker, S., Michalareas, G., Oostrik, M., Serafimaki, A., Kahraman, H. M., Struiksma, M. E., & Poeppel, D. (2019). Crowdsourcing neuroscience: Inter-brain coupling during face-to-face interactions outside the laboratory. *Neuroimage, 227,* Article 117436. https://dx.doi.org/10.1016/j.neuroimage.2020.117436

Dikker, S., Wan, L., Davidesco, I., Kaggen, L., Oostrik, M., McClintock, J., … & Poeppel, D. (2017). Brain-to-brain synchrony tracks real-world dynamic group interactions in the classroom. *Current Biology, 27*(9), 1375-1380. https://doi.org/10.1016/j.cub.2017.04.002

Eliot, L., & Schaden, B. (2017). *Was geht da drinnen vor? Die Gehirnentwicklung in den ersten fünf Lebensjahren.* Piper Verlag. (In German)

Elnikova, O. E., & Merenkova, V. S. (2019). Relations of sensorimotor integration and inhibitory processes with internal position of patient's personality. *RUDN Journal of Psychology and Pedagogics, 16*(1), 39-54. https://dx.doi.org/10.22363/2313-1683-2019-16-1-39-54

Havlík, M. (2017). Missing piece of the puzzle in the science of consciousness: Resting state and endogenous correlates of consciousness. *Consciousness and Cognition, 49,* 70-85. https://doi.org/10.1016/j.concog.2017.01.006

Hayward, G. (2009). *'Let's walk and talk': The effect of social interaction on gait entrainment* [Unpublished master's thesis]. University of Cambridge.

Hillman, C. H., Pontifex, M. B., Raine, L. B., Castelli, D. M., Hall, E. E., & Kramer, A. F. (2009). The effect of acute treadmill walking on cognitive control and academic achievement in preadolescent children. *Neuroscience, 159*(3), 1044-1054. https://dx.doi.org/10.1016/j.neuroscience.2009.01.057

Hu, Y., Pan, Y., Shi, X., Cai, Q., Li, X., & Cheng, X. (2018). Inter-brain synchrony and cooperation context in interactive decision making. *Biological Psychology, 133,* 54-62. https://dx.doi.org/10.1016/j.biopsycho.2017.12.005

Hunter, M. R., Gillespie, B. W., & Chen, S. Y. P. (2019). Urban nature experiences reduce stress in the context of daily life based on salivary biomarkers. *Frontiers in Psychology, 10,* Article 722. https://doi.org/10.3389/fpsyg.2019.00722

Immordino-Yang, M. H. (2016). Emotion, sociality, and the brain's Default Mode Network: Insights for educational practice and policy. *Policy Insights from the Behavioral and Brain Sciences, 3*(2), 211-219. https://dx.doi.org/10.1177/2372732216656869

Immordino-Yang, M. H., Christodoulou, J. A., & Singh, V. (2012). Rest is not idleness: Implications of the brain's default mode for human development and education. *Perspectives on Psychological Science, 7*(4), 352-364. https://doi.org/10.1177/1745691612447308

Killingsworth, M. A., & Gilbert, D. T. (2010). A wandering mind is an unhappy mind. *Science, 330*(6006), 932-932. https://doi.org/10.1126/science.1192439

Kotz, S. A. (2020). Ist Rhythmus der Motor für erfolgreichen Zweitspracherwerb? Untersuchungen zum Sprachverständnis und zu sensomotorischen Voraussetzungen des Zweitspracherwerbs. In H. Böttger & M. Sambanis (Eds.), *Focus on evidence III: Fremdsprachendidaktik trifft Neurowissenschaften* (pp. 49-58). NARR. https://goo-gl.me/sxbZ5 (In German)

Kubesch, S. (2002). Sportunterricht: Training für Körper und Geist. *Nervenheilkunde: Zeitschrift für interdisziplinäre Fortbildung, 21,* 487-490. (In German)

Liu, N., Mok, C., Witt, E. E., Pradhan, A. H., Chen, J. E., & Reiss, A. L. (2016). NIRS-based hyperscanning reveals inter-brain neural synchronization during cooperative Jenga game with face-to-face communication. *Frontiers in Human Neuroscience, 10,* Article 82. https://dx.doi.org/10.3389/fnhum.2016.00082

Mason, M. F., Norton, M. I., Van Horn, J. D., Wegner, D. M., Grafton, S. T., & Macrae, C. N. (2007). Wandering minds: The default network and stimulus-independent thought. *Science, 315* (5810), 393-395. https://doi.org/10.1126/science.1131295

Medea, B., Karapanagiotidis, T., Konishi, M., Ottaviani, C., Margulies, D., Bernasconi, A., … & Smallwood, J. (2018). How do we decide what to do? Resting-state connectivity patterns and components of self-generated thought linked to the development of more concrete personal goals. *Experimental Brain Research, 236*(9), 2469-2481. https://dx.doi.org/10.1007/s00221-016-4729-y

Miller, J. C., & Krizan, Z. (2016). Walking facilitates positive affect (even when expecting the opposite). *Emotion, 16*(5), 775-785. https://doi.org/10.1037/a0040270

Nemanič, M., & Mihelac, L. (2018). Exploring the impact of music on speech rate modification in persons who stutter. In *Proceedings of Holistic Approach to the Patient* (pp. 210-217). PHAP.

Pérez, A., Carreiras, M., & Duñabeitia, J. A. (2017). Brain-to-brain entrainment: EEG interbrain synchronization while speaking and listening. *Scientific Reports, 7*(1), 4190. https://dx.doi.org/10.1038/s41598-017-04464-4

Raichle, M., MacLeod, A., Snyder, A., Powers, W. J., Gusnard, D. A., & Shulman, G. L. (2001). A default mode of brain function. *Proceedings of the National Academy of Sciences, 98*(2), 676-682. https://dx.doi.org/10.1073/pnas.98.2.676

Ratey, J. J., & Hagerman, E. (2013). *Superfaktor Bewegung: Das Beste für Ihr Gehirn!* VAK Verlag GmbH.

Schulz, K. H., Meyer, A., & Langguth, N. (2012). Körperliche Aktivität und psychische Gesundheit. *Bundesgesundheitsblatt – Gesundheitsforschung – Gesundheitsschutz, 55*, 55-65. http://doi.org/10.1007/s00103-011-1387-x (In German)

Sio, U. N., & Ormerod, T. C. (2009). Does incubation enhance problem solving? A meta-analytic review. *Psychological Bulletin, 135*(1), 94-120. https://doi.org/10.1037/a0014212

Smallwood, J., Nind, L., & O'Connor, R. C. (2009). When is your head at? An exploration of the factors associated with the temporal focus of the wandering mind. *Consciousness and Cognition, 18*(1), 118-125. https://doi.org/10.1016/j.concog.2008.11.004

Spitzer, M. (1996). *Geist im Netz, Modelle für Lernen, Denken und Handeln.* Spektrum Akademischer Verlag. (In German)

Spitzer, M. (2003). *Lernen: Gehirnforschung und die Schule des Lebens.* Spektrum Akademischer Verlag.

Walk, L. (2011). Bewegung formt das Hirn: Lernrelevante Erkenntnisse der Gehirnforschung. *Die Zeitschrift für Erwachsenenbildung, 1,* 27-29. https://doi.org/10.3278/DIE1101W027

HEINER BÖTTGER
Catholic University of Eichstätt-Ingolstadt | Universitätsallee 1, 85072 Eichstätt, Germany
heiner.boettger@ku.de

DEBORAH KÖLTZSCH
Catholic University of Eichstätt-Ingolstadt | Universitätsallee 1, 85072 Eichstätt, Germany
deborah.koeltzsch@ku.de