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Attentional focus, the Feldenkrais Method and mindful movement

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Attentional focus in motor learning, the Feldenkrais Method and mindful movement

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Abstract

This paper discusses attentional focus in motor learning and performance from the point of view of mindful movement practices, taking as a starting point the Feldenkrais method. Updating a discussion several years ago of between Buchanan and Ulrich on the one hand and Ives on the other – both as regards the understanding of what an external focus of attention means, as well as to the evidence base for the motor learning efficacy of the Feldenkrais method – leads to suggestions of different aspects of the concept of external focus that could be studied empirically. In addition, this is put into the context of Eastern (martial arts derived) mindful movement practices.

Keywords: external focus of attention, constrained action hypothesis, self-invoking trigger hypothesis, mindful movement, Feldenkrais method, Ki-Aikido

Note: As customary in scientific writing, trade and service marks are not displayed in this text.

Potential conflicts of interest: the author is Feldenkrais teacher

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1. Introduction

A considerable amount of work in sports psychology attests to the importance of the choice of attentional focus in movement learning and performance, and in particular to the advantages of an external focus (Wulf 2013). In another strand of research, inspired by the recent popularity - and evidence for psychological efficacy - of mindfulness and acceptance based approaches, researchers studied mindfulness based interventions in sports ((Gardner & Moore 2012), (Kaufman, Glass, Arnkoff & others 2009) (Bernier, Thienot, Cordon & Fournier 2009)). In contrast to usual psychological skills training, the latter interventions aim at changing the relationship to one's inner experiences (thoughts, emotions, etc.) rather than the experiences themselves. In this context one should notice that this aim was already present not only in many “Eastern” *mindful movement* practices (e.g., traditional martial arts, compare Ilundain-Agurruza (2015)), but also in some “Western” somatic practices (see below).

Given that mindfulness is widely defined as a particular way of paying attention (Baer 2003), one might expect considerable overlap between these areas of research. Yet, surprisingly, few studies seem to connect them. One point of contact was made already several years ago, before the recent explosion in mindfulness research, when (Buchanan & Ulrich 2001) described the Feldenkrais method (a “Western” form of mindful movement) in a tutorial and argued that it deserves scientific scrutiny as a method of changing motor behaviour and function. This was criticized by Ives (2003) because of perceived lack of evidence for “physiological” changes in performance due to practising the Feldenkrais method, which in turn was explained by alleged internal, hence inappropriate, attentional focus as well as assumed overemphasis on kinesthetic training.

Recent developments, both in the study of the effects of attentional focus and the efficacy of the Feldenkrais method, merit a new look at the relationship between the Feldenkrais method, attentional focus and mindfulness. The present paper will argue that external focus of attention is an important part of motor learning in the Feldenkrais method, and further that other features of the method tie in very well with the most popular explanation for the usefulness of an external focus of attention: the constrained action hypothesis. Finally, some speculations concerning relations to mindful movement practices will be presented, using the example of the martial art of (Ki-)Aikido.

2. Background

This section contains a brief description of the Feldenkrais method and basic facts about the importance of the focus of attention in motor learning, then goes on to review Ives' critique and previous answers to it.

2.1 The Feldenkrais method

Moshé Feldenkrais, *ingénieur-docteur* and expert martial artist, developed his method of movement-based re-education, which aims at improving the functioning of the mind-body - which is seen as an inseparable unity - starting in the 1940ies (Feldenkrais 1949; Feldenkrais 1981; Buckard 2015). Feldenkrais saw movement both as a crucial tool for re-education (Feldenkrais 1987(1972)), as well as being constitutive of many if not all of the human functions one might want to improve. In this context, improving movement function can range from simple activities of daily life, through being able to deal with a physical handicap (a major knee injury was one motivation for Feldenkrais to begin his studies), to efficient and effective movement in life-or-death situations (during WW2 Feldenkrais wrote a manual for unarmed combat: (Feldenkrais 2009(1942))). In an even more general sense, function is here understood as “the interaction of the person with the outside world or the self with the environment” (<http://feldenkrais-method.org/en/iff/standards-of-practice/>, section 1.4.) Given the focus on (re-)education and learning, it is customary in the Feldenkrais world to speak of *lessons* rather than exercises or treatments.

The Feldenkrais method is practised in two forms: verbally directed *Awareness Through Movement (ATM)* lessons, usually held for groups, and manually directed – hence necessarily individual – *Functional Integration (FI)* lessons. In this paper I will focus on *ATM* since these lessons are obviously more comparable to the literature on attentional focus in motor learning in that the focus of attention is manipulated via verbal instructions. Nevertheless, it is worth pointing out that the names of the two forms of practice should not be seen as indicative of differences in the two approaches: In fact, in both *ATM* and *FI* lessons the goal is to expand awareness through movement (*not* movement with/through awareness!) and integrating function in the sense of “using the whole self” in it: all parts of the body-mind work together harmoniously and efficiently in performing the function.

ATM lessons were described by [Buchanan and Ulrich \(2001\)](#) as “verbally guided movement explorations in which teachers focus the students' attention on the sensory information that accompany a series of movements [...] teachers primarily direct students' awareness to the exploratory process.” In common with *FI* lessons, the goal is not only to “enhance people's awareness of their habitual solutions to motor problems and the sensations accompanying those habits, demonstrate other solutions, and help students select easier, more efficient, and more effective movement options”, leading to “more seemingly automatic use” of motor skills, but also to help them learn about the learning process so that they can transfer the learning approach to other settings and thereby “become self-directed learners who can apply the perceptual-motor skills and exploratory strategies teachers believe to be fostered by Feldenkrais lessons to a variety of learning situations.” (As an aside, we might notice that such self-directed learning is consistent with the advantages of autonomy in motor learning; see, e.g., [Andrieux, Danna and Thon \(2012\)](#); [Chiviacowsky \(2014\)](#)).

2.2 Attentional focus and motor learning

Work in motor learning conducted since the end of the 1990s by Gabriele Wulf and others showed that motor performance and motor learning is profoundly influenced by the focus of attention during the movement. Specifically, “an external focus (i.e., on the movement effect) enhances motor performance and learning relative to an internal focus (i.e., on body movements)”, both in terms of effectiveness and efficiency, as well as whole-body movement coordination (Wulf (2013); other reviews include Wulf (2007), Wulf and Lewthwaite (2010), Wulf (2014)). Typical instructions are for example to focus on the movement of the club (external focus) versus focusing on the movement of the arms (internal focus) when practising golf (Wulf 2007; p.43), or, when balancing on a platform, focusing on the feet (internal focus) versus focusing on markers near the feet on the platform (external focus) (ibid p.41f). Interestingly, in the latter case balance improved even more with markers in the middle between the feet as well as with markers farther out to the side, compared to markers at the feet.(ibid p.68&69). Another interesting observation is that the advantages of external focus seem to show themselves mainly in learning *tasks* that the learner finds difficult (ibid p.129). On the other hand, more complex and hence demanding *instructions* might eliminate the advantages of an external focus (ibid p.130ff): “Overall, these findings suggest that external focus instructions are best limited to one cue at a time. This is especially true for novices, who might otherwise be easily overwhelmed by the amount of information [...]” (ibid p.133).

A suggested explanation for the advantage of an external focus of attention is the *constrained action hypothesis* (McNevin, Shea & Wulf 2003), which holds that an internal focus of attention might interfere with automatic processes that control movement in that it “constitutes a conscious intervention into control processes that would ‘normally’ regulate movements effectively and efficiently” (Wulf 2007; p.114), whereas an external focus lets the motor processes self-organize organically (e.g., Wulf, McNevin and Shea (2001); Kal, van der Kamp and Houdijk (2013)). This can nicely explain the relationship between task difficulty and the effectiveness of an external focus of attention -an external focus is more helpful for difficult tasks - since “when the task is relatively simple and the performer is satisfied with the ongoing motor control processes, he or she is not tempted to intervene.” (Wulf 2007; p.129).

2.3 Ives' critique and answers

In a comment on Buchanan and Ulrich (2001), Ives (2003) surveyed previous reviews of research on the Feldenkrais method and some newer material, and concluded from this that the evidence at the time of his writing did not justify recommending the Feldenkrais method above other techniques, and further that “any effects noted appear to be psychological and not physiological.” For example, he pointed to three studies on postural sway following Feldenkrais lessons that reported findings which were both conflicting and of small effect size. Trying to explain this apparent lack of effectiveness, he claimed that “[a]n essential factor in the Feldenkrais Method is its emphasis on self-awareness, and this factor may be its shortcoming when training for better body coordination”; further that Buchanan and Ulrich (2001) themselves supposedly “pointed out, [that] the self-awareness emphasis is contrary to the literature on goal setting”; and in addition likened this to an external focus of attention, which may be useful in conditions with a large psychological dimension, but which is inferior to an external focus in motor learning and performance.

In their reply, Buchanan and Ulrich (2003) disagreed both with Ives' interpretation of research on the efficiency of the Feldenkrais method (in particular the dichotomy between physiological and psychological effects), as well as his views on the role of kinesthesia in motor behaviour. Absent from their comment is a discussion of the issue of external versus internal focus of attention. Similarly, Connors, Galea, Said and Remedios (2010) argued in a qualitative study of Feldenkrais method balance classes that these are based on motor learning principles, but do not discuss the issues raised by Ives. Buchanan (2012) gave an updated answer to Ives' concerns regarding the

effectiveness of the Feldenkrais method, but again did not refer to the focus of attention and its implications.

2.4 Overview of the present paper

In the following I will argue that the critique of the Feldenkrais method based on the alleged internal focus of attention rests on a subtle but crucial misunderstanding of the meaning of “external focus”, as well as of the way the Feldenkrais method is practised: current use of “external focus” and theories for its effectiveness seem to imply that it is well aligned with the Feldenkrais method in particular and mindful movement more generally. Before doing so I will start with a brief look at recent research on the Feldenkrais method in the next section. The following section contains a more detailed look at attentional focus and the Feldenkrais method, the final section puts the discussion in the context of other mindful movement practices.

3. Current state of evidence concerning the Feldenkrais method

Here I briefly review the current evidence for the effectiveness of the Feldenkrais method and some work concerning its theoretical background.

3.1 Effectiveness

Buchanan (2012) already stressed that the study of the Feldenkrais method has progressed since the time of Ives' comment and provided a systematic overview and discussion. Even more recently, the review and meta-analysis (Worley & Hillier 2015) appeared, based on twenty randomized controlled trials of the Feldenkrais method (not yet including the interesting pilot study on the effects on people suffering from Parkinson's disease by Teixeira-Machado, Araújo, Cunha, Menezes, Menezes and Melo DeSantana (2015), which appeared after the review was published). They were able to perform meta-analyses with seven studies, finding in favour of the Feldenkrais method for improving balance in ageing populations. This is particularly interesting given Ives' remarks above on postural sway, and the fact that these effects are more obviously connected to motor performance than other claimed effects of the Feldenkrais method may be. The overall conclusion of the review was that “[t]here is further promising evidence that the FM [Feldenkrais method] may be effective for a varied population interested in improving functions such as balance.”

Arguably, additional indirect support for the efficacy of the Feldenkrais method comes from the fact that it is but one of a number of Western somatic education methods (Mullan 2014), some of which are closely similar to it and also have some support from empirical research. To pick only one example, the Alexander technique is often compared to the Feldenkrais method (e.g., Buchanan (2012; section 4.2)), the main difference being that in the Alexander technique the teaching apparently tends to be somewhat more directed: according to Jain, Janssen and DeCelle (2004), "In the Alexander technique, the teacher provides more clear direction to the student, whereas in the Feldenkrais method, the teacher makes a point of not directing toward a specific outcome." and "In the Alexander technique, the objective is controlled, elegant, functional movement, whereas in the Feldenkrais method, the desire is spontaneous, elegant, functional movement". Recent evidence for the effectiveness of the Alexander method includes Cohen, Gurfinkel, Kwak, Warden and Horak (2015) for balance, O'Neill, Anderson, Allen, Ross and Hamel (2015) for gait behaviour, and Little et al. (2008) for back pain.

3.2 Theoretical basis and basic mechanisms

The Feldenkrais method is a “highly fluid and dynamic method” whose “practitioners/teachers continually evolve their understanding and practice of the Method” (<http://feldenkrais-method.org/en/iff/standards-of-practice/> Preface). Feldenkrais' original development of the method was based on his thorough review of the scientific state of the art at the time (Feldenkrais 1949),

much of which nevertheless has held up remarkably well over time given that this review happened more than half a century ago (Schleip 2000).

Two recent papers looked at the foundations from different angles: in work using fMRI scanning by Verrel, Almagor, Schumann, Lindenberger and Kühn (2015), a short, Feldenkrais-based sensorimotor intervention - usage of the “artificial floor” - had effects on cortical activity in functionally related brain regions; whereas Kimmel, Irran and Luger (2015) provide a perspective on the relationship between dynamic systems theory and the Feldenkrais method (as well as Shiatsu) using a micro-ethnographic approach.

Support for the idea to use Feldenkrais movement lessons for the re-education of the whole person comes from Clark, Schumann and Mostofsky (2015), who propose a "model of skilled attention in which motor plans, attention, and executive goals are seen as mutually co-defining aspects of skilled behavior that are linked by reciprocal inhibitory and excitatory connections."

Let us now re-examine the relationship between attention and the Feldenkrais method.

4. Focus of attention and “Awareness Through Movement”

This is the main section of the paper: Remarkably, in recent work a focus on the *quality* of movement was counted as *external* focus. I will argue that, since quality of movement is a main point of attentional focus in the Feldenkrais method, its focus is in large part external. Furthermore, in as far as the constrained action hypothesis and micro-choking are the basis of the advantage of external focus in motor learning, it seems even clearer that the Feldenkrais method should be expected to be an excellent way of approaching improvement of (movement) function.

4.1 External focus of attention: recent developments

There seems to have been a subtle shift in the meaning of the expression “external focus of attention”: whereas Wulf, Höß and Prinz (1998) spoke of “attention on the *effects* of their movements *on the apparatus or implement*—that is, the environment” (italics on “effects” in the original, other italics added), recent work included instructions to direct attention to the *quality* of the movement among external focus instructions. Specifically, Neumann and Brown (2013) had their participants perform sit-ups under 2x2 conditions: (external/internal) x (association/dissociation), resulting in four modes of attentional focus: (a) external and task relevant, (b) internal and task relevant, (c) external irrelevant (e.g., scenery), and (d) internal irrelevant (e.g., daydreams). Best results were achieved in the external association condition. Notably, the instruction for this consisted in “repeating the phrases “make your movements smooth” and “make your movements flow””; thus attention was directed to the quality of the movement. Wulf (2013) also counted this as an external focus of attention. We will see below that including emphasis on the “how” of the movement makes external focus of attention an excellent fit with the Feldenkrais method.

Another relevant recent development are the speculations in Wulf and Lewthwaite (2010), who suggest an explanation of the constrained action hypothesis based on “self-invoking triggers”, conjecturing that internal focus instructions (those which “involve the human body”) provoke access to the self and thereby may trigger *self-evaluation and active self-regulation*, leading to “a series of ongoing ‘microchoking’ episodes with attempts to right thoughts and bring emotions under control”. Negative thoughts and emotions are in turn known to “influence or correlate with the neuromuscular coordination or control of movement tasks and skills” so that (negative) self-evaluation may lead to less automatic, more conscious and inefficient use of the body. McKay, Wulf, Lewthwaite and Nordin (2015) provide empirical evidence consistent with the self-invoking trigger hypothesis.

This invites further speculation: One role of emotion is to provide information. Positive affect signals a clear path to go ahead with whatever is at hand, e.g., cognitions (Clare & Huntsinger 2007) or perceptual inclinations (Huntsinger 2013) whereas negative emotions signal the necessity

for change. If this is so, then *positive*, as well as *non-judging* and hence anxiety-free, forms of self-evaluation should give no reason to try to bring thoughts, emotions (or maybe even the movements themselves) under control and hence *not* interfere with automatic movement processes. This has already been noticed in Wulf and Lewthwaite (2010): “It may be that active self-regulatory activities do not ensue, or at least demand less effort and attention, when positive self-regard and optimal task performance are experienced.” As Ilundain-Agurruza (2015) pointed out, important is not only what one attends to, but also how one does so. Viewed in this light, it is not at all clear how different the view expressed in Toner and Moran (2015) really is from the prevailing view about the optimality of an external focus of attention: “careful attention to our bodily means (and attendant feelings) of action” could very well be read as paying attention to the quality of what one is doing, hence an external focus.

4.2 Attention in the Feldenkrais method: a closer look

Recall Ives' claim that Buchanan and Ulrich supposedly pointed out that self-awareness has a crucial role in the Feldenkrais method, and that such an (alleged) emphasis is contrary to the literature on goal setting. Presumably, this refers to their discussion of conceivable differences between dynamic systems theory and the Feldenkrais method, where they state, “During a Feldenkrais lesson, emphasis is placed on attending to sensory information present during exploratory movements. Teachers of this method argue that by first improving the sensitivity of perception one can learn to adapt any behavior more easily. Thus, during instruction, the motor goal or task is secondary to the process of improving perceptual-motor skills for subsequent use in self-organizing task-specific behaviors.”

To me, there seems to be a natural but crucial misunderstanding involved in Ives' claim: “attending to sensory information” in Feldenkrais is not the same as putting emphasis on “self-awareness”, in particular not if the latter is understood in the sense of an internal focus on movement of body parts. In fact, attention in the Feldenkrais method consists *both* of a foreground and a background (e.g., Krauss (2001; p.66), for divided attention see for example Moran (1996; p.48ff)) of open, *effortless* attention (compare the articles in Bruya (2010)). The foreground will usually (but not always) consist in the movement exploration undertaken, the background can be other regions of the body, the position in space, the environment, etc. A very clear example of divided attention is provided by one of the so-called Alexander Yanai (AY) lessons¹, specifically AY#359 “Tanden with bending the knees” (see Solovay (1994-2004; volume 8 part A)), where attention is divided by directing it primarily to a certain point in the body (the *Tanden*, see farther below) and in addition to “the length of the spine, the width of shoulders and arms, the length of the legs, the spreading of the face, the mouth, the exposure of the teeth, and the widening of the area of the eyes ... [...] such that the face will be able to smile at any moment.” Movements are to be done *only* to the extent that it does not disturb this attention. In the self-explaining terminology of Lutz, Slagter, Dunne and Davidson (2008) popular in the mindfulness literature, the Feldenkrais method is much more similar to *open monitoring* than to *focused attention* meditation.

Crucially, from the very beginning of his explorations Feldenkrais understood that “how [one] did a movement was much more important than what the movement consisted of” (Feldenkrais 1981). In other words: even for what is in the foreground of attention, the important thing to pay attention to is not considered to be the movement itself but the quality of the movement – that is, an external focus of attention (compare above). Examples of explicit instructions to attend to the quality of the movement can be found in Connors et al. (2010; Table 6: 1.3) (even though they classified “quality of movement” under intrinsic feedback, in contrast to the apparent current usage of the term referred to above). In this context, *self-evaluation and active self-regulation* are precisely what the Feldenkrais work is careful to avoid. Thus, trying to do a “correct” movement is

¹ For about a quarter century, Feldenkrais taught ATM lessons at his studio in Alexander Yanai street, these lessons were recorded on tape. After his death, the resulting collection of about 550 lessons was transcribed and translated from Hebrew into English, a translation into German is at this time only partly completed.

explicitly discouraged, in favour of curious and open exploration. As [Buchanan and Ulrich \(2001\)](#) expressed it, "[d]uring *Feldenkrais* lessons, students are not told rules for how to do a movement but are guided to explore action possibilities and attend to the accompanying sensations. The presumption is that they will self-organize behaviors emerging from individual constellations of intrinsic factors in relation to the extrinsic factors posed during lessons." Examples from the Alexander Yanai series (Solovay 1994-2004) instructions explicitly displaying this kind of guidance include: AY#343 „Do not become involved in the movement.“, AY#310 “Try to organize the breathing, the chest, and the lack of intention to succeed.”, AY#182: “Try it despite the situation being uncomfortable. Organize so that it will be easy to do. That is the essence of the essences – to make the difficult comfortable.”, or AY#035: “saying that you should breathe like this or that becomes a fundamental mistake.” In addition, the emphasis on ease and staying within a comfortable range is consistent with research that shows that measuring oneself against performance criteria that are too demanding is detrimental to motor learning (e.g., Chiviacowsky and Harter (2015)).

[Ives \(2003\)](#) was perfectly right in saying that a “strategy in which focus is placed on internal bodily sensations such as breathing, pain, and muscle tension [...] appears not in harmony with the desired outcomes of Feldenkrais lessons.” Precisely for this reason, the focus of attention in the Feldenkrais method is primarily on quality and ease of movement, hence external.

4.3 Self-evaluation, micro-choking and the Feldenkrais method

Returning to the issue of attention and effort, it is important to point out that “Reduce your effort” is almost a cliché in the Feldenkrais world. In the vast majority of cases, instructions in Awareness Through Movement are to move with ease and comfort (e.g., <http://www.feldenkrais.com/standards-of-practice> section 1.10) and to stay within the range that is comfortable. There are at least two reasons for that: less effort allows distinguishing more subtle sensations, and it contributes to the avoidance of negative self-evaluation during and after the lesson.

Concerning the latter, Feldenkrais (2002(1985)) writes that when acting correctly, “the alternative of failure has no compulsive tension about it.” In fact, the lessons should be done in a way that encourages good mood since (ibid p.xxxix): “Learning must be undertaken and is really profitable when the whole frame is held in a state where smiling can turn into laughter without interference, naturally, spontaneously.” Besides moving with ease, a negative self-evaluation is also avoided by slowly building up complex movements from simple parts (compare the remarks quoted above on complex instructions with external focus) and by not declaring an intended outcome of the lesson, thereby encouraging curiosity as well as discouraging critical self-evaluation that might be caused by observing how far one still is of the intended final movement.

As concerns the issue of effort and sensitivity to sensations, it is perfectly consistent with both the theory and the practice of the Feldenkrais method when Ives (2003) points out that “conscious and focused effort is not required and perhaps not even important to improve perceptual sensitivity”. Feldenkrais himself wrote (Feldenkrais 2002(1985)) that “[t]he keener the watch on resistance, the finer is the skill and competence in the end.” The point is not to sharpen sensitivity in order to enable conscious intervention in movement patterns but rather to be able to notice and then stop obstructing the natural course of movement. Already Buchanan and Ulrich (2001) quoted Feldenkrais as stating that “re-education of the kinaesthetic sense, and resetting it to the normal course of self-adjusting improvement of all muscular activity - the essence of life - is fundamental”. One may or may not agree that it is the essence of life, but “self-adjusting improvement” is precisely what mediates the usefulness of an external focus of attention in motor learning, according to the constrained action hypothesis.

One way Feldenkrais expressed this was using the idea of mono-motivated action (Feldenkrais

2002(1985); chapters 4&14), in particular of avoiding “parasitic”, unnecessary muscle action – both movement that does not contribute to the function at hand as well as unhelpful stiffness, i.e. lack of efficient participation of the whole self in the function. [Wulf \(2013\)](#) noticed that what Feldenkrais would have called parasitic muscle action seems again related to an internal focus of attention: “A higher degree of co-contractions of agonist and antagonist muscles with an internal focus was found by [Lohse et al. \(2011\)](#) using an isometric force production task.” More generally, the concept of mono-motivation and its opposite, cross-motivation, fits perfectly with the above mentioned idea that performance deficits under internal focus condition result from the desire to both execute a movement and regulate emotions at the same time – a clear example how cross-motivation interferes with automatic processes.

By the way, it is interesting to note parallels between the Feldenkrais' idea of mono-motivation and psychological research on the relationship between conflicting goals and well-being (e.g., [Kelly, Mansell and Wood \(2015\)](#) , [Koletzko, Herrmann and Brandstätter \(2015\)](#)), in particular in view of the already noted fact that the goal of the Feldenkrais method is not only improved movement but (self-)education of the whole person. Nevertheless, a discussion of this is beyond the scope of this paper.

4.4 Summary and preliminary conclusion

To sum up, Feldenkrais “Awareness Through Movement” lessons are characterized by: focus on quality of movements, positive mood and avoiding cross-motivation. If the above quoted speculations concerning the crucial role of avoiding negative self-evaluation and microchoking hold true, this would seem to suggest that Feldenkrais is an excellent approach to motor learning.

The Feldenkrais method in the form of *Awareness Through Movement* provides a treasure trove of experience with the use of attentional focus instructions. In general, proper instruction requires considerable expertise not least because “no pain, no gain” is deeply ingrained in our culture (and, arguably, in the human mind – compare the negativity bias ([Rozin & Royzman 2001](#))), so that it is difficult for many people to adjust to effortless motor learning. Nevertheless, some simple interventions should lend themselves reasonably easily to experimental study. To give just one example: Returning to the study that successfully used “flow” and “smoothness” of movement to improve performance during sit-ups ([Neumann & Brown 2013](#)), it would be worthwhile to try instructions to put attentional focus on the relaxation of the antagonists (back muscles), or more generally on allowing movement in the back. If this results in performance enhancement compared to focusing on the feeling in the abdominal muscles (the internal focus condition in the paper) this would be evidence against the assumption that referring to the body is always sufficient to trigger microchoking (compare above). Of course all this would have to be done with suitable manipulation checks, since an instruction “make the movement smooth” might already make the study participants relax their back muscles (it is hard to make smooth movements while being aware that the antagonists are contracted).

Thus we are back full circle to the work of [Buchanan and Ulrich \(2001\)](#); [Buchanan and Ulrich \(2003\)](#): the Feldenkrais method deserves the attention of the movement researchers.

5. Mindful movement

Mindfulness is a hugely successful concept that is widely conceptualized as “the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment.” ([Kabat-Zinn 2003](#)). Evidently, Feldenkrais *Awareness Through Movement* classes are a form of “Mindfulness Through Movement”: one pays non-judgemental attention to the presently unfolding movement experience, rather than trying to follow a prescribed “correct” movement form.

Thus, if indeed non-judging forms of self-observation do not prejudice automatic and hence good movement learning and performance, one would expect this to apply in particular to mindful movement practices. Indeed, according to Sappington and Longshore (2015) there is “preliminary support for the efficacy of mindfulness-based interventions in for [sic] the enhancement of sport performance”. Also, mindfulness seems to contribute positively to motor control as Naranjo and Schmidt (2012) found that “mindfulness meditation practice is associated with slower body movements, better motor performance, and enhanced awareness of perceptual-motor conflict” in a visuomotor reaching task with false feedback, and in the work of Kee, Chatzisarantis, Kong, Chow and Chen (2012) state mindfulness induction led to both better performance and more use of external focus strategies (looking at a spot/spots in front) in a subsequent balance task. Zhang, Si, Duan, Lyu, Keatley and Chan (2016) show in a randomized trial that beginners' dart throwing performance as well as psychological measures improve more for a mindfulness training program (mindfulness-acceptance-commitment approach, MAC) than for an attention control group (i.e., control received sports psychology lectures).

Connected with choking under pressure, Ilundain-Agurruza (2015) discussed traditional Japanese swordsmanship as a case study of extreme pressure to perform, and in particular the idea of *mushin*: the concept of an imperturbable mind (literally, “no mind”) that is able to uphold fluid attention unperturbed by thoughts and emotions. Practice forms like *Iaido* (the art of drawing the sword) are movement meditation techniques that help attain *mushin* through mindfulness in that “[t]hose trained in these ways are mindfully aware without remaining fixed.” A modern Japanese martial art with deep roots in ancient swordsmanship is *Aikido*; for this art, which Lothes, Hakan and Kassab (2013) called a form of “meditation-in-action”, these authors provided some evidence that its practice increases mindfulness.

This again points to mindful movement as a way to prevent micro-choking. In this context it is interesting that many Japanese (and Chinese) martial art forms emphasize putting the attentional focus primarily on the point in the abdomen called *tanden* in Japanese. This may sound like an internal focus of attention, but one should notice that the purpose is not to regulate movement but to calm the mind. This is particularly clear in *Shin-Shin-To-Itsu-Aikido* (Aikido with mind and body as one; for short: Ki-Aikido), which is underpinned by four basic principles, see, e.g., Tohei (1996; ch.2): 1.) Keep one point 2.) Relax completely 3.) let Ki extend² 4.) weight underside. Crucially, these four principles are not really different but rather they are aspects of the same underlying principle: cultivation of keeping the attention at the *tanden* one point (an apparently internal focus of attention) is no different from cultivating the ability to “let Ki extend” away from oneself in all directions (obviously an external focus of attention). This suggests a negative answer to the second of the two related questions posed in Wulf (2013), namely: “Are attempts at controlling body movements the precondition for less-than-optimal performance? Or are simple references to the body able to invoke the self system [...] and trigger self-related thoughts which, in turn, cause micro-choking episodes?” The above speculations suggest one way to deal with the problem: keep (part of) your attention at *tanden* thereby relaxing and letting your attention (“Ki”) extend; thus avoiding micro-choking that would arise from conflicts between (more or less conscious) intentions and automatic processes. This means in Aikido language to “unify mind and body”³, or in Feldenkrais *parlance* to “act with your whole self”.

2 I do not have the English translation of the book at hand, but as far as I remember it uses the translation “extend Ki”. This is unfortunate, since it might sound like extending Ki was an active act, which it is not. The translation in the German edition “Ki fließen lassen”, i.e., “let Ki flow”, is preferable in this respect, but does not indicate the (mainly) outward nature of the flow which can be seen in the relevant exercises.

3 Interestingly, the root meaning of the word “yoga” is also “to add”, “to join”, “to unite”, or “to attach”, see <https://en.wikipedia.org/wiki/Yoga#Etymology>

References

- Andrieux, M.; Danna, J. and Thon, B. (2012). *Self-Control of Task Difficulty During Training Enhances Motor Learning of a Complex Coincidence-Anticipation Task*, Research Quarterly for Exercise and Sport 83 : 27-35.
- Baer, R. A. (2003). *Mindfulness training as a clinical intervention: A conceptual and empirical review*, Clinical Psychology: Science and Practice 10(2) : 125 – 143.
- Bernier, M.; Thienot, E.; Cordon, R. and Fournier, J. F. (2009). *Mindfulness and acceptance approaches in sport performance*, Journal of Clinical Sport Psychology 25 : 320.
- Bruya, B. (Ed.), (2010). *Effortless Attention: A New Perspective in the Cognitive Science of Attention and Action*. Cambridge: MIT Press.
- Buchanan, P. A. (2012). *The Feldenkrais Method® of Somatic Education*. In: Bhattacharya, A. (Ed.), *A Compendium of Essays on Alternative Therapy*, InTech.
- Buchanan, P. A. and Ulrich, B. D. (2001). *The Feldenkrais Method®: A dynamic approach to changing motor behavior*, Research Quarterly for Exercise and Sport 72 : 315-323.
- Buchanan, P. A. and Ulrich, B. D. (2003). *Attending to the Process of Changing Behavior: A Reply to Ives' Commentary*, Research Quarterly for Exercise and Sport 74 : 124-126.
- Buckard, C., (2015). *Moshe Feldenkrais: der Mensch hinter der Methode*. Berlin Verlag.
- Chiviawosky, S. (2014). *Self-controlled practice: Autonomy protects perceptions of competence and enhances motor learning*, Psychology of Sport and Exercise 15 : 505 - 510.
- Chiviawosky, S. and Harter, N. M. (2015). *Perceptions of competence and motor learning: performance criterion resulting in low success experience degrades learning*, Brazilian Journal of Motor Behavior 9(1).
- Clark, D.; Schumann, F. and Mostofsky, S. H. (2015). *Mindful Movement and Skilled Attention*, Frontiers in Human Neuroscience 9.
- Clore, G. L. and Huntsinger, J. R. (2007). *How emotions inform judgement and regulate thought*, Trends in Cognitive Sciences 11(9) : 393–399.
- Cohen, R.; Gurfinkel, V.; Kwak, E.; Warden, A. and Horak, F. (2015). *Lighten Up: Specific Postural Instructions Affect Axial Rigidity and Step Initiation in Patients With Parkinson's Disease*, Neurorehabilitation and Neural Repair 29(8) : 878-888.
- Connors, K. A.; Galea, M. P.; Said, C. M. and Remedios, L. J. (2010). *Feldenkrais Method balance classes are based on principles of motor learning and postural control retraining: a qualitative research study*, Physiotherapy 96 : 324-336.
- Feldenkrais, M., (1949). *Body and mature behaviour: A study of anxiety, sex, gravitation, and learning*. London: Routledge & Kegan Paul.
- Feldenkrais, M., (1981). *The elusive obvious*. Meta Publications.
- Feldenkrais, M., (1987(1972)). *Awareness through movement: health exercises for personal growth*. Penguin.
- Feldenkrais, M., (2002(1985)). *The potent self: A study of spontaneity and compulsion*. Berkeley: Frog Books.
- Feldenkrais, M., (2009(1942)). *Hadaka-Jime: The core technique for practical unarmed combat*. Genesis II Publishing.
- Gardner, F. and Moore, Z. (2012). *Mindfulness and acceptance models in sport psychology: A*

decade of basic and applied scientific advancements, Canadian Psychology 53(4) : 309–318.

Huntsinger, J. R. (2013). *Does emotion directly tune the scope of attention?*, Current Directions in Psychological Science 22 : 265-270.

Ilundain-Agurruza, J. (2015). *From clumsy failure to skillful fluency: a phenomenological analysis of and Eastern solution to sport's choking effect*, Phenomenology and the Cognitive Sciences 14 : 397-421.

Ives, J. C. (2003). *Comments on "The Feldenkrais Method®: A dynamic approach to changing motor behavior"*, Research Quarterly for Exercise and Sport 74 : 116-123.

Jain, S.; Janssen, K. and DeCelle, S. (2004). *Alexander technique and Feldenkrais method: a critical overview*, Phys Med Rehabil Clin N Am 15 : 811-25, vi.

Kabat-Zinn, J. (2003). *Mindfulness-based interventions in context: Past, present, and future*, Clinical Psychology: Science and Practice 10 : 144-156.

Kal, E.; van der Kamp, J. and Houdijk, H. (2013). *External attentional focus enhances movement automatization: a comprehensive test of the constrained action hypothesis*, Hum Mov Sci. 32(4) : 527-39.

Kaufman, K. A.; Glass, C. R.; Arnkoff, D. B. and others (2009). *Evaluation of Mindful Sport Performance Enhancement (MSPE): A new approach to promote flow in athletes*, Journal of Clinical Sport Psychology 25 : 334.

Kee, Y.; Chatzisarantis, N.; Kong, P.; Chow, J. and Chen, L. (2012). *Mindfulness, movement control, and attentional focus strategies: effects of mindfulness on a postural balance task*, Journal of Sport and Exercise Psychology 34(5) : 561-79.

Kelly, R. E.; Mansell, W. and Wood, A. M. (2015). *Goal conflict and well-being: A review and hierarchical model of goal conflict, ambivalence, self-discrepancy and self-concordance*, Personality and Individual Differences 85 : 212 - 229.

Kimmel, M.; Irran, C. and Luger, M. A. (2015). *Bodywork as systemic and inter-enactive competence: participatory process management in Feldenkrais® Method and Zen Shiatsu*, Frontiers in Psychology .

Koletzko, S. H.; Herrmann, M. and Brandstätter, V. (2015). *Unconflicted goal striving: Goal ambivalence as a mediator between goal self-concordance and well-being*, Personality and Social Psychology Bulletin 41 : 140-156.

Krauss, J., (2001). *Einfach bewegen : Feldenkrais - der Weg zur Verbesserung von Bewegung und Beweglichkeit ; im Einklang mit dem eigenen Rhythmus leben*. Paderborn : Junfermann.

Little, P.; Lewith, G.; Webley, F.; Evans, M.; Beattie, A.; Middleton, K.; Barnett, J.; Ballard, K.; Oxford, F.; Smith, P.; Yardley, L.; Hollinghurst, S. and Sharp, D. (2008). *Randomised controlled trial of Alexander technique lessons, exercise, and massage (ATEAM) for chronic and recurrent back pain*, BMJ 337.

Lothes J, n.; Hakan, R. and Kassab, K. (2013). *Aikido experience and its relation to mindfulness: a two-part study*, Percept Mot Skills. 116(1) : 30-39.

Lutz, A.; Slagter, H.; Dunne, J. and Davidson, R. (2008). *Attention regulation and monitoring in meditation*, Trends in Cognitive Science 12(4) : 163-9.

McKay, B.; Wulf, G.; Lewthwaite, R. and Nordin, A. (2015). *The self: Your own worst enemy? A test of the self-invoking trigger hypothesis*, The Quarterly Journal of Experimental Psychology 68 : 1910-1919.

McNevin, N.; Shea, C. and Wulf, G. (2003). *Increasing the distance of an external focus of attention enhances learning*, Psychol Res. 67(1) : 22-9.

- Moran, A. P., (1996). *The psychology of concentration in sport performers : a cognitive analysis.* Hove : Erlbaum.
- Mullan, K. J. (2014). *Somatics: Investigating the common ground of western body-mind disciplines,* Body, Movement and Dance in Psychotherapy 9 : 253-265.
- Naranjo, J. R. and Schmidt, S. (2012). *Is it me or not me? Modulation of perceptual-motor awareness and visuomotor performance by mindfulness meditation,* BMC Neuroscience 13:88.
- Neumann, D. L. and Brown, J. (2013). *The effect of attentional focus strategy on physiological and motor performance during a sit-up exercise,* Journal of Psychophysiology 27(1) : 7-15.
- O'Neill, M. M.; Anderson, D. I.; Allen, D. D.; Ross, C. and Hamel, K. A. (2015). *Effects of Alexander Technique training experience on gait behavior in older adults,* Journal of Bodywork and Movement Therapies 19 : 473 - 481.
- Rozin, P. and Royzman, E. B. (2001). *Negativity bias, negativity dominance, and contagion,* Personality and Social Psychology Review 5 : 296-320.
- Sappington, R. and Longshore, K. (2015). *Systematically reviewing the efficacy of mindfulness-based interventions for enhanced athletic performance,* Journal of Clinical Sport Psychology 9 : 232-262.
- Schleip, R. (2000). *Lichtblicke im Dschungel der Gehirnforschung: Von "Body and Mature Behaviour" (1949) bis zur Gegenwart,* FeldenkraisZEIT 1.
- Solovay, E. (Ed.), (1994-2004). *Awareness Through Movement lessons: Dr. Moshe Feldenkrais at Alexander Yanai. Vol.1 - Vol.11.* International Feldenkrais Federation.
- Teixeira-Machado, L.; Araújo, F.; Cunha, F.; Menezes, M.; Menezes, T. and Melo DeSantana, J. (2015). *Feldenkrais method-based exercise improves quality of life in individuals with Parkinson's disease: a controlled, randomized clinical trial,* Alternative Therapies in Health and Medicine 21(1) : 8-14.
- Tohei, K., (1996). *Das Ki-Buch: Der Weg zu Einheit von Geist und Körper.* Werner Kristkeitz Verlag.
- Toner, J. and Moran, A. (2015). *Enhancing performance proficiency at the expert level: Considering the role of "somaesthetic awareness",* Psychology of Sport and Exercise 16, Part 1 : 110 - 117.
- Verrel, J.; Almagor, E.; Schumann, F.; Lindenberger, U. and Kühn, S. (2015). *Changes in neural resting state activity in primary and higher-order motor areas induced by a short sensorimotor intervention based on the Feldenkrais method,* Frontiers in Human Neuroscience 9.
- Worley, A. and Hillier, S. (2015). *The Effectiveness of the Feldenkrais Method: A systematic review of the evidence,* Evidence-Based Complementary and Alternative Medicine : Article ID 752160.
- Wulf, G. (2014). *Attentional focus.* In: Tenenbaum, R. E. & G. (Ed.), *Encyclopedia of Sport and Exercise Psychology,* Thousand Oaks, CA: Sage Publications.
- Wulf, G., (2007). *Attention and motor skill learning.* Champaign : Human Kinetics.
- Wulf, G. (2013). *Attentional focus and motor learning: a review of 15 years,* International Review of Sport and Exercise Psychology 6 : 77-104.
- Wulf, G.; Höß, M. and Prinz, W. (1998). *Instructions for motor learning: differential effects of internal versus external focus of attention,* Journal of Motor Behavior 30(2) : 169-79.
- Wulf, G. and Lewthwaite, R. (2010). *Effortless motor learning? An external focus of attention enhances movement effectiveness and efficiency.* In: Bruya, B. (Ed.), *Effortless attention: A new perspective in attention and action,* Cambridge: MIT Press.

Wulf, G.; McNevin, N. and Shea, C. (2001). *The automaticity of complex motor skill learning as a function of attentional focus*, Quarterly Journal of Experimental Psychology A 54(4) : 1143-54.

Zhang, C.-Q.; Si, G.; Duan, Y.; Lyu, Y.; Keatley, D. A. and Chan, D. K. C. (2016). *The effects of mindfulness training on beginners' skill acquisition in dart throwing: A randomized controlled trial*, Psychology of Sport and Exercise 22 : 279-285.