

Embodiment as symbolic and semantic grounding – directional movement, meaning and language

Abstract

Classical cognitive science approaches understand language as based on amodal representations. In contrast, the findings of neuroscience and embodiment suggest that thought and language involve sensorimotor simulations. Recent phenomenological and creative arts-based research derived from embodied-enactive approaches supports the proposition that language and thought derive from embodiment. By synthesizing cognitive sciences research findings from an embodiment perspective, this article addresses how meaning is ascribed to symbols in general, and to words in particular (the so-called ‘*symbol grounding*’ problem). The article then engages with corporeal and semantic dimensions, drawing on *spatial bias* research, addressing empirical findings on directional movements and their meaning, and argues that embodiment is fundamental to the construction of abstract concepts and language (consistent with *semantic differential research*). Methodological challenges, arising from the dynamic nature of the body’s many intricate ways of grounding the mind, alert us that the linear logic of positivist methods may be inadequate to investigate the body in motion. Finally, clinical implications and future research directions are discussed.

Keywords: embodiment, enaction, body movement, experiencing, spatial bias, conceptual metaphor theory, dance movement therapy, body-base of language, dynamic systems theory

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1. Background

Movement is fundamental for the human condition. Humans communicated in complex nonverbal ways before developing the rudiments of language in the course of ontogenesis. Both movement and language are major attainments of evolution. But what ties the two together? This article will make an argument for the grounding of language in embodiment, and for the connection of both via meaning.

This article argues that embodied experiencing forms the ground on which meaning and language rest. As a conceptual paper it follows a cognitive science perspective from an embodied-enactive perspective. I will proceed from an understanding of embodiment as an approach that addresses the symbol grounding problem and exemplify the grounding of language in embodiment with empirical findings from spatial bias research, focusing on movement dimensions. Then, I will connect these empirical findings to the semantic differential [63], a major language-related dimensional theory. And finally, I will discuss clinical and research implications of the developed approach.

2. Argument

2.1 Addressing the symbol grounding problem

Stevan Harnad articulated the symbol grounding problem in 1990 [27] as the problem that treats the issue of how words get their meaning, of what exactly meaning is, and of how meaning relates to consciousness. Harnad put it this way: „How can the semantic interpretation of a formal symbol system be made intrinsic to the system, rather than just parasitic on the meanings in our heads? How is symbol meaning to be grounded in something other than just more meaningless symbols?“ ([27]; p. 335). In 2003, Harnad posed four questions to help us answer the symbol grounding problem:

- How do words get their meanings?
- What are meanings?
- What is consciousness?
- How are mental states meaningful? [26]

I will provide my brief answer to these questions from an embodied enactive perspective at the beginning of this paper.

The first question (How do words get their meanings?) will not be addressed in this paper. I do here only want

to point to the special case of how onomatopoeic words emerge from sounds of nature or animals (such as cock-a-doodle-do, with interesting variations in individual languages), or from action sounds (such as *to snooze*, *to zip*, or *to giggle*) in terms of resemblances of the sounds.

The second question: What are meanings? leads right into the topic of the paper. From an embodied-enactive perspective, we can propose that meanings are sedimentations of embodiment [4] that went through at least a primitive or rudimentary evaluation. In a phylogenetic argument on the beginning of meaning, Sheets-Johnstone [71], [74] argues, through the example of a bacterium, that it must be surface sensitivity (the primary form of proprioception) that allows the bacterium to distinguish a toxic from a nourishing environment and move into the direction of the latter. This surface sensitivity, the intelligence or ability to distinguish inner from outer, leads to rudimentary evaluative processes in service of survival. The beginnings of meaning and consciousness are thus tied to the (living and resonating) membrane that separates inside and outside of the body. For the infant, meaning emerges from these same sedimentations and rudimentary evaluations, relates to emotion, attitude, identity, and cognition, and is later captured by language (Figure 1 depicts this process).

For the adult, this pathway remains intact as the inductive way of processing information from the environment (including the body) via interoception and exteroception. Simultaneously, starting early in life, language influences the processing of information from the environment, by superimposing focus, labels, direction, attitudes, and beliefs (deductive processing) that interfere with the processing of inductive information in multiple and layered ways [63]. Piaget calls this *adaptation*, consisting of *accommodation* (inductive processing; bottom-up) and *assimilation* (deductive processing; top-down) [63]. Adaptation is an embodied process that is structured by the constraints of the body on the one side (e.g., elbow joints can only move in one direction and not in the other) and the constraints of the environment on the other (e.g., gravity has exactly this strength on planet earth and your body has to arrange its actions with it [1]).

Addressing the third question *What is consciousness?* from an embodied enactive perspective, consciousness emerges at the interface between inner and outer, with the distinction of the rudimentary self and the non-self, at the membrane, our skin, our biggest sense organ. The meaning of the skin is manifold and fundamental; the entire nervous system including the brain develop from our ectoderm [60], [2]. In the example of Sheets-Johnstone [71], the beginnings of meaning and consciousness are tied to surface sensitivity in a one-cell organism, enabled by the living and resonating membrane between inside and outside of its body. This membrane that we share with all living organisms, in humans, has two characteristics that we can continuously and actively influence: the tension-level (and the according tension-flow changes) [37] of our muscles, causing variations of its permeability, and shape-flow/shaping (form changes) of

our surface expanding, growing and shrinking, causing variations of its exposure. Both tension-level and shaping have direct mental correlates [37], [38], addressing the fourth question: *How are mental states meaningful?*

Tension-levels are related to regulation on the level of the individual and its needs [37], [38]. High tension levels protect us from perceiving overstimulation from particular external stimuli. They can help us stay elated, yet they also may create rigidity of exteroceptive and interoceptive perceptions, in parts resulting from a low permeability. High tension supports the assimilation side of the adaptation process [64] and limits accommodation (which may be functional in many situations; for example, any time, when defences are needed, such as when under time pressure). Low tension levels make us more permeable to stimuli from the outside as well as from the inside [51]. They support the accommodation side of adaptation. Yet, they can also make us passive and low in energy or mental state.

Shaping relates to interpersonal relations and relations to objects [37]. Growing movement (and the according shaping) can engender positive mood states and trust while shrinking movement can lead to more negative mood states and mistrust. Body feedback effects are the impressive function that indicates what we can do to use our movement in our best service. As described above, the ability of self-propelled movement means that the body can move in response to a nourishing or toxic environment. It can also move using the evolutionarily advanced active skills of body feedback, as one important aspect of our embodiment, to influence meaning-making, states of consciousness, and mental states [42], [38]. Let us now turn to empirical data that supports the argument of language as built upon our embodiment.

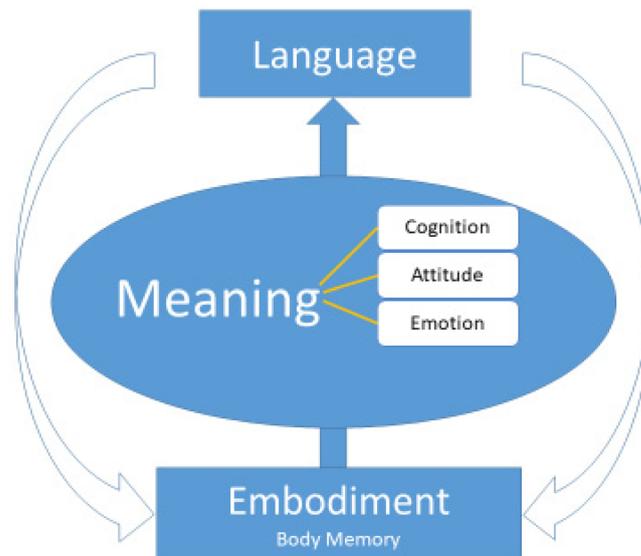
2.2 The grounding of meaning in embodiment

“We usually think of thinking as being language-dependent – that language, thinking and rationality are an inviolate triumvirate of some kind or other. And we don't remember having thought in movement in terms of our early life, and having learned how to navigate in the world by way of movement, which is the way we learn in the beginning” (Sheets-Johnstone, [74], p. 3).

“A proud man expresses his sense of superiority over others by holding his head and body erect. He is erect, and makes himself as tall as possible; so that metaphorically he may be said to be swollen or puffed up with pride.” (Darwin [11], p. 263-4)

2.2.1 Empirical evidence from spatial bias research

Most of the evidence presented here stems from research in Western cultures. We would like to point out the tension between universalist and culture-specific interpretations



Note: Embodiment (movement, gestures, postures) is the sensory and procedural ground on which the distinct concepts of language rest; this is a bidirectional pathway, from embodiment to language, and back (82; see end of discussion): blue arrow in the middle for bottom-up processes, white arrows at the sides for top-down processes; meaning is in the center.

Figure 1: Embodiment as the ground for meaning and language

of embodiment. *Bias* means a subjective perception that deviates from given facts; the concept of bias may be biased in itself, in so far as in its use here it stems from Western positivistic thought; part of the insights in this article stem from the authors own embodied experience, which needs to be acknowledged a source of wisdom/knowledge, but as a biased perspective as well.

Movement has a key function in understanding how things take on meaning for us. We acquire central concepts and categories, such as space, time, inside/outside, before/after, part/whole, etc. through our own movement, the movements of things and others, and our interactions with them [72]. We often acquire meanings of concepts through simultaneous multi-sensory experiences on the body-level.

The philosopher Ernst Cassirer already stated in 1925 in his *Theory of Symbolic Forms* that the main spatial directions “forward – backward, upward – downward and right – left” in both the visual and haptic space are not consistent with the “organ sensations/movements” corresponding to them [10]. They are not interchangeable, because each of these directions is linked to a certain organ sensation – each of these directions has a certain emotional meaning tied to it. Spatial bias research has taken up this topic of sensations and movement directions, interested in why certain mental affinities would let us move in certain ways and not others.

For Barbara Tversky [80], for example, body perception is the basis of spatial perception and this in turn is the basis of concept formation. The associated theory again is *Conceptual Metaphor Theory* [47] assuming that all abstract concepts have formed from our embodiment. The concept of time, for example, is conceptualized from

our direct experience as “movement through space” [29], [30]. Various linguistic metaphors, such as “I feel down”, “...on top of things”, “I am thrown back” or “ahead of my time”, suggest that spatial directions (movement pathways in space) and content-related meaning are not co-incident but systematically related [57].

Two major lines of research from embodied cognition approaches address these phenomena. *Conceptual Metaphor Theory* [47] from cognitive linguistics, assumes that abstract thought is based on embodiment via embodied metaphors. *Spatial Bias Research*, from social psychology [55], [80], investigates with experimental paradigms how spatial directions and meaning relate [5], [9]. Spatial bias research investigates the phenomena of the psychological implications of spatial directions (as described by Cassirer [10]). On the basis of our bodily experience, it assumes that directional movement is fundamentally biased, with specific psychological and semantic implications.

Whenever movement and meaning are incongruent, we understand them more slowly, more incorrectly, or store them less well in our memory [15], [41]. The congruence of movement and meaning during a categorization task also reliably predicted the recollection of terms; congruent terms were recollected significantly more often. Movement thus plays a role in evoking abstract concepts, and this role extends beyond the communication function of movement.

2.2.2.1 The meaning of the body

„Our ability to move in the ways we do and to track the motions of other things gives motion a major role

in our conceptual system. The fact that we have muscles and use them to apply force in certain ways leads to the structure of our system of causal concepts. What is important is not just that we have bodies and that thought is somehow embodied. What is important is that the peculiar nature of our bodies shapes our very possibilities for conceptualization and categorization“ . (Lakoff & Johnson [47], p.19)

The body is the only object in the world that we can perceive from the inside and from the outside. This ambiguity [58] provides the ground for consciousness. Consciousness of the self and the world emerges with proprioception, at the interface of interoception and exteroception [74], [73].

Embodiment research contributes evidence from the body as the carrier of meaning in online and offline cognition [22], [23]. The knowledge that meaning is grounded in the body is by no means new. Piaget [64] and Vygotsky [84] argued and demonstrated experimentally how language and abstract concepts arise from the sensorimotor experience in the world we live in. Vygotsky [84] substantiated the direct developmental line between nonverbal and verbal communication. In cognitive linguistics, Lakoff and Johnson [47], [48] claim that any metaphor, and thus any abstract concept, is derived from our embodiment (concrete sensory experience in and with the world). Not only our language systems rest on our embodiment. Lakoff and Núñez [48] showed in their joint book “Where mathematics comes from” that our mathematical systems are also based on our embodiment.

I generally want to join the line of arguments of Lakoff and Johnson [47] here. Yet, as both a psychologist and dance therapist, I focus more strongly on the *kinaesthetic experience of movement* as a carrier of meaning that feeds into our formation of abstract concepts.

2.2.2.2 Development of movement and meaning in planes (movement analysis)

Following the convention of clinical movement analysis [3], [37], [46], the present research uses the term *sagittal axis* [24] when referring to forward and backward motion. The *horizontal axis* is qualified by right-left movement; and the vertical axis by up-down movement.

Theories of movement analysis have suggested that movement on the *sagittal axis* (the forward-backward dimension) is related to agency and decision making [37], [46], [50]. Movement to the front is related to being decided, going into action, and leaving behind other options, whereas movement to the back is related to indecision and ongoing reflection. Another trait-related dimension is the relation of forward motion to extraversion (e.g., vigorous) and backward motion to introversion (e.g., shy). Developmentally, movement on the *horizontal axis* (left-right) is the first acquisition of an infant. In the phase when infants are not yet able to sit upright, their circle of movement and vision is mostly restricted to left-right motion [37], [36]; the horizontal plane is related to communication. Movement on the *vertical axis* (up-down)

predominates during the second year of life, when children sit up and then stand on their own two feet, conquering the vertical dimension related to gravity, and (self-)presentation [37], [49]. Movement on the *sagittal axis* (backward-forward) is predominant during the third year of life and is related to the child’s development of a sense of time, agency, decision making, and confrontation [37], [46].

2.2.2.3 The meaning of directional movement (spatial bias research)

Regarding the meaning of directional movement, Tversky [80] put forth that people have three psychologically asymmetric primary axes, from left to right, from head to foot, and from front to back. She stated that these facts about their bodies affect people’s perception of the world and their behavior in it, and in turn, bias spatial thinking and metaphoric spatial thinking [80]. Consequently, directional movement is fundamentally biased, with specific psychological and semantic implications (see Figure 2) The implications of spatial directions for meaning have been examined mostly for the horizontal axis [9], [54] and for the vertical axis [57], [59], [70]. Schubert [70] showed that the concept of power is partly represented as vertical difference (see also [25]. Procter and Cho [65] showed how up and down are systematically related to positive and negative valence. Koch, Glawe and Holt replicated these findings [41], further establishing the relation of vertical movement to the emotional (up – happy; down – sad) and power dimension (up – powerful; down – powerless).

We know from gesture studies, that the sagittal movement axis is related to time construals [62]. This axis is therefore of particular interest for abstract concepts such as time in embodiment theory [5], [6], [9], [41]. People gesture to the front when they refer to an event in the future and to the back when they refer to an event in the past. This is true at least for Western cultures. Núñez and Sweetser [62] showed that the Aymara Indians from Northern Chile, for example, gesture “the other way round,” to the front for past events and to the back for future events. There is further evidence that the sagittal axis is related to trait variables such as agency and decision-making, as well as the personality dimensions of extraversion (front) and introversion (back; [37], [41], [46], [50]. Backward movement is related to hesitation, but also to take time for reflection before action [42].

2.3 Correspondence of embodied spatial dimensions to the meaning dimensions in language

2.3.1 The measurement of meaning with the semantic differential

If we look again at the three dimensions of movement and their connection with meaning, we find a similarity

Spatial Bias

Directional Movement and Meaning (Figure 2)

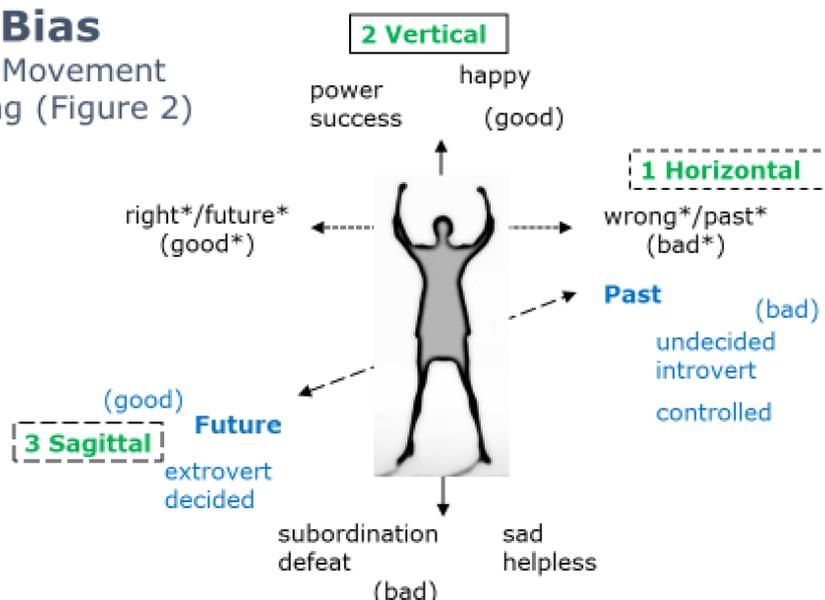


Figure 2: Overview of spatial bias research results from empirical studies (10, 42, 53, 54, 56, 58, 61, 69, etc.)

to a major system that analysed the meaning dimensions in language: The resulting main meaning dimensions of spatial movement correspond to the theory of the semantic differential [63]. Osgood Suci and Tannenbaum [63] categorized thousands of adjectives from dictionaries of different languages to find the fundamental meaning dimensions of language. After many factor-analytical evaluations, three main dimensions resulted from their analysis:

1. The evaluation dimension (evaluation dimension with the poles of positive and negative with by far the most adjectives loading on this dimension; e.g. pleasant – unpleasant, friendly – unfriendly, comfortable – uncomfortable, good – bad, etc.)
2. The potency dimension (strength dimension with the poles of superiority and inferiority and the second most adjectives; e.g., powerful – powerless; potent – impotent; strong – weak, dominant – submissive, etc.), and
3. The arousal dimension (action/excitation dimension with the poles of active and passive and the third most adjectives; e.g. excited – unexcited, aroused – unaroused; wild – calm; moved – stoic) (see Table 1)

Table 1: Underlying meaning dimensions of language

Dimension	Amount of adjectives	Examples
Evaluation	Most	pleasant – unpleasant, friendly – unfriendly, comfortable – uncomfortable, good – bad, etc.
Potency	Second most	powerful – powerless; potent – impotent; strong – weak, dominant – submissive, etc.
Arousal	Third most	excited – unexcited, aroused – unaroused; wild – calm; moved – stoic, etc.

2.3.2 Language and movement are tied to the same meaning dimensions

The semantic similarity between the embodiment dimensions and the dimensions of the semantic differential is striking. Together with knowledge about the development of concepts from non-verbal to verbal [37], [64], [75], [84], they suggest that linguistic meaning dimensions (see red text in Figure 3) are based upon our embodied meaning dimensions; in brief, that our language rests upon our embodiment.

Limitations of this assertion: Semantic Differential studies have only worked on the major dimensions of adjectives across languages, so the connection found here would not apply to nouns or verbs, etc. Yet, adjectives are particularly tied to emotions and states of well-being or stressful states. Movement being centrally connected to those states suggests movement-based therapies to be particularly well-suited to shift those states in a person. Meaning in language employs the same dimensions as meaning in the body. This in turn encourages us to work with the body to reach the mind, as well as to work with emotions/feelings: moving – breathing – sensing.

3. Discussion

3.1 Implications for therapy: accessing the knowledge of the body

Current gold standard therapies such as cognitive behavioral therapy (CBT), follow from a traditional cognitive science framework and this has led to modalities like creative arts therapies (CATs) and body psychotherapies receiving less attention, despite evidence of their effectiveness. In the context of psychotherapeutic processes in CATs, particularly in dance movement therapy, the

Spatial Bias

Directional Movement and Meaning (Figure 3)

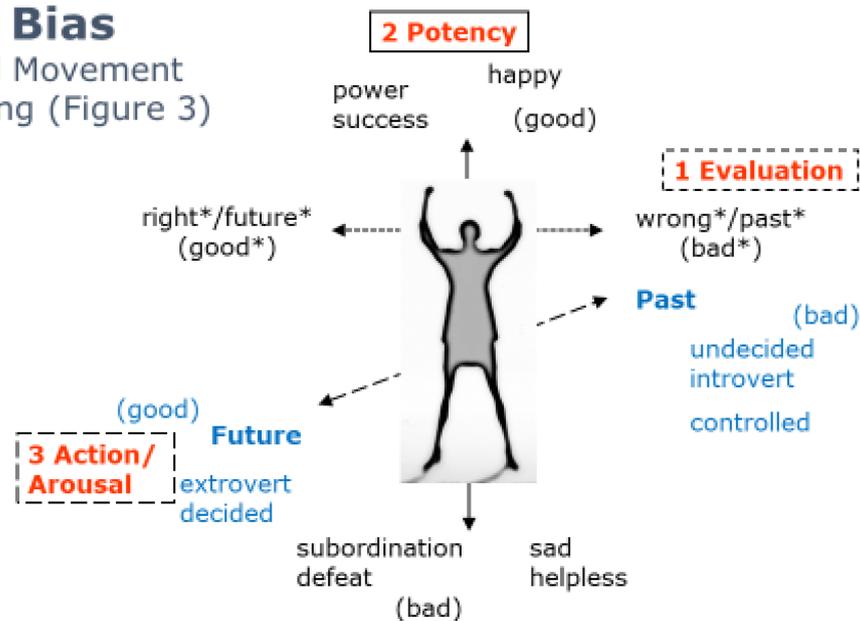


Figure 3: Summary of spatial bias research results from empirical studies (10, 42, 53, 54, 56, 58, 61, 69, etc.) with dimensions of the Semantic Differential (red text); note that the evaluation dimension is the most pervasive

symbolic function of movement becomes relevant. If verbal treatment methods are ruled out, treatment processes from diagnosis to healing can take place almost entirely in the non-verbal realm. In scientific terms, however, this makes the healing process difficult to access. It is precisely here (in the non-verbal realm) that the inexpressible and non-verbalizable condenses into non-verbal metaphor, symbolism and memory, and seeks a breakthrough into the verbal realm. This is a suitable field of research to investigate and systematically document such translation processes [7], [18].

The body and interpersonal space are the setting for these translations; their resonance is the prerequisite for the experience of qualities [58] and empathy [53]. The level of expression can be divided into functional and symbolic-representational aspects. Both play an important role in communication. While the functional aspect of movement (non-verbal) and verbal language predominates in everyday life, the symbolic-representative level plays a greater role in cultural forms such as dance and improvisation, poetry and literature. In a variety of psychosomatic and psychiatric diseases, the symbolic-representative form of movement or language also comes to the fore. This is one of the reasons why body-centred and symbol-oriented forms of therapy, mediated through artistic media, are so suited for these contexts.

When we move to music with meaningful lyrics, we all can experience the interrelatedness of our own movement, physiological state (arousal), emotional state, language, and symbol. The cues from both music and text enter into our dance, our expression, our movement and our consciousness. They affect us, feed the next motion, and influence the intentional arcs in motion. Our music selection will be influenced by our present emotional, meaning making, and sublimation states [66], and present developmental tasks [13]; the resulting symbols

will also adapt their shapes to the inner and outer needs and cultural expressive and communicable forms [31]. Trusting the body brings us to discover a tacit epistemological knowledge [7], [28] that can be accessed in the service of knowledge expansion, methodological improvement, or therapy [8]. It works as the ground upon which our constructions of the world are based.

Research evidence shows that dance movement therapy works for many clinical populations to reduce stress, depression, and anxiety, and to increase well-being and quality of life [40], [45]. Next to outcome research, mechanism research on how dance movement therapy works is gaining momentum.

Embodiment was recently identified as one of the major joint therapeutic factors of creative arts therapies (CATs) [12]. A major component of it is interoception, the ability to sense and feel and listen to the body. This is a precondition to finding an authentic expression of the inner world to the outside, *concretization*, and finding a *symbol to communicate* this – two more joint therapeutic factor of CATs, within a therapeutic relation. DeWitte et al. [12] altogether identified 19 therapeutic factors from the clinical empirical literature on therapeutic factors in creative arts therapies. *Embodiment*, however, is also a general therapeutic factor that is of crucial importance in any (psycho-)therapy. Rogers [68], drawing on Gendlin's concept of experiencing [21], described that a crucial predictor of the therapy outcome is the ability of the client to pause and listen to what is going on inside of herself, to reflect the next meaningful step in the process.

3.2 Future directions for research: approximating the dynamic body

Where to go from here? The investigation of the living dynamic body is neither static nor complete. We need research that is:

1. More basic:

Looking at phenomena such as inward and outward movement. Investigating directional movements and their meanings requires investigating movement that is directed towards the inside or outside of the body (incorporation versus expulsion). Here, three research groups have already contributed significantly:

1. Fuchs [17], with his notion of centrifugal and centripetal body directions;
2. Kestenberg [37], with her description of inner versus outer movement rhythms, and
3. Topolinski and colleagues [79]; Maschmann et al. [56], who point to the linguistic-motor anchorage of movement of speech (such as vowels moving to the inside or the outside of the body) and the psychological implications of it. These findings await further empirical differentiation.

The potential clinical applications include specific areas such as eating disorders and addiction, and reformulated understanding, and treatment, of experiences currently termed mental disorders [7], [19].

2. More dynamic:

Looking at the relativity of space in dynamic movement [77]; phenomenologist Erwin Straus [77] describes how all directions become integrated in dynamic dance movement, and how laws or rules found for the body in everyday functional movement may form the basis for dance movement. Accordingly, the movement towards and away from the body, including the basic dimensions of expanding and releasing [40], and growing and shrinking [37], that humans share with all other living beings, may be more important than, or overwrite the rules of, directional movement. Meriting attention are movements of the torso that connect us to our emotions, mergers of posture and gesture and progressions from implicit to explicit to integrated directional (shape flow) movement, forming the rhythms and qualities that are so vital to our expressivity ([37], [43], [75]).

3. More interactive:

Moving into the intersubjective directions of movement and meaning, as conceptualized by Georg Kafka and others. Kafka's essay [32] on the Uraffekte ('basic affects') described four basic interpersonal movement tendencies forming basic affects:

- along with me to you (love, affection);
- along with you to me (greed, desire, obsession);
- away with me from you (fear, disgust);
- away with you from me (anger, hate, rejection).

There is much potential for empirical work on the action tendencies of these emotions. Empirical work on the communicative function of movement rhythms has thus

far only been conducted on handshakes and embraces [44].

4. More diverse:

Most of the research presented here stems from Western cultures. Future research should take position and context more explicitly into account and provide space to unheard voices from non-privileged cultures and ethnicities, and other minority groups.

5. More epistemological:

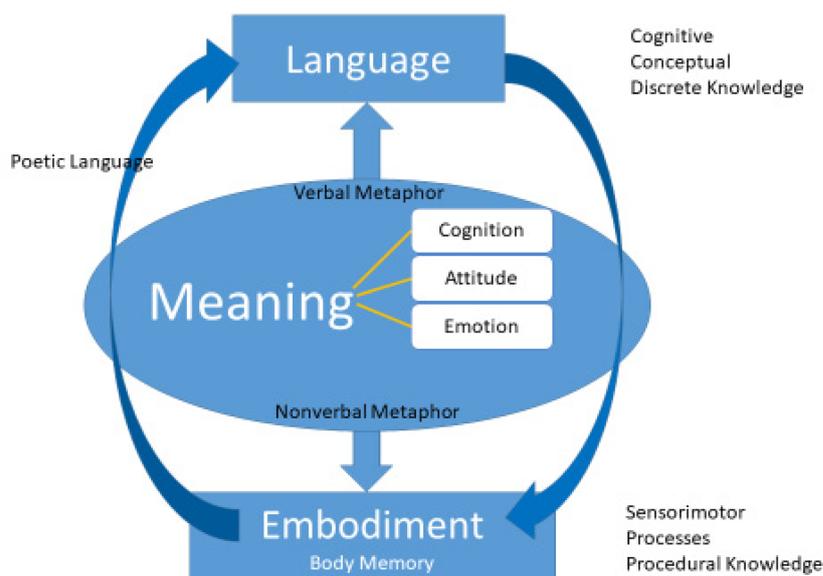
There are profound implications to *taking experiencing and moving seriously* as the epistemological basis of our human condition (relating to the fourth Kantian question: *What is man?*). Firstly, the knowledge developed purely through observation (such as all positivist data collection), necessarily fails to capture a fundamental part of the human experience.

Secondly, humans are a social beings, and the principles of *autopoiesis* (the self-sustaining reproduction and maintenance of a system) apply not only for the individual but also the dyad [39]. Each dyad creates a unique entity that its members must adapt to in order to facilitate genuine encounter [68]. The *I–we–I transitions* [35] that we may experience in dance are described by physicist, dynamic systems and psychomotor researcher Scott Kelso [34], [33] as an ability, a potentiality of humans, following rules of phased transition. Psychoanalytic dance movement therapist Frances Schott-Billmann describes the being and becoming one (with another, or) with a community, on the basis of rhythmic movement [79]. Her book elaborates upon basic rhythms (that she terms *primitive dance*) as the ground for expression, cultural learning, and acquisition of psychological functionality and health.

4. Conclusions

We started out with an attempt to answer Harnad's [26] articulation of the symbol-grounding problem [27], [26], implying that cognitive concepts are an inadequate symbolic language system, with which to explain language [71]. The emergence of meaning requires the anchoring of language in embodiment and in environment. Meaning is at the center of both language and embodiment.

Assuming that our bodies are the lived sedimentation of our experiences [4], moment-to-moment experiential changes are reliable sources of knowledge, accessible through sensory-descriptive pathways (as in focusing [21] or the moving cycle [7]). This knowledge relates more to consciousness than to mere biology (uninfluenced by cell renewal) and yet is mostly unconscious. We can intentionally attend to the body's experience thus creating spaces for such knowledge to surface so that we can profit from the wisdom of our bodies. But such knowledge also accompanies us in the constant body-mind-emotion-thought cycle, with the precise knowledge accessed dependent upon attentional shifts, driven by internal and external stimuli. In the end, life is a miracle, and our bodies its



Note: Rather than the bi-directional 'bottom up' and 'top down' (Figure 1), processes between embodiment and language can be conceptualized as circular. *Meaning* is the point of culmination where active expression starts, whether in the verbal or the nonverbal modality (note that all arrows go from meaning to expression or through meaning). Verbal and nonverbal metaphors build the bridge to expression on either level; the meaning that resides in the body can be traced by techniques such as the description of the felt sense (21).

Figure 4: Interrelatedness of movement and language in dance

carriers; and science but an inept attempt to try and capture it.

We have further gained insight that psychology and cognitive sciences offer converging evidence for how metaphors are grounded in movement, how movement dimensions are differentially experienced and how our language builds on the same (developmental) dimensions. Empirical evidence and phenomenological literature both attest to embodiment as the ground upon which language rests [75]. The basic dimensions of language, as evidenced in semantic differential research [62] reflect the basic meaning dimensions on the body level, as described by spatial bias research (e.g., [6], [9], [62]). The question "How can we access the knowledge of the body?" is particularly important in therapeutic contexts.

1. Sensing/perceiving the cues from our bodies, and trusting our movement while postponing meaning making (i.e. evaluation, categorization) are key to human and scientific development [7], [8], [16], [21]. The body develops meaning from emergent sensory and movement experience that is observed, and attended to, rather than judged or suppressed in service of cognition.
2. As researchers wishing to keep the sensory quality of experience alive in our methodology and our writing, we can choose to use phenomenological observation and description, poetic language (see Figure 4), and arts-based research approaches, such as e.g. aesthetic answering [51]. This helps us to stay connected to the sensory ground of our experience and to work with what we are: moving, breathing and sensing beings, open to our environment [62].

For classic cognitive science, embodied enactive approaches suggest new answers for the symbol grounding problem, adding to our knowledge of how to ground language and meaning in the world. Linguists would ideally become more aware of body narratives and psychologists and psycholinguists of the intricate dynamic relationship between the verbal and the nonverbal. To fully account for dynamic phenomena such as movement, dynamic systems, or similar approaches that can account for complexity beyond the linear logic of positivist methods, are required [20], [34], [33], [78],[81] , [82].

The implications for science, for therapy, and for everyday life are radical; trusting the innate intelligence and authority of the organism more, as the ground for the constructions we make in the world. This may indeed lead to the need for less construction, and more listening and action – a developmental and functional advantage for science, for psychotherapy, and for the world.

The article aims to contribute to *the experiencing and moving body* finding, and inhabiting, its proper place in the world. Taking the body and dynamic movement seriously as ground for language and thought, enactive cognitive sciences could start to investigate body-mind practices in a more elaborate way; evolving to differentiate the components of action (spatiality as the 'what', and dynamism as the 'how') and acknowledging that cognition is not only a *creator of action* [14] but also *stems from action* [40], [61]. Research is called upon to specify the dynamic body as a major principle upon which mental constructions rely, and to provide and elaborate suited methods for its empirical investigation.

Glossary

Embodied-enactive terminology employed in this article

- **Meanings** are sedimentations of embodiment [4] that went through at least a primitive or rudimentary evaluation
- **Consciousness** emerges at the interface between inner and outer, with the distinction of the rudimentary self and the non-self, at the membrane (the skin); it is tied to surface-sensitivity, and thus proprioception [74]
- **Language** is defined as verbal language here (both meaning and consciousness emerge more clearly when they are named)
- **Cognition** is thought; **emotion** is feeling
- **Movement** is locomotion of the body
- **Embodiment** denominates the concrete sensory experience in and with the world; the experiential dimension of being a body, i.e. *sensing one's own body* from inside, outside and at the intersection of inside and outside, including its interaction with thought, emotion, and environment.
- **Embodiment research** denominates a field of research in which the *reciprocal influence of the body as a living, animate, moving organism on the one side and cognition, emotion, perception, and action on the other side is investigated with respect to expressive and impressive functions on the individual, interactional, and extended levels* [43].

Notes

Competing interests

The author declares that she has no competing interests.

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https://www.youtube.com/watch?v=YHPXoBKzxFY&list=PL1yla9mDbxqVQOIE1u3jvFUzZBV_I4tOn&index=1

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“I do believe that it is important (...) to establish this theory, with testable assertions to drive evidence collection (in a non-positivist framework, if the author insists, though I believe some positivist methods, used appropriately, may nevertheless be compatible). This is particularly true for a biomedical audience, whom this journal targets, which often sees itself as a theoretical only because the theoretical assumptions are unstated (ex. dualism, deterministic biological processes, etc).”

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