# Are Abstract Concepts Like Dinosaur Feathers?

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## Conceptual Metaphor Theory and conceptualisation strategies in gesture of blind and visually impaired children

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The human nervous system evolved for the control of complex physical actions. Yet, we are far from understanding the human capacity for complex abstract thought. One theory suggests that both abstract and concrete thinking is based on a single perceptual mechanism grounded in physical experience. Asking the question posed by psychologist Daniel Casasanto whether "abstract concepts are like dinosaur feathers" we investigate the evolutionary processes that allowed humans to deal with abstract phenomena by putting them in concrete terms. After all, we frequently resort to analogies, similes or metaphors when describing the intangible. We may say "put that into words" as if words were containers into which thought can be stored. Conceptual Metaphor Theory goes a step further by saying that not only do we speak about abstract concepts in physical terms, but we think about them in this manner as well. However, the theory itself has been vigorously criticised because its principal theses are considered impossible to falsify. The author of this book proposes a new perspective on the conceptual role of metaphors. Filled with theoretical analyses and empirical research on the speech and gesture of seeing, blind and visually impaired children, this book demonstrates that the basis for abstract thought may well lie in physical experience.

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# Introduction

*"There's so many different worlds*
*so many different suns*
*And we have just one world*
*but we live in different ones"*

(Mark Knopfler "Brothers in Arms")

People across the globe live vastly different lives, but many of them have something in common: the tendency to search for the meaning of life. Questioning the significance of our existence seems to be a deeply ingrained need, explored by a multitude of works of cinematography, music, poetry, literature and art. Seeing a falling star, waking up on a beautiful morning, a chance meeting between former lovers, a bicycle accident are simple events that, once interpreted, can be woven into the fabric of our life story. It is clear to us that the events of life hold meaning. Yet, there is no widely accepted theory as to how that meaning is derived. Perhaps then, the most interesting question to ask is not about the meaning of life, but about meaning itself. What is the relation between life experiences and thought? How does the physical world influence human conceptual structure? How did we become capable of thinking about notions more abstract than the upcoming meal?

A promising avenue in research on this topic has been opened by the theory of embodied cognition. Embodied cognition is based on the assumption that nervous systems evolved for the adaptive control of action rather than abstract thought (Semin and Smith 2008: 1) therefore conceptual structure is grounded in an experiential foundation: specifically the sensory-motor system. Our brains and nerves were meant to control movement and related thought. Yet, most of us are equally able to think of a sandwich as they are to conceive of such things as gravitation or love.

There is no widely accepted explanation for the capacity for abstract thought: the relation between the body and the mind is still far from clear. Study results are often inconclusive, and research insight can be intertwined with metaphors specific for researchers' methodologies (Eliasmith 2003). Some researchers claim that that knowledge is amodal[1] and represented in

[1] Amodal here means disconnected from any particular sensory modality in the brain.

abstract codes, distinct from the sensory modalities through which it was acquired (Fodor 1975; Pylyshyn 2007). At the same time, studies showing that metaphorical language activates brain areas responsible for movement paint a different picture: that of abstract cognition grounded in experience. Grounded cognition theories postulate that knowledge is represented in modal systems based on perception; in other words, cognition depends on perceptual simulations (Barsalou 2008). In linguistics, one direction of exploring the mind-body relationship is to study metaphors produced in language and other modalities to speculate about the nature of underlying conceptual representations. Defining metaphor as the act of understanding or speaking about a concept in terms of another concept, Conceptual Metaphor Theory[2] proposes that the human conceptual system is inherently metaphorical in that abstract notions are conceptualised in terms of concrete phenomena. This effect has been demonstrated by a number of studies investigating spoken and written language, which showed that certain abstract concepts are consistently represented in concrete terms. For instance, we speak (and most likely think) of time in terms of space and motion, but not vice-versa (Fusaroli and Morgagni 2014).

CMT was an important development in cognitive science, exploring and systematising the relationship between the body, language, and mind. Yet, it has been criticised vigorously for its methodological shortcomings, most notably the lack of falsifiability and predictive power (Vervaeke and Kennedy 1996, 2004). In this book, the author hopes to demonstrate that most of these issues can be addressed at the theoretical level by introducing additional constraints on metaphorical mapping and postulating the existence of premetaphoric conceptual structure. It is the author's belief that such a restructuring effort would increase the accessibility and plausibility of CMT for other branches of cognitive science, most notably computational modelling, neuropsychology, psychology, developmental psychology and others. The author will seek to reach these goals by proposing a hierarchical model of metaphor based on a simple network model of the conceptualisation system. The proposed changes in CMT include integrating the solutions from the image schema theory (Rohrer 2005; Hampe 2005; Johnson 1987), LCCM hypothesis (Evans 2010) and Objectification Theory (Szwedek 2002) into a CMT-based framework, and applying a tiered model of metaphoric pro-

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[2] Although it was initially called Conceptual Metaphor Theory and still known in linguistics by that name, Lakoff and Johnson's proposal was assigned a number of different names by its creators, including Contemporary Theory of Metaphor (CTM) and Neural Theory of Metaphor. For the sake of clarity I will be using the acronym CMT to mean Conceptual Metaphor Theory and its further instantiations.

cesses to conceptual metaphor research. Within this conceptual model, objectification, or the ontological metaphorisation from abstract to concrete domains, introduced by Szwedek (2002, 2011) provides the much-needed constraints on metaphorical mapping, and is understood as an emergent feature. What is more, postulating a developmental hierarchy of metaphoric processes imposes structure on the CMT model. As a result not only does it improve the predictive power of the theory, but also makes it easier to construct falsifiable hypotheses. Both of the proposed changes are supported with empirical evidence gathered by the author of the study alone and in collaboration, as well as relevant research from other domains. The empirical part of this book consists of two studies on the understanding of abstract and concrete concepts in the framework of Objectification Theory and the related hierarchical metaphor model. An important part is the empirical study on the importance of gesture in blind and seeing children and young adults providing further evidence in favour of the proposed model.

Chapter 1

# Conceptual Metaphor Theory: a game changer for cognitive science

Human behaviour and thought is very much limited by habits developed from perception and experience. The way we think is largely conditioned by our previous physical experience. Imagine a simple box. It has an opening in front and a mirror on its left wall. The box is constructed in a way that allows the user to put their hand inside where it becomes occluded, so that you can only see the reflection of your hand in the mirror. If, having inserted the dominant hand inside this contraption, you try to draw even the simplest of shapes (a circle, a triangle, or a schematic drawing of a house) the task turns out to be surprisingly difficult. The information you receive from the mirror image of our drawing hand is counterintuitive and deceiving. Proprioception and visual perception tell the brain different stories about how the hand should be moving. In order to succeed at the task, you need to try and consciously ignore the very type of feedback that became the default source of information for your brain. Only by learning to position the hand in relation to external landmarks (for example the walls of the box), rather than falling back on hand-eye coordination, can we complete the task successfully and quickly. This simple experiment illustrates the extent to which we rely on sensory stimuli and how difficult it is to break routines established by sensorimotor perception. The construction of the human mind stays in a strong relation to the human body.

The theory of embodied cognition takes into account this and similar observations. It speculates that the basis for thought is derived from experience. Mental representations are grounded in bodily experience because sensory and motor information constitute a part of conceptual structure. For example, the mental representation of a car is not an abstract verbal symbol, but rather an event in a complex multi-sensory network that involves, for example, neurons in the brain's visual areas re-enacting visual experience of cars (Thagard 2005: 192). A growing body of research corroborates the em-

bodied view of cognition: from studies showing that infants can draw conclusions about visually presented objects from previously learned tactile information as early as 1 month after birth (Meltzoff and Borton 1979; after Rohrer 2005) to experiments showing a correlation between physical behaviour and understanding of abstract concepts (Casasanto 2010, 2008; Casasanto and Lozano 2007; Boroditsky 2000; Miles et al. 2010). The theory of embodied cognition appears to resolve the question regarding the origin of meaning. It is the body and its experience that shape our understanding of the world. While the idea that there is a relation between experience and the understanding of the physical world seems straightforward, it is much more difficult to extrapolate this reasoning to non-physical, abstract concepts.

Let us consider human bodies to be physical systems operating within a material world. Conceivably, based on our experience we should only be able to perceive and conceptualise physical phenomena. Nevertheless, we are able to conduct complex mental operations on a daily basis, whether it is planning ahead to purchase cat food in bulk via the Internet or speculating about the nature of the multiverse. We are arguably one of the few, if not the only, species able to bridge the gap between sensorimotor experience and abstract reasoning. It is unclear whether and how bodily experience shapes abstract conceptual structure. Embodied cognition theory speculates that abstract reasoning relies on basic "spatial perceptual mechanisms present in lower animals" (Lakoff 1990: 74) that underwent evolution. In other words, we use the same mechanisms as other animals to perceive both physical and abstract concepts. One solution to the abstract concept origin problem was proposed by Daniel Casasanto, who put forward that "the mind recruits old structures for new uses" (2010: 453–454), so that conceptualisation would rely on one, experientially grounded mechanism. Indeed, in many ways sensory perception appears to constitute a plausible basis for more advanced processes of abstract reasoning. However, before we accept Casasanto's solution for the abstract concept dilemma one question needs to be answered: how the gap between the domains of the sensual and the non-sensual was crossed. The answer is provided by Conceptual Metaphor Theory: through metaphorisation.

## 1. What is a metaphor?

It is a widely held belief that in ordinary circumstances people talk in literal terms, and figurative language use is an exception rather than the norm. Common usage of the term "metaphor" implies poetic language, lan-

guage that is out of the ordinary and used for the sake of originality or evoking emotions. The cognitive linguistic definition of the term and the traditional understanding overlap, as both views agree that when we resort to metaphors we talk (or think) about one concept in terms of another, "two different and disparate subject matters are mingled to a rich and unpredictable effect" (Hills 2011). This definition is interesting for two reasons. First, because it is a point of agreement between two otherwise completely disparate, views. Second, because it unwittingly touches upon one of the biggest weaknesses of the cognitive linguistic account of metaphor: its unpredictability. Before we discuss the weaknesses of conceptual metaphor as a scientific theory, let us briefly review the history of metaphor research.

Metaphor is an extensively studied phenomenon. Research on figurative language used to be more or less confined to the domain of philosophy and literary studies wherein metaphor was described as "a poetically or rhetorically ambitious use of words, a figurative as opposed to literal use" (Hills 2011). Going beyond this definition of metaphor has not been an easy task. The idea that metaphor is a conceptual phenomenon hinges on the belief that it is distinct from other types of language. The psychological and linguistic research communities tend to disagree on this issue, with some researchers pointing out metaphor may be a distinctive iteration of an existing phenomenon, such as similes or category inclusion statements (Keysar et al. 2000, Thomas et al. 2001; Glucksberg 2003). While much of the existing research on the topic of conceptual metaphor necessarily separates figurative and literal language, with metaphor being a category in the former, some researchers still argue that metaphors are merely cases of comparison or analogy (Keysar et al. 2000) or untypical categorisation processes (Thomas et al. 2001; Glucksberg 2003). The comparison view argues that in order to understand anomalous expressions such as "her father is a dinosaur" we first judge their truth-value. Metaphors are judged as literally untrue and, consequently, interpreted as if they were similes i.e. "her father is like a dinosaur". This form permits inferencing because comparing two concepts requires the identification of shared features. There are, however, two problems with the simile approach. First, metaphor differs from juxtaposition in that in metaphor we speak of one thing (the target domain) in terms of another thing (the source domain), whereas in juxtapositions two things are compared. In other words, metaphorical language suggests that the target and source domains are one and the same, while nothing like this is suggested in typical similes. Second, there are countless similarities between any two concepts, meaning that metaphors would be impossible to interpret as similes, or rather that any given metaphoric expression would generate an infinite number of interpretations (Glucksberg 2003: 92). Needless to say,

this does not happen as people are routinely able to understand "her father is a dinosaur" as meaning that the father is elderly, or old-fashioned (rather than, say, an animate being or covered with skin). An alternative view, presented by Michael Thomas and colleagues (2001) is that metaphors are anomalous class inclusion statements where one thing (the target domain) is included or classified within the other (the source domain). Within this hypothesis, a statement such as "her father is a dinosaur" would be interpreted to mean that the father can be classified as part of the "dinosaur" category. Class inclusion statements like these would trigger an inferencing process investigating how the concept of "father" and the prototypical members of the "dinosaur" category can be classified together so that the features they share are brought to the foreground and contribute to metaphor understanding. The categorisation view has two distinct advantages over the comparison view. It does not assume that in order to understand metaphorical statements literal meaning must be rejected first, a belief that has been empirically shown as untrue (Glucksberg 2003). Moreover, rather than solely focus on features that category members share, it highlights the importance of feature salience. For instance, while the concept of "father" and "dinosaur" share such properties as breathing, digestion, or having skin they are not what the metaphorical expression "her father is a dinosaur" brings to the foreground. On the other hand, salient properties of the concept "dinosaur" which may not be salient in "father", such as being a relic of the past, are highlighted in the metaphor. The categorisation view of metaphor paved the way for research that focused not only on its role in language, but on the underlying conceptual structure. The next question, whether metaphor is a conceptual or a language phenomenon, could not have been answered without deciding where to draw the distinction between literal and figurative language.

## 2. A closer look at the literal vs. figurative distinction

As mentioned above, studying metaphor as more than a rhetorical device is a relatively recent development. Attitudes toward non-literal language are constantly evolving, and developments in a variety of fields including philosophy, psychology, neurology and linguistics suggest that we are far from reaching a consensus on even the most basic of questions: what metaphor is, and what makes humans capable of metaphorical thinking. The emergence of theories like the categorisation view of metaphor made it increasingly clear that metaphors extend far beyond the domain of poetic language and into everyday communication. While many researchers continue

to talk about "literal" and "figurative" language, this distinction is not as straightforward as it initially seemed. Some of the questions that need to be answered in order to understand the nature of metaphor include: whether figurative language is fundamentally different than literal language and in what way; if they require different kinds of mental processing; whether there exists a distinction between cognitive processes behind literal and figurative language production and understanding. In fact, most of these questions have already been asked and have been receiving progressively complex answers.

Ancient philosophers and rhetoricians saw metaphor as a linguistic device deliberately applied to reach a desired effect, "a temporary self-explanatory change in the usage of a general or singular term" (Hills 2011). It was assumed that this fleeting change in meaning of a term executed for rhetorical purposes occurred at a superficial level, was temporary, and the effects were limited to the scope of a single work, speech, or conversation. What is more, traditionally the aim of metaphor was understood to be transferring a familiar term from its usual location in conceptual space into an uncommon setting in order to produce a surprising and poignant rhetorical effect. The nature of this change was supposed to be temporary and linguistic, which suggests that what was at that time understood under the term "metaphor", today would be taken to mean novel metaphor, or more precisely novel metaphorical expressions. The view that the function of metaphor is ornamental, and metaphor itself is a bonus feature to the obligatory faculty of literal language had dominated metaphor research since Aristotelian times. It resulted in the creation of the standard pragmatic model (cf. Searle 1979), and the comparison view of metaphor described above. Both of these views initially influenced the way metaphor was understood, and both were subsequently refuted by evidence from psycholinguistic studies.

Psycholinguistic research provided much needed insight into the nature of metaphor. Considered merely a departure from literal language, metaphoric meaning was initially thought to be secondary to the literal interpretation of an utterance. Consequently, the interpretation of non-literal language was supposed to be more cognitively demanding. The standard pragmatic model proposed that language is processed in stages, and understanding always begins with an attempt to access the literal meaning. Within this model, arriving at the context-appropriate meaning of a non-literal expression requires three steps. First, derive the literal meaning of the sentence. Second, assess the meaning against its context. Finally, if the literal meaning does not make sense in the context, search for non-literal meaning that does make sense. In other words, the standard pragmatic model assumes that the mind follows a procedure that could be summarised as

"where an utterance is defective if taken literally, look for an utterance meaning that differs from sentence meaning" (Searle 1979: 114). As we now know, this model is unlikely to be true (Glucksberg 2003, 2001). Study after study shows that metaphor comprehension is no more difficult or time consuming than understanding literal language (McElree and Nordlie 1999; Coulson and Petten 2002; Blasko and Connine 1993). In one of the studies, Blasko and Connine (1993) used a phenomenon called semantic priming to test whether literally and metaphorically related words facilitated recognition of certain concepts. They used lexical decision time (the time that it takes a participant to read a word presented to them on a screen and decide whether it is a word in a given language) to measure semantic accessibility. If the target word and the prime word are semantically related then our decisions are faster than decisions involving unrelated words. For example, during an experiment we are presented with a string of letters that spell the word "pencil" on a computer screen, and asked to decide whether it is a word in English or not. This decision is quicker if the word "pencil" is preceded by a related word like "paper", and slower if we have been shown a semantically unrelated word like "chicken" (Camac and Glucksberg 1984; Meyer and Schvaneveldt 1971; after Glucksberg 2003: 93). This is because semantically related words "prime" each other, or facilitate mutual recognition. Participants in the Blasko and Connine (1993) study listened to metaphoric sentences, such as "Jerry first knew that loneliness was a desert p when he was very young". A target word or a word-like string of letters would appear on the screen as the participant listened to the metaphorical expression in the sentence (the moment is marked in the example with the letter p). The task was to decide as quickly as possible after the string of letters appeared whether it was a word in English or not. Words that appeared on the screen belonged into one of three categories: metaphorical (in case of the "loneliness is a desert" metaphor the word was "isolate"), literal ("sand"), and unrelated ("moustache"). The aim of the experiment was to measure whether responses are quicker for any category of target words. For instance, faster responses to literal targets than metaphorical ones would indicate that literal meanings are activated more quickly than nonliteral ones. Results showed that both metaphorical and literal target words were recognised faster than unrelated controls, indicating that literal and figurative meaning is accessed equally quickly. These results are corroborated by other studies on metaphor comprehension that found no differences between literal and metaphorical language comprehension in terms of reaction time.

Understanding metaphoric meaning not only happens as rapidly as literal interpretation, it is also obligatory. Just as we cannot refuse to under-

stand a familiar language, interpreting metaphor is not optional. Glucksberg and colleagues (2003: 93) demonstrated this in a series of experiments based on a modified version of the Stroop test (1935). The Stroop test originally demonstrated that people find it difficult to suppress literal meanings. Participants in the original test were asked to name the colour of ink in which colour names were printed. Although the task appears simple enough, people find it difficult to say the name of the colour rather than the word in which it is written. For instance, the correct answer for the word "red" printed in blue ink would be blue. Participants in Stroop-like experiments are much slower to respond when the name and ink colour are mismatched than when they are not, suggesting that it is difficult to suppress comprehension of words on which attention is focused. Glucksberg (2003) applied this logic in his own study, and asked participants to judge if sentences presented to them on a screen were literally true. The stimuli comprised of four types of sentences: literally true (for instance, "some fruits are apples"), literally false ("some fruits are tables"), metaphors ("some jobs are jails") and scrambled metaphors ("some jobs are butchers"). The assumption was that if metaphoric meaning is optional then it would be no more difficult to reject literally false but metaphorically true sentences than scrambled metaphors. The results clearly showed that participants had difficulty in rejecting metaphors as literally false. Glucksberg and colleagues repeated the study using metaphors rated for aptness, and got the same results. They concluded that it is impossible to consciously inhibit understanding of metaphorical meanings.

Studies like these opened up the possibility that figurative language plays a profound role not only in language, but also in cognition. This departure from the standard pragmatic model meant that figurative speech was no longer perceived as a deviation from literal, truth-conditional language. Research indicated that literal and metaphorical language may not be so different after all. The traditional literal-figurative dichotomy was famously challenged by Lakoff, who believed that it is a mistake to draw a line between the two, or imply that what is literal cannot be metaphorical. He pointed out that traditional understanding of the literal/metaphoric language dichotomy hinges on the assumption that everything can be comprehended literally, and that only literal statements can be judged as true or false which makes metaphorical language superfluous (1993). However, language and gesture studies clearly show that as soon as a conversation departs from very concrete physical experience and drifts onto abstract topics such as emotion or mathematics people show evidence of metaphoric thinking (Cienki and Müller 2008: 16). Consequently, cognitive linguistics draws the distinction between what is literal and what is not at a different

level, insisting that only "those concepts that are not comprehended via conceptual metaphor might be called literal" (Lakoff 1993: 188). And, as a multitude of studies show, literal concepts understood in this sense are few and far between. The figurative vs. literal language distinction may even prove redundant, if we consider these terms to be labels for extremes on a continuum of language processes (Turner 2005: 1).

## 3. Metaphors we live by

From early metaphor theories to current hypotheses about the metaphoric structure of thought, views on the nature of metaphor have radically evolved. The paradigm shift is particularly prominent when it comes to the importance of figurative language in general, and metaphor in particular, for language and thought. In other words, the question whether, and to what extent metaphor affects cognition.

In the nineteen eighties a distinctive style of theorizing about language, thought, and meaning took shape in the works of George Lakoff, Mark Johnson, Michael Reddy, Ronald Langacker and their followers. This trend came to be known as cognitive linguistics. Cognitive linguists marked a departure from the assumptions of Chomsky's Generative Grammar (1980) in that language was no longer considered a set of meaningless symbols arranged by, yet unrelated to grammatical structures.

While "Metaphors We Live By" (Lakoff and Johnson 1980) is undoubtedly a seminal work on conceptual metaphor, many other researchers participated in bringing about this revolutionary change in paradigm. As early as 1979 Michael Reddy exposed our unconscious assumption that thoughts and ideas are things. In his essay "The conduit metaphor" (1979) he explains how the metaphorical nature of the concept of communication influences our thinking and problem-solving strategies. For instance, when we say "Try to *get* your *thoughts across* better" or "You still haven't *given* me any *idea* of what you mean" (emphasis author's) we are not only trying to solve a problem, we are defining it. Choosing these sentence structures suggests that the speaker sees communication as transfer of meaning, where words are containers into which meaning should be packed (Reddy 1979: 286). By this logic, a breakdown in communication is either the fault of the speaker for not putting enough meaning into words, or the listener for not being able to unpack this meaning, or even sneaking meaning of their own into the words they received: "reading too much *into* things". Reddy goes on to show how introducing a different metaphoric paradigm of communication dramatically changes not only our understanding of the process, but also our problem

solving strategies. "The conduit metaphor" is not only a brilliant exploration of a novel problem, but also a turning point for cognitive linguistics.

Late twentieth Century was a crucial period for the development of cognitive science. In the same year Reddy's work on conduit metaphor was published, Donald Schön released his excellent analysis of what he called at that time the "generative metaphor" (1979) describing what we now know under the term conceptual metaphor. Schön advocated a perspective on metaphor research that treats it as central to the task of accounting for human thought and problem solving strategies. "Metaphors we live by" appeared shortly after, spurring the development of Conceptual Metaphor Theory. Conceptual Metaphor Theory "was one of the earliest theoretical frameworks identified as part of the cognitive semantics enterprise and provided much of the early theoretical impetus for the cognitive approach. The basic premise of Conceptual Metaphor Theory is that metaphor is not simply a stylistic feature of language, but that thought itself is fundamentally metaphorical in nature" (Evans and Green 2006: 286). Although the framework has been since developed by numerous researchers, it was Lakoff and Johnson who first introduced the notion of conceptual metaphor in their book "Metaphors We Live By". CMT states that human conceptual structure is based on correspondences between conceptual domains, which are called cross-domain mappings. CMT was closely followed by its sister, the embodiment theory. While Lakoff and Johnson's theory stated that many abstract concepts had a metaphorical basis, embodiment theory set out to explain the existence and meaning of concrete concepts by claiming they are grounded in everyday experience (Lakoff and Johnson 1999). By the end of the 1990's metaphor research became entrenched in cognitive linguistics, although CMT was still subjected to criticism from researchers representing various branches of cognitive science.

"Metaphors we live by" laid the foundations for the conceptual view of metaphor. The theory has been modified and refined since its inception (cf. Lakoff and Johnson 1980; Lakoff 1993; Lakoff and Johnson 1999). In order to account for recent discoveries in cognitive sciences, including the results of brain studies, Lakoff attempted to incorporate a number of computational modelling principles into his hypotheses to make CMT more neurologically grounded. This prompted him to suggest the renaming of CMT as Neural Theory of Metaphor (2008). In addition, Lakoff and colleagues created a list of possible conceptual metaphors which can be found in the Master Metaphor List (Lakoff et al. 1991). Although the list is under continuous development it is not, and did not intend to be, an exhaustive set of mental mappings. In fact, under the current iteration of CMT creating such a list would be impossible.

The main assumption of CMT as formulated by Lakoff and colleagues (Lakoff 1987; Lakoff and Johnson 1980; Lakoff and Turner 1989; Gibbs 1994; Gibbs et al. 1997; Kövecses 2011) is that metaphor is not primarily a language phenomenon but rather a cognitive mechanism. Not only do we describe things in terms of other things, we think about them in this manner as well. Within the CMT framework metaphor is understood as a "conceptual mapping", a set of correspondences from a source to a target domain (Ruiz de Mendoza Ibáñez and Pérez Hernández 2011: 162). For instance, we may say "this software is a gem" to evoke a multitude of meanings: that we are happy to have found it, that we feel lucky to have it, that it is unique and coveted by our peers and so on. In this metaphor the source domain PRECIOUS STONE/MATERIAL is mapped onto the target domain COMPUTER SOFTWARE, adding to the original meaning of the target concept. At this point we can make two interesting observations regarding metaphorical mappings. First, clearly not all features of the source domain are mapped onto the target. By saying "this software is a gem" we do not necessarily mean that it is valuable in monetary terms, or imagine it to have decorative potential. Second, many researchers pointed out that in general source domains tend to be more concrete than target domains (Ungerer and Schmid 2006: 121; Gibbs 1996: 310). We tend to understand more abstract concepts in terms of more concrete ones rather than the other way around. Thus, most metaphors are unidirectional. While examples of computer programmes being described in terms of valuables are plentiful, one would be hard pressed to find evidence that people talk about gems in terms of software. In order to account for these observations Lakoff proposed a set of rules for metaphorical processes which he summarised in the invariance hypothesis (Lakoff 1990; Brugman 1990) and embodied grounding hypothesis (Lakoff and Johnson 1999).

As mentioned before, conceptual metaphors involve mappings of features between two (or more) conceptual domains. A conceptual domain can be defined as any coherent organization of human experience. Examples of conceptual domains include LOVE, JOURNEY, THEORY, BUILDING, ANIMALS, DOGS[1] etc. Similar metaphorical expressions appearing in a variety of different languages led researchers to believe that mappings between conceptual domains correspond to neural mappings in the brain. Although it is possible to draw an infinite number of similarities between any two concepts

[1] Research on conceptual metaphor often employs a convention, where domains are indicated with capital letters, concepts in lowercase letters, and words and expressions are separated with quotation marks. We will follow this convention throughout this book wherever it adds to the clarity of the text.

making the number of potential mappings unlimited, only some of those mappings are used. For instance, if abstract concepts such as theories are understood in terms of concrete concepts like buildings as CMT claims, then we should be able to see all the properties of buildings occasionally reflected in the way people speak about theories. This is not the case. While it is possible to speak of theories as having "foundations (assumptions), architects (formulators), and blueprints (origins)" (McGlone 2007: 114) we rarely mention their stairwells, hallways or sprinkler systems. Initially, conceptual metaphor theory "had difficulty explaining why certain source-to-target domain mappings in conceptual metaphors are not likely to occur and why some lexical items, but not others, associated with a source domain are evident in analyses of metaphorical discourse"(Gibbs 2011: 536). It is evident that conceptual metaphors are not complete sets of mappings with one-to-one feature correspondence. Certain mappings are favoured, while others are never used. Lakoff introduced the Invariance Hypothesis as a general principle meant to account for this disparity between mappings that are possible and those that are observed in language and thought. He proposed the Invariance Principle (Lakoff 1990; Brugman 1990), stating that "metaphorical mappings preserve the cognitive topology (the image-schematic structure) of the source domain" (Lakoff 1990: 54). In other words, metaphors must follow the structure of the source domain or the relevant image schema. Image schemata are meaningful pre-conceptual structures grounded in recurrent bodily movements through space, perceptual interactions, and ways of manipulating objects (Hampe 2005: 1). Lakoff postulated that our physical experience imposes constraints on non-experientially based conceptual representations, because source domain structure must be preserved in the target domain mappings. This explanation turned out to be problematic. The IP is based on the assumption that all conceptual domains come equipped with pre-metaphoric structure grounded in embodied experience. Yet, it is unclear how source domain structure can be preserved in abstract, non-experientially grounded domains which cannot have it by definition (Brugman 1990). What is more, even if the process of metaphorical mapping is constrained by source domain structure, the fact that certain expressions within the theories are buildings mapping are deemed acceptable and others are not remains difficult to explain. The BUILDINGS source domain technically permits all building-related mappings. Why some are popular ("She completely demolished my idea") while others remain obsolete ("His theory is full of toilets") remains just as unclear as before the introduction of the IP. Interestingly, while the Invariance Principle aims to explain mapping asymmetries, it does not predict which mappings are more likely to occur in language. Clearly, while IP solved some problems, it also brought to light

important questions. If we assume that the structure of the target is preserved in the source domain is it possible to identify one source domain from which all structure had ultimately been inherited? Do abstract and concrete concepts share structure at some basic level? Perhaps it is best to seek answers to these questions by analysing the nature of conceptual structure and the relationship between the concrete-abstract distinction and experience.

### 3.1. The question of concreteness

Conceptual Metaphor Theory postulates that most abstract thoughts depend on metaphorical projection from embodied experience, which is literal in the sense that it is directly understood. If metaphor is defined as a set of mappings between different domains, then developmental studies show evidence of metaphorical thinking very early in human development. Infants as young as 29 days have exhibited the capacity to make cross-modal inferences. Meltzoff and Borton (1979) demonstrated this in an experiment where two groups of infants were given either a knobbly or smooth pacifier to suck on. Each pacifier was placed in the infant's mouth without being seen by the baby. Afterwards, big visual models of knobbly and smooth pacifiers were shown to the babies. Both groups preferred to fixate on the shape that they have explored orally, and did so 70% of the time. The results were interpreted to mean that children were able to make a connection between the texture explored by touch (the knobbly/smooth texture of the pacifier) and its equivalent from a different sensory domain (the visual representation of a pacifier with a knobbly or smooth texture). Experiments like this may indicate that the capacity for synaesthetic metaphorical thinking appears very early in human development. Although the experiment was found difficult to replicate with children that young, the results of follow up studies conducted with older children seem to confirm Meltzoff and Borton's findings. What is more, children get better at this task with age (Rohrer 2005). Meltzoff and Borton's experiment shows that the ability to make inferences that go across sensory domains is a skill present at a very early stage in development. It is worth considering whether this, or a similar mechanism constitutes the basis of abstract thought. Are we recycling existing motor representations to support thinking about non-physical phenomena?

Casasanto (2010: 453) proposed that cross-modal inferencing may have been the foundation of abstract thought. Patterns in language and gesture certainly suggest that physical experience and abstract mental representations are related. For instance, speakers who talk about abstract phenomena

recruit language from more concrete domains (Lakoff 1993; Gibbs 1996; Johnson 1993, Casasanto 2010). Baby behaviour also supports the assumptions of embodiment theory: that we are somehow able to use concrete, physical experiences to conceive of less tangible phenomena. At the same time, the very assertion that some domains are more conceptually rich, concrete and embodied than others is problematic. Cognitive research paradigms often differentiate between abstract and concrete source and target domains as if the distinction were an easy one, and intuitively made. However, as Szwedek (2011, 2002) astutely points out, identifying the grounds on which a phenomenon may be classified as "concrete" or "abstract" is far from uncomplicated. In general, researchers operate under the assumption that target domains "tend to be more vague and incomplete than the source domains" (Gibbs 1996: 311). The problem with this standpoint is twofold. First, it is difficult to find objective criteria for measuring the level of *vagueness* and *incompleteness* of a domain, particularly because conceptual metaphor is supposed to be implicit and unconscious. Second, it remains unclear whether it is helpful to sharply distinguish between abstract and concrete concepts rather than explore the possibility that abstract and concrete concepts are opposites on a single continuum, or even consider this distinction entirely unnecessary (Turner 2005).

Conceptual Metaphor Theory makes a number of assumptions regarding abstract concepts. For instance, that abstract domains are created by importing structure from concepts grounded in physical experience (Lakoff 1990). This view has been challenged on many levels, including the lack of criteria for concreteness (Szwedek 2002), requirement for pre-metaphoric conceptual structure (Vervaeke and Kennedy 1996), connection between the sensorimotor and conceptual systems (Pinker 1997), and the apparent reductionism of this idea (Vervaeke and Kennedy 1996, 2004). Soon after its inception, CMT and its embodiment claims found itself on the receiving end of harsh criticism. Stephen Pinker, one of the most prominent critics of embodiment, hypothesised that mental representations of abstract concepts were copies of "ancestral circuits" for reasoning constructed on the basis of experience but subsequently disconnected from their experiential basis (1997: 355). Pinker's claim that these representations lost their connection to the sensorimotor neural circuits has been since disproved, with studies showing that participants listening to recordings of sentences show activation in brain areas responsible for action even if the verb is used in a non-literal context. For instance, the sentence "He could not grasp his idea" activated neurons in the hand region of the motor cortex, a phenomenon that is attributed to the activity of so-called mirror neurons (Arbib 2006). Despite the harsh criticism, conceptual metaphor and embodiment theories have become the leading

paradigms in cognitive linguistics, receiving support from most major linguists. Krzeszowski even went on to claim that a "linguist refusing to follow Lakoff and Johnson's philosophy faces the question of whether she can still do some empirically valid linguistics" (2002: 266).

## 4. Typology of conceptual metaphors

In a later version of their book "Metaphors we live by" Lakoff and Johnson (2003) proposed an amended typology in which they distinguish three types of metaphor: structural, orientational and ontological. These metaphor types are treated as independent and equal. Orientational metaphors are based on the orientation of objects in space, for instance when we understand "over the moon" to mean "happy" because HAPPY is UP is a widespread conceptual metaphor. Structural metaphors are mappings of structure between two domains, typically one more abstract than the other. For instance, in the THEORIES are BUILDINGS metaphor the structure of buildings is used to understand the abstract concept of theories. This metaphor can generate such linguistic expressions as "the foundations of this hypothesis". Finally, in ontological metaphors one concept is represented in terms of another concept, where the latter is more concrete than the former. The conduit metaphor is an example of ontological metaphor, since the abstract idea of communication is represented using the concrete notion of a container. Although the idea behind introducing these three metaphor types is clearly to increase the clarity of CMT, Szwedek (2011) points out that the categorisation criteria (structure, orientation and existence of things) seem to be arbitrarily chosen.

The notion that ontological, structural and orientational metaphors are equal has been criticised from a number of perspectives (Szwedek 2011, 2008, 2002, 2000b), primarily because of its reliance on arbitrary criteria and oversight of the fact that structure and orientation logically depend on the existence of an object. Szwedek proposed Objectification Theory, an amendment to the CMT that establishes a hierarchical typology of metaphor based on the object concept. Within this view, metaphor types form a hierarchy with orientation depending on structure, and structure relying on the existence of an object (ontology). Objectification Theory and its consequences for CMT will be discussed further in this book. Another alternative typology was proposed by Grady and colleagues (Grady et al. 1996; Grady 1997, 1999). In their interpretation conceptual metaphors have different levels of metaphoric complexity. Primary metaphors are those that stem from everyday embodied experience, whereas complex metaphors are com-

posed of primary metaphors. "A primary metaphor exhibits a metaphorical mapping for which there is an independent and direct experiential basis and independent linguistic evidence. A complex metaphor, on the other hand, is a self-consistent metaphorical complex composed of more than one primary metaphor" (Gibbs 2011: 357). The third category, compound metaphors involve both primary and complex metaphorical mappings). Grady's metaphor typology is frequently applied in metaphor research, in particular studies that focus on the classification of metaphoric expressions. Many studies show that primary metaphors or similar structures play a role in understanding certain abstract concepts, interpretations of some conventional metaphoric expressions, and young children's verbal metaphor comprehension (Gibbs et al. 2004). This approach does, however, raise a number of questions regarding the embodied or experiential nature of primary metaphors. Let us take the INTERRELATED is INTERWOVEN conceptual metaphor as an example. Its basis is only experiential for persons who have had direct (non-linguistic) experience of weaving, which is a comparatively small subset of people. It is unclear whether a concept should be considered embodied merely because of an existing possibility of being experienced and whether metaphor based on such a concept would be classified as primary for persons who have first hand experience as opposed to non-primary for people with merely theoretical knowledge of weaving. Thus, Grady's metaphor typology has been found a useful, but not exhaustive way of constraining metaphorical mappings.

## 5. Conceptual Metaphor Theory and its criticism

"Metaphors We Live By" was in many ways a game changer for cognitive science. The book proved that metaphors are common in everyday language and overturned many major tenets of western thought, including the notion that language should be studied separately from the body. Above all else, it demonstrated that "our ordinary conceptual system, in terms of which we both think and act, is fundamentally metaphorical in nature" (Lakoff and Johnson 1980). Nevertheless, CMT did not receive universal empirical acclaim. It has received criticism from both within, and outside of cognitive linguistics. Perhaps one of the reasons behind this is that the more empirically-minded cognitive science disciplines (including cognitive psychology and neuroscience) strongly depend on the scientific method. This means that a theory cannot be accepted until the hypotheses it generates have been tested and received empirical backing. McGlone recently concluded that "its atmospheric influence notwithstanding, the [CMT] view has

not fared well theoretically or empirically" (2007: 122) and questioned "the explanatory value of the conceptual metaphor construct" (2007: 109). Gibbs, while he fundamentally disagrees with most of CMT's critics, admits that the explanatory scope of CMT is limited and the theory should not be considered a general theory of figurative language understanding (2011: 530). This lack of scaleability is a serious problem for a theory that has traditionally been concerned with relations and structures at the mental representation level. CMT focuses on non-linguistic conceptual processes responsible for meaning construction, the so-called backstage cognition (Evans 2010: 603). Consequently, it is difficult to see how its scope as a theory of cognition could exclude figurative language understanding. This suggests that the problem lies in Gibbs' answer to criticism rather than the criticised points themselves.

A closer investigation of opinions critical towards CMT reveals that the main source of problems within the conceptual metaphor framework is its applicability to empirical research. Originally, evidence for CMT was gathered using introspection and other intuitive methods which was the reason behind its cool reception by the rest of the cognitive science community. The traditional method of cognitive linguistic inquiry is theoretical systematic analysis of language expressions in different languages (Croft and Cruse 2004; Lakoff and Johnson 1980; Kövecses 2002). Researchers would choose a text or discourse to analyse and identify metaphorical expressions that it contains. The next step would be to identify the conceptual metaphors behind those expressions. A plethora of studies demonstrates the influence of embodied experience on the understanding of such abstract concepts as emotions (Kövecses 2003), the self (Lakoff and Johnson 1999), space (Casasanto 2010) and time (Miles et al. 2010) However, it is clear that researchers have been increasingly moving away from the example-based paradigm and applying empirical testing methods. Before cognitive linguistics can live up to its aspirations and provide an account of language consistent with insight from other cognitive science disciplines it needs to apply methods used by empirically focused sciences. Before that is possible certain methodological problems need to be addressed.

### 5.1. Unconstrained conceptual mappings

In his recent review of evidence supporting CMT, Gibbs maintains that "conceptual metaphors are not merely linguistic, but reflections of entrenched thought" (2011: 541). He cites a variety of psychological studies demonstrating a connection between embodied representations and abstract concepts. It is clear that the assumption about a strong link between the

body and conceptual structure is supported by an equally strong body of research. However, in its current form Conceptual Metaphor Theory is vague enough to permit many interpretations, a property that it may have inherited from its predecessor, the standard pragmatic model of metaphor. That is not to say that the quoted research is unsound. Most experimental studies focus on showing a link between language, experience, and conceptual structure, or illustrate the existence of a mapping with a large set of examples. Few studies, however, compare literal and metaphorical theories of meaning, and even fewer are formulated in a way that makes disproving CMT with negative results a possible outcome. Despite an impressive body of research, many researchers are still reserved towards the Conceptual Metaphor Theory (Vervaeke and Kennedy 1996, 2004; Ritchie 2003; Murphy 1997) on the grounds that "empirical evidence can only support a model that is well specified enough to make clear predictions" (Murphy 1997: 102).

What is more, the Invariance Principle states that metaphors retain generic experiential structure. As mentioned above, Ruiz de Mendoza Ibáñez takes it to mean structure of the embodied source domain at the generic level. He does not explicitly define, however, what can be considered generic. Let us make a working assumption that embodied experience is the most generic, following Grady's distinction between primary and compound metaphors (Ruiz de Mendoza Ibáñez and Pérez Hernández 2011). If we take our previous example "my father is a dinosaur" we will see that the extent to which concepts can be considered embodied is far from straightforward. Is dinosaur an embodied concept? And, more importantly, can it be considered more generic than father? Szwedek (2010) points out that it is quite typical of CMT research to simply state that the source domain is more concrete than the target domain, without specifying the precise criteria on which the level of abstractness is judged. Furthermore, neither the typology introduced by Lakoff and Johnson (1980, 2003) nor Grady's primary metaphor (1996) seem to provide enough constraints for CMT to generate testable hypotheses. As it is, virtually any language phenomenon (or lack thereof) can be explained by postulating the activation of an implicit mapping, making conceptual metaphor unfalsifiable in the empirical sense.

### 5.2. Falsifiability and predictive power

Any two concepts are infinitely similar. People are able to draw parallels between things practically ad infinitum but, in fact, we rarely do. As we have seen, there is no clear explanation why some metaphorical mappings within a given conceptual metaphor are acceptable and some are not. This

phenomenon is called overgeneration, or "producing impossible and/or infelicitous metaphorical expressions on the basis of a preexisting mapping that is used to construct acceptable examples" (Ruiz de Mendoza Ibáñez and Pérez Hernández 2011: 180). Although introducing the Invariance Principle was a step in the right direction, the issue of overgeneration remains unresolved. This constitutes a problem for empirical testability of CMT. The ability to predict infelicitous mappings would mean that CMT meets the Popperian standard of falsification (Popper 1959); the theory would be rejected if mappings identified as infelicitous were observed in the data, or receive backing if their absence was correctly predicted. However, while the IP allows for a post-hoc explanation as to why certain mappings occur and rationalises metaphor felicity judgements, it is unable to generate accurate predictions regarding overgeneration. In its current form CMT is able to explain verbal metaphors appearing in political discourse and classify them according to implicit conceptual mappings. Yet, it would not be able to predict accurately which conceptual metaphors of politics would be unacceptable, and which mappings within acceptable conceptual metaphors—infelicitous. On this ground CMT has been questioned multiple times (McGlone 2007; Murphy 1997; Vervaeke and Kennedy 1996, 2004; Valenzuela and Soriano 2005; Gibbs 2000).

Naturally, it can be argued that conceptual metaphor research focuses largely on identifying existing conceptual mappings rather than predicting possible ones. However, predictive power is an important feature of a theory of cognition. First, as was already mentioned, it introduces the element of falsifiability. If the framework is unable to consistently produce evidence for its claims then it cannot be accepted as reliably scientific. Second, with introspection and individual language analysis being still the predominant research methods in cognitive linguistics, introducing an element of falsifiability would greatly improve the chances of replicating research results. Finally, falsifiable hypotheses constitute a starting point for most empirically minded sciences, therefore improving the falsifiability of CMT might generate research that is increasingly interdisciplinary (Gibbs 2000). Diversification of methodologies and types of data is an important step towards improving the quality of conceptual metaphor research (Gibbs 2007). At the same time, CMT consists of more than a single hypothesis, therefore it cannot be tested within a single experimental study. As a broad interdisciplinary framework it may, however, generate a set of testable hypotheses. Improving the predictive power and falsifiability of CMT means increasing its appeal to more empirically-minded scientists. With many sciences embracing an interdisciplinary approach, improving the plausibility of CMT should be at the forefront of research goals in cognitive linguistics.

### 5.3. Sources of evidence

Some authors within the cognitive scientific community expressed concern over the fact that conceptual metaphor research claims to use linguistic results to develop models of mental representation (Valenzuela and Soriano 2005: 5). The main reason why critics think that linguistic evidence alone does not constitute a sufficient background to make claims about the psychological reality of conceptual metaphors is circularity of argumentation. Using linguistic evidence to support a theory based on the assumption that language structure reflects conceptual structure is not looking for an answer to why people use language the way they do, it is trying to prove a conviction we already have. Murphy argues that "taking verbal metaphors and idioms as evidence about conceptual structure is assuming a particular answer to the question – an answer that is not yet well supported" (1997: 106). Furthermore, a circular relation exists not only between the source of evidence and assumptions of CMT, but also between the data and the hypotheses. "How do we know that people think of theories in terms of buildings? Because people often talk about theories using building-related expressions. Why do people often talk about theories using building-related expressions? Because people think about theories in terms of buildings" (McGlone 2001: 95). Proponents of CMT in its current form reject these arguments as reductive in that they conflate "sequence of Lakoff's argumentation to the relation between two statements claiming that they mutually presuppose each other" (Kertész and Rákosi 2009: 4). Even they agree, however, that the CMT framework is in need of reconstruction in order to field further criticism. Another solution to the circularity problem proposed by Valenzuela and Soriano is converging evidence from different sciences (2005: 7). Indeed, cognitive linguistic researchers for some time now have been branching out into behavioural and reaction time studies, gesture studies, using neuro- and psycholinguistic research paradigms and increasingly sophisticated methodology including eye-tracking, functional magnetic resonance imaging (fMRI) and ERP. Evidence from a variety of disciplines and methodologies pointing in the same direction would dramatically increase credibility of CMT. If the data is gathered using empirical methods the results will be even more promising as empirical evidence enjoys a privileged status in scientific inquiry. However, only well defined theories generating testable hypotheses can become the subject of empirical inquiry. One feature that has so far prevented CMT from enjoying the status of a serious contender among mental representation theories is the lack of clarity.

### 5.4. Clarity

It is important for theoretical models to be criticised. In the absence of relevant criticism theories become dogmas, the accuracy of which by definition cannot be improved. Paradoxically, it is the vague and ill-defined theories that are the hardest to disprove. Theories with well-defined scope and hypotheses are easier to test and, therefore, falsify. If a theory makes specific predictions that can be tested the results yield credence to (or weaken) the theoretical claims made by that theory. In contrast, if the assumptions are vague the model is difficult to refute. It has been pointed out a number of times (McGlone 2007, 1996; Murphy 1997; Vervaeke and Kennedy 1996, 2004; Valenzuela and Soriano 2005) that conceptual metaphor makes rather sweeping generalisations about cognition. Moreover, its main tenet that language expressions are systematically metaphorical because they reflect the metaphorical structure of concepts is impossible to refute in its current form. Whenever a seemingly non-systematic expression is found it can be explained away as a member of a broader, narrower or newly discovered metaphor family. Thus, if a cognitive linguist meets someone who talks about love in terms of a zoo trip this peculiarity can be explained by classifying trips as types of journeys (ergo: LOVE is a JOURNEY), postulating that emotions are like animals in restraint (LOVE is a WILD ANIMAL) and so on. As fruitful as it is for generating new and insightful research, this strategy does not lend scientific credibility to CMT. In turn, clarity is vital to falsifiability because "empirical evidence can only support a model that is well specified enough to make clear predictions" (Murphy 1997: 102). The problem of the lack of clarity can only be addressed at a theoretical level. As this chapter demonstrated, CMT has a number of issues to resolve, including the lack of clear criteria for distinguishing between abstract and concrete concepts, imperfect metaphor typology, and circularity of argumentation.

## 6. Alternatives to CMT[2]

Opposite the many proponents of CMT, which became the dominant theory in linguistic research, stand those who are sceptical towards the validity of the very claim on which Lakoff's theory was founded: that cognition is metaphorical. Gibbs (2011) cites a plethora of psychological studies

[2] For detailed coverage of theories in line with the conceptual metaphor view but different to CMT the reader is advised to consult Kövecses (2011), who published an excellent overview of contemporary theories of metaphor.

attesting to the existence of a connection between embodied representations and abstract concepts. Although he admits that one of the requirements of good psychology is to contrast the predictions of a given theory against alternative ideas (Gibbs 2000), he nevertheless chooses not to cite other explanations for the results obtained by conceptual metaphor research. Murphy (1997) voiced his scepticism in this regard multiple times, pointing out that metaphorical theories of cognition have not conclusively been shown to be better than their literal counterparts. Furthermore, if metaphoric and literal views on conceptualisation are to be compared, the theories in question need to be articulated precisely enough to allow that comparison. In Murphy's view, CMT did not fulfil this condition. While empirical data appear to support CMT, other accounts may be equally able to explain the same data. Non-metaphoric views in cognitive linguistic research are seldom presented or tested as an alternative to hypotheses relying on conceptual metaphor, so that "much of the writing supporting metaphoric concepts does not consider a plausible non-metaphoric alternative hypothesis" (Murphy 1997: 100). One notable exception is a study by Pfaff, Gibbs, and Johnson (1997) where both metaphoric and non-metaphoric approaches to conceptualization[3] were tested. Nevertheless, empirical studies that directly compare CMT with literal paradigms are few and far between. Such oversight may be an indirect effect of the difficulty testing the metaphoric view due to the way CMT is formulated. Vervaeke and Kennedy claim that the fact that conceptual metaphor cannot be falsified as a theory makes it a controversial foundation for empirical research (1996, 2004).

### 6.1. Five models of metaphor

Outside of literal accounts of conceptualisation CMT has faced competition from other metaphor models. Steen (2007) enumerates three alternative views. The two domain model (Lakoff and Johnson 1980) can be compared to the conceptual integration model (Fauconnier and Turner 1996), class/category inclusion statement model (Glucksberg 1991) and the Career of Metaphor theory (Bowdle and Gentner 2005). Lakoff and Johnson approach metaphor as a set of systematic conceptual correspondences between two broad conceptual domains. In direct competition stands the conceptual integration network model, represented by Blending Theory proposed by

[3] The experiments in question examined the role of metaphorical knowledge in people's use and understanding of euphemisms and offensive expressions (Pfaff, Gibbs and Johnson 1997).

Giles Fauconnier and Mark Turner. Proponents of blending refrain from using the expression "conceptual domain" in favour of the more general term "mental space". Blending Theory views metaphor as an interaction of four domains: the source domain and target domain (mental space), the shared domain and the blend (Coulson and Oakley 2000). The third model, metaphor as categorisation or class inclusion statement (Glucksberg 1991), has been described in the section on alternatives to CMT. Glucksberg's approach, unlike cognitive linguistics assumes that cognitive and linguistic processes are separate. Finally, the Career of Metaphor model aims to reconcile CMT and the categorisation approach, distinguishing between novel and conventional metaphors (Bowdle and Gentner 2005).

Frequently glossed over in conceptual metaphor research, Objectification Theory proposed by Szwedek (2000a, 2002, 2004, 2005, 2008) in many ways constitutes an improvement over CMT. As mentioned before, Lakoff and Johnson (1980, revised 2003) proposed that metaphor typology is non-hierarchical: ontological, orientational, and structural metaphors stand on a par with one another in that that they are applied simultaneously and are of equal importance. Szwedek argues that orientation and structure can only be perceived in relation to physical objects. Therefore, "before any entity can be assigned structure or orientation, it must be objectified first" (Szwedek 2004: 121). Objectification of a concept entails understanding it as a physical object (and/or describing it in physical terms). Within this view, objectification must constitute a fundamental step in metaphorization applied before any other metaphor type. This is because structure and orientation are physical properties that can only be assigned to physical entities (or concepts metaphorically construed as such). In agreement with the Inheritance of Properties hypothesis (De Beaugrande and Dressler 1981; after Szwedek 2004), having acquired object-status, abstract concepts may be described in terms of structure and orientation. CMT has spurred both empirical research into the nature of metaphor and theoretical musings regarding the validity of the framework. Despite theoretical reservations against conceptual metaphor models of cognition, empirical studies so far appear to subscribe to one of the four metaphor models outlined by Steen. This book aims to demonstrate that introducing the changes proposed by Objectification Theory would greatly improve the cohesion and plausibility of CMT and related theories. Objectification Theory is compatible with most conceptual metaphor models; it should be understood as an amendment rather than an alternative. At the same time, by introducing an additional step in metaphorisation, OT fulfils the criteria of a falsifiable scientific theory with reasonable predictive power, paving the way to a wider recognition of conceptual metaphor theories of cognition within life sciences.

## 7. Putting CMT in the framework of cognitive science

In the first half of the twentieth century, following the works of Baudouin de Courtenay, de Saussure, Hjelmslev, Bloomfield and the structuralists, linguistics became recognised as an autonomous branch of science (Krzeszowski 2002: 267–268). Although linguists admitted to influences from other branches of humanities and life sciences, they still claimed to be independent from philosophy, psychology, sociology, or even mathematics. However, it is increasingly clear that cognitive linguistics forms an integral part of cognitive science, just as language is an integral part of cognition. While CMT widened linguists' understanding of language and communication, it also forced researchers to become involved in research that is increasingly interdisciplinary. Multiple conferences show that it is no longer feasible for cognitive linguists to perform research in isolation. Cognitive linguistics is closer than ever to other natural sciences and further from the notion that language can be studied as an autonomous phenomenon outside of meaning, environment, or context. Yet, the interdisciplinary recognition of CMT and related frameworks is limited to psychology and gesture studies. The methodological frameworks functioning in other branches of cognitive science are not always compatible with traditional methods of conducting cognitive linguistic inquiry, and not always willing to overlook the non-falsifiable nature of CMT. A coherent, testable model of conceptual metaphor would go a long way to increase the credibility of this line of research. How to develop that model will be the subject of the next chapter.

Chapter 2

# What's in a concept? Theories of mental representation

*"Thinking can best be understood in terms of representational structures in the mind and computational procedures that operate on those structures."*

(Thagard 2005: 12)

Research has convincingly shown that much of our conceptual structure depends on physical experience. We think of time in terms of space (Gentner et al. 2002) and our speech and gestures reflect this belief (Casasanto and Jasmin 2012). Conceptual Metaphor Theory asserts that the structure of mental representation can be studied through language. This claim has generated some controversy (cf. Gibbs 2011); as a result language data alone is no longer considered sufficient to support the CMT account of conceptualisation. CMT needs more sources of evidence to substantiate its theoretical claims. However, for this to be possible it needs to provide a framework compatible with modern psychological and neurological research. This chapter (and, indeed, the whole book) seeks to do just that. We will cover recent developments in mental representation models and see how they compare to classical models (Markman 1999) as well as newer or less established approaches (Barsalou 1999; Semin and Smith 2008). We will take a better look at the applicability of CMT to empirical research on conceptual processes, both with and without the amendments introduced in Objectification Theory (Szwedek 2002). Finally, we will see whether Objectification Theory provides a better account of conceptualisation than CMT alone.

## 1. Classical and embodied accounts: toward a comprehensive approach to mental representation

"What are you thinking about?" is a question that has long been used to attract the attention of those who are deep in thought. It is interesting to note that we never question *whether* someone is thinking about something. It is

implied that when we think, there has to be a thing to think about. In a nutshell, we understand thinking as manipulating concepts. This is why accounting for knowledge representation is a crucial part of most cognitive models. Theories of mental representation serve as frameworks within which research approaches are developed and studies conducted. It is important to scrutinise not only the assumptions and predictions they make, but also their compatibility with the increasingly empirically-focused field of cognitive science. One of the most important questions in cognitive science is the nature and origin of knowledge.

The debate whether conceptual structure is embodied or symbolic has a long history. Embodiment it is not the first theoretical approach that identified perception as the source of representation. Prior to the twentieth century, theories of cognition relied to a great extent on perception (Barsalou 1999). The subsequent developments in logic, statistics and computational modelling inspired theories that divorced perception and meaning. Classical representation theory, which was built on these developments, postulates that mental representations take the form of amodal symbols (Fodor 1975, 1983). According to such amodal theories of cognition, perception and knowledge are separate. While they do not contest the claim that many mental representations stem from perception, action or introspection, these types of theories are based on the belief that concepts are stored in the semantic knowledge system in the form of symbols (Markman 1999; Markman and Dietrich 2000a). The paradigm shift started by CMT brought back embodied accounts of conceptualisation, a change that reconciled cognitive linguistic research with psychological accounts of mental representation and semantic storage (the so-called mental lexicon). Having said before that literal and metaphorical accounts are not compared often enough, let us briefly review evidence for these theories side by side.

The classical theory of representation assumes that human perceptual and conceptual systems are separate (Goldstone and Barsalou 1998) and that concepts, in particular abstract concepts, are arbitrary and amodal in nature (Lakens 2010). Classical representation has served well in the development of computer programmes for language production and recognition. The belief that knowledge can be divorced from experience has been challenged by research demonstrating that the sensorimotor cortex is involved in language understanding (Rohrer 2001, 2005; Rizzolatti and Craighero 2004). Areas in the brain formerly thought to be responsible for sensorimotor functions appear be involved with higher cognitive processes including conceptualisation and language (Hauk and Pulvermüller 2011; Pulvermüller et al. 2005, 2012). This means that if we ask someone (who is conveniently located inside an fMRI scanner) to imagine they are playing tennis we will see activa-

tion in the brain areas responsible for language comprehension and memory, but also in the motor cortex areas normally involved in playing[1]. Although some findings showing motor activation during language understanding have been questioned, it is slowly becoming clear that Lakoff and Johnson (1999) who hypothesised that conceptual structure reflected bodily experience may have been right in many respects, including the relation between conceptual structure, language, and perception. Although their claims were based on a set of correspondences between linguistic expressions, the beliefs expressed in CMT are also corroborated by evidence from experimental studies. Amodality of representation is among many principles of the classical theory of representation that have been questioned by research on embodied cognition, including perceptual symbol systems, dynamic systems, and situated cognition based accounts of thought and language (Markman and Dietrich 2000a). The ongoing debate is important not only to research in the broad field of cognitive science, but also directly to cognitive linguistics which is largely based on traditional theories of representation. The change in framework may be slow but is significant on many levels. In particular, the shift towards a more empirically based framework could become the mortar that connects all the separate bricks within cognitive science including prototype theory, image schemata, cognitive linguistics and conceptual metaphor.

Although the classical and embodied approaches take different stances with regard to the origin, structure and form of mental representations, they both allow for a similar working definition. In both accounts mental representations are understood as states of intelligent systems that carry information (Markman and Dietrich 2000a: 471). It needs to be noted that representations must be interpretable. That means "something is a representation only if a process can be used to interpret that representation" (Markman 1999: 8). For instance, a series of impulses in a network, whether an artificial neural net or one inside our own brain, can be said to represent a concept only if it is possible to decode the meaning of these impulses. In search for a unified framework that allows for an inherently perceptual mental representation system we need to consider two possible solutions. First, we can introduce changes into the classical model so that it accounts for recent findings regarding conceptual structure (Markman and Dietrich 2000a). Alternatively, we can adopt a non-classical account. Theories based on the embodied grounding hypothesis competing with the classical account include perceptual symbol systems (Barsalou 1999), situated cognition (Robbins and Aydede 2009), embodiment (Semin and Smith 2008; Fogassi and Ferrari 2007), dynamical

[1] This discovery has already been used to asses the consciousness of patients in vegetative state (Cruse et al. 2011; Owen et al. 2006).

systems (Beer 2000) or a variation thereof. Let us now examine these possibilities in more detail.

Theories within the classical account of mental representation share a number of assumptions: mental representations are enduring states of intelligent systems that carry information; cognitive systems require some form of symbolic representation; some representations are amodal in that they are divorced from sensory modalities; and many cognitive functions can be modelled without referring to the sensorimotor system of the agent[2]. The key claim within this framework is that symbols are amodal and arbitrary. The structure of the symbol does not reflect the underlying perceptual activation pattern. For instance, within the classical model symbols for colours are not related to the brain activation patterns recorded during colour perception. Colour symbols and colour percepts[3] are assumed to use different representational schemes and operate according to different rules. As a consequence of the arbitrariness of symbols they are not systematically related to percepts. That would mean that the mental representation of colours blue and green do not resemble each other more than the representations of blue and red (Barsalou 1999), although the perceptual activation patterns are conceivably more similar for the first pair than the second. Although some of the proposals of the classical theories of representation are debatable, there are important qualities that make them benchmarks for other accounts of conceptual structure. These include the ability to implement the token/type distinction, account for inferencing, combine symbols, represent propositions and, importantly, the ability to account for both abstract and concrete concepts (Markman 1999; Markman and Dietrich 2000a). It is clear that any theory positing itself as an alternative to the classical model must not only be able to adequately account for the above mentioned phenomena, but also demonstrate the value added quality that would make it better or more plausible than other accounts of representation. Having established this set of benchmarking qualities, let us look at how different models of representations compare with the classical view. We will analyse the proposed conceptualisation mechanisms, criteria for the abstract vs. concrete distinction, and the perspective on language.

### 1.1. Language, memory and representation structure

Classical theories of representation are grounded in language (Collins and Loftus 1975; Fodor 1975). Although they treat language and symbols as

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[2] For a detailed overview of classical theories of representation see (Markman 1999).

[3] Percept is a term used for perceptual representations within the classical account (Fodor 1975, 1983).

different, researchers in the field appear to believe knowledge representation mirrors linguistic structure (Barsalou et al. 2008). Predicates for objects, events, and properties often correspond to the words that denote them. For instance, classical theories of representation assume that there is a substantial overlap between the concept of a bird and the meaning of the word "bird". Amodal symbols in relevant literature are typically represented by words, under the premise that a word is close to what constitutes the content of the symbol. Because classical views on representation tend to present thought as a series of operations on symbols, this view overlooks that, in fact, one-to-one word to concept correspondence is both impractical and impossible. Words not only differ in formality, emotional valence and familiarity but also are perceived differently by different people making the equivalence between words and concepts an imperfect analogy at best. Still, symbolic thought within classical accounts of representation is assumed to be analogous to language in many ways. Both language understanding and conceptual processing are assumed to be sequential. After all, language is based on sequential processing of words in a sentence, just as conceptual processing is a series of operations on symbols, where symbols are processed as lists or in sentence-like structures (Fodor and Pylyshyn 1988). Although the classical account of representation is compatible with structural linguistics, researchers in the field of cognitive linguistics tend to adopt non classical approaches to representation. This is because amodality of representations cannot be easily reconciled with the belief that cognition is embodied, a key assumption of cognitive semantics (Lakoff 1987; Lakoff and Johnson 1999) and one confirmed by many empirical studies. At the same time, cognitive linguistics is far from rejecting any kind of connection between words and concepts. Quite the opposite, concepts and words in both theories are considered closely related. "It is nearly impossible to talk about a child learning the concept of sheep without her learning the word because the evidence that the child knows the concept comes from her applying the word correctly" (Murphy 2004: 386). The difference is that classical models work on the implicit assumption that words signify concepts, while theories based on Conceptual Metaphor Theory explore this assumption. This is reflected not only in the theoretical framework of the discipline, but also in study design as many cognitive linguistic studies rely solely on linguistic evidence to draw inferences about conceptual structure, a fact that has been vigorously criticised from outside and within the domain (Murphy 1997; Gibbs 2007, 2011).

Another assumption of the classical model is that all representations need to be enduring and, therefore, stored in long-term semantic memory (Markman and Dietrich 2000a). Grounded cognition approaches such as situ-

ated cognition and dynamic systems present possible alternatives. Situated cognition, for instance, states that many aspects of the world remain stable so there is no need to remember them, or code them in memory. Perhaps the best understood cognitive phenomenon that supports the dynamic view is change blindness. In a famous experiment, the Invisible Gorilla Test, Daniel Simons and Christopher Chabris asked participants to watch a short video of people passing a basketball and count the number of times the ball passed between the players. About halfway through the video, a person wearing a full gorilla suit entered the screen. After they have seen the clip, the participants ware asked if they noticed anything out of the ordinary take place. In most groups, 50% of the subjects did not report seeing the gorilla. The phenomenon of change blindness, when we do not notice changes in those elements of a scene that are out of our conscious focus, could be seen as evidence in support of situated cognition. Alternatively, the dynamic systems approach defines representations as dynamic states of a neural network. Such states by definition are neither amodal nor enduring because information is supplied from the sensory and motor systems, and dynamically influences the state of the network. With each new piece of information the pattern of activation in a network changes, and the mental representation is slightly adjusted. Both of these non-classical approaches make a compelling argument that representation does not necessarily need to be enduring or amodal. It is entirely possible that representations change in relation to experience and depend on the original sensory information. What is more, studies show that linguistic forms in the language system and situated simulations in the modal system of the brain are related (cf. Barsalou et al. 2008). Although there is no evidence directly disproving it, there seems to be no need for amodal enduring representations. Nevertheless, we are far from conclusively stating which of the two approaches serves as a better foundation for a mental representation model. Another decisive factor is how the theory accounts for the formation or acquisition of concepts.

W have already seen that amodal representations are by definition not directly grounded in experience. While the classical account allows for some perceptual involvement in categorisation, the process by which percepts become divorced from modality-specific data to become concepts is unclear. Classical theories of mental representation have long been faced with the symbol grounding problem (Harnad 1990), or the question how an amodal symbol is related to its specific instances in the physical world. This issue does not arise in embodiment- and simulation-based accounts of representation applied in cognitive linguistics. The very premise of grounded cognition is that representations stay grounded in sensory modalities. Instead of focusing on the origin of representation, many studies demonstrate that concep-

tual structure is grounded in experience. Concrete concepts are assumed to be directly or indirectly embodied, or based on bodily experience and sensory data. Matters get increasingly complicated with the conceptualisation of non-physical concepts and ideas. There are many contrasting accounts of abstract conceptualisation. This book shows how concept creation processes can be modelled through conceptual metaphorization, but there are many more theoretical models of conceptualisation. Proponents of the classical approach claim that it is impossible to fully explain the emergence of abstract concepts without reference to amodal symbols. However, studies suggest that representations grounded in specific sensory modalities are theoretically just as flexible as amodal concepts, and that both concrete and abstract concepts can be accounted for in this manner (Barsalou 1999; Goldstone and Barsalou 1998). Concept creation, or conceptualisation is often confused with categorisation, or grouping concepts into categories. Although these words are often used interchangeably, they describe somewhat different phenomena.

### 1.2. Categorisation and conceptualisation

Categorisation is one of the most basic and indispensable cognitive functions of living organisms. Even amoebas distinguish between two categories of things they encounter: "food" and "not food" (Lakoff 1987). A category is a class of objects in the world (Murphy 2004). Categories are useful cognitive devices: once established, they serve to reduce the mental load. One of the goals of categorisation is to provide maximum information with minimum cognitive effort (Rosch 1999: 252). This is possible because instead of analysing every encountered object as a novel entity we may classify it as a category member. For example, let us assume there are two categories of animals: domestic (friendly) and wild (potentially hostile). When we meet an unfamiliar animal we automatically assign it into one of those groups on the basis of its resemblance to other category members. This relieves us from having to individually assess the threat level for each animal we meet. What is more, categories permit generalisation and inferencing. Once we decide that the goat we just met belongs to the category of domesticated animals we may also determine that all goats are domesticated and, as a result, infer that goats are a non-hostile species. Naturally, category based inferences and generalisations are not error-proof. The goat we classified as domesticated may prove to be wild, or it may be a domesticated animal with a nasty temper. The fact that categorisation judgements are vulnerable to error is illustrated by such phenomena as stereotyping (Andersen and Klatzky 1987; Hamilton 1981; Zarate and Smith 1990). Nevertheless, categorisation remains

a ubiquitous cognitive phenomenon. Whether it is recognising that the person sitting across the table is our spouse, or pronouncing a joke to be awful, most cognitive acts can be seen as acts of categorisation (Goldstone and Kersten 2003). Classical and embodied accounts of mental representation take different approaches to categorisation and, as a consequence, the nature of concepts.

Concepts and categories are two terms that usually appear together in psychological research. As mentioned above, categories denote classes of objects. In contrast, concepts constitute the mental representation of a class of objects (Murphy 2004)[4]. Classical theories of representation assumed that concepts consist of rule-based definitions. For example, concept X is comprised of properties separately necessary and jointly sufficient for the concept to be an X (Machery 2011: 16). If someone held the classical concept of bachelor they would believe that in order to be a bachelor it is both necessary and sufficient to be an unmarried adult male. The traditional account of concepts is associated with a simple model of categorisation. In order to categorise an object as X one needs to determine if the object has features that are necessary and sufficient for X. For instance, determining whether someone is a bachelor would mean that we consult our mental checklist of features necessary and sufficient for that concept: human (yes), adult (yes), male (yes), married (no). A more advanced version of the classical theory is based on the notion of Boolean concepts. In the simple version of the classical account a set of necessary properties qualifies an object as X. A Boolean concept of X may be any combination of properties, provided that necessary and sufficient conditions are identified and met. Research on classical concepts focused on rule identification tasks, in which participants were presented with a set of artificial objects or stimuli and asked to identify the rule by which they were all classified as members of the same category. While they are useful sources of knowledge about the basics of category learning, for the most part rule based accounts of conceptualisation have been replaced by prototype and exemplar based theories. The main factors involved in rejecting the classical view of concepts were its inability to account for fuzzy category boundaries, concept complexity, and typicality and exemplar effects in experimental studies. Classical accounts of categorisation are able to accurately predict categorisation decisions when categories are clearly delineated but not when category boundaries are fuzzy or vague. Consider the category "bald". Within the classical model, classifying people as bald would be based on the presence or absence of the feature "has hair". The classical model works well for binary features, where the only answers possible are "yes" (feature present, therefore concept belongs to a given catego-

[4] We will refine this definition later in the book.

ry) and "no" (feature absent, concept does not belong to the category). But "has hair" is a non-binary feature, meaning that there are plenty of stages of baldness between the unequivocal "yes" (is definitely hairy) and the unequivocal "no" (is completely bald). Should people with minimal amounts of hair be classified as bald? What amount of hair on the scalp makes one exempt from being categorised as bald? Machery (2007) proposed that the fuzzy boundaries problem may be overcome if we assume that it is not the category boundaries that are vague, but rather the predicates used as classifying features. In our example this would mean that instead of accepting bald to be a fuzzy category we assume that the feature "has hair" is fuzzy. Another illustration of this problem is Labov's famous cup/bowl experiment (1973). He showed the participants a set of drawings of cup-like objects and asked them to decide whether an object was a cup or a bowl. The participants were more likely to interpret an ambiguous object as a bowl in food related contexts and less likely to call it a bowl if they were asked to imagine that it contained coffee. The results of Labov's experiment can be taken to suggest that category judgements are context dependent in a way that cannot be accounted for with predicate vagueness. Prototype theory provides a better explanation for the fact that someone may be described as bald in one context but not in another.

The second reason behind the wane in popularity of the classical view was that it had problems in accounting for complexity of representations. If concepts are sets of necessary and sufficient features then it is reasonable to assume that there is a level of complexity at which some of these features are concepts themselves. For instance, the concept of murder must include the notion of killing and some idea of intentionality. If indeed concepts are structured in this manner complex concepts should be more difficult to interpret than simple concepts, because the former demand longer processing. However, studies show that complex concepts such as murder are no more difficult to process than the supposedly simpler concepts they are composed of. In contrast to the classical account, most grounded cognition approaches to representation are based on some version of the prototype theory (Rosh 1973). The prototype theory not only postulates that there is a basic level of representation rather than various complexity levels, but also accounts for the third problematic area, namely typicality and exemplar effects.

One of the first challenges to classical theory was Eleonor Rosch's research on colour terms (1973) which demonstrated that categories are not the bounded, clearly delineated sets of features that classical logic requires. For instance, most people disagree that red hair is a good example of the colour red. However, if their mental representations followed the rules of classical logic it would be impossible for them to decide whether something is

a 'good' or 'bad' example of a category because in the classical framework category inclusion is a yes/no decision. In classical accounts, concepts that satisfy the necessary and sufficient features rule are all equally good representatives of a category. This does not seem to be the case in real life. Rosch's study indicated that category membership is judged by degrees, and that colour concepts have neither critical attributes nor definite boundaries (Rosch 1973; Gabora et al. 2008). What is more, people agree that certain colours are better representations of a colour category than others. This sort of graded, prototypical structure is not limited to colour terms, but rather seems to apply to a variety of categories (Rosch 1999, 1973; Rosch and Mervis 1975; Smith and Medin 1981). Following the above-mentioned studies demonstrating that Prototype Theory has greater explanatory power than the classical model, PT has been embraced by many researchers on grounded cognition, perception and language.

## 2. Prototype theory: an accurate account of representation?

Typically, theories working on the assumption that mental representations depend on simulation, situated action, and bodily states are called grounded cognition theories (Barsalou 2008). These include the embodied cognition view espoused in CMT (Lakoff and Johnson 1999), situated cognition, and dynamic systems theories of representation, but also the mirror-neuron based simulation view (Arbib 2006a; Arbib 2006b). Cognitive linguistics was among the first branches of science to champion modern grounded cognition theories. Most cognitive linguistic research rejects the notion that concepts are sets of necessary and sufficient features in favour of the view that categories have a prototype structure. Prototypes are composed of features that can be considered typical (likely to describe an object in the category), or diagnostic (indicative of category membership) or a combination of both (Machery 2007). For instance, a prototype of cats could represent them as small, furry, with a tendency to purr etc. It would also be composed of a number of exemplars of cats, or entities that were classified into this category. The exemplar most representative of a category is the one closest to the prototype. As mentioned above, prototype theories received support form a wide range of empirical studies. In the 1970's Posner and Keele showed that it is easier to recognise prototypical than atypical examples of a category. They used patterns of dots to represent members of artificial categories and asked participants to learn those categories based on examples, which were distorted versions of the prototypical dot pattern. When given a new set of patterns to classify, participants found the task easier if the dot

arrangement matched the prototype closely. Patterns that were distant from the prototype took longer to classify and produced more errors. In a similar vein, Eleanor Rosch showed that verifying category membership is easier and faster for items that match the prototype than for atypical category members. Participants in her study responded quicker when asked to verify the truth of the sentence "A robin is a bird" than "A penguin is a bird" presumably because the subject of the former resembles the prototype more closely than the latter (Rosch and Mervis 1975; Thagard 2005). Another study by Rosch showed that typicality judgements for a given familiar category are quite consistent across participants (Rosch 1973). Informants in the study were given a list of items and asked to judge how typical they were as members of a specific category. For example, the category of birds included robins, swallows, penguins, ostriches and chickens. The participants demonstrated a large measure of agreement in their judgements; as we can imagine most people agreed that robins and swallows are very good examples of the category while ostriches and penguins are not. We have also seen that, in contrast to classical representation theories, prototype theories were able to account for a wide variety of cognitive phenomena including categorisation, induction, and concept combination (cf. Machery 2007; Murphy 2004).

The nature of conceptual structure has been the subject of ongoing debate, most of which is beyond the scope of the present work. However, even from the limited analysis above it seems clear that the classical account of concepts as composed of sets of necessary and sufficient features is inadequate for the purpose of any empirically grounded interdisciplinary model of conceptualisation. Empirical research demonstrated the explanatory and predictive power of grounded cognition models. It appears that any model of conceptualisation aspiring to reconcile theoretical and empirical findings must take into account the prototype theory of representation. In this book, I take the prototype theory of representation to be the closest to what we currently know about human conceptualisation processes. The specific effects that the choice of paradigm has on the proposed amendments to Conceptual Metaphor Theory, and the theoretical model will be discussed and explained in the following chapters.

## 3. Practical value of cognitive models

The previous sections discussed theoretical issues regarding models of mental representation and experimental paradigms associated with those models. It is important to remember that theories of representation, whether they are psychological, linguistic or psycholinguistic, are objectively only as

valid as the evidence that supports them. The structure and assumptions of any theoretical framework should yield to empirical testing, or risk criticism from the empirically-focused part of the cognitive science community – much as was the case with CMT. There is a growing need for interaction between theoretical and empirical approaches to mental representation (Gibbs 2007). Without models of how complex reasoning and expertise develops we will not be able to understand how perceptual representations are constructed or how to reproduce them in AI circuits. Although cognitive science would ultimately like to produce an explanation regarding the progress from sensation to high-level cognition, these models cannot be developed in a purely bottom-up fashion (Markman and Dietrich 2000a: 474).

There is a number of reasons why developing new models and improving existing theories is beneficial for both the theoretical, and the empirical side of cognitive science. First, models help researchers design studies. Any empirical study is based on theoretical assumptions that inform study design and methodology. For instance, many psycholinguistic studies consider reaction time to be indicative of processing difficulty; the longer it takes for a participant to react to a stimulus, the more difficult to process it is assumed to be. The theoretical background of this assumption is related to the belief that human cognitive processing capacity is a limited resource, the online allocation of which follows certain principles. Similarly, the researchers' understanding of concepts will influence study design. If this understanding evolves so should the methodology. "Theoretical change should translate into operationalization change. Or, to put it differently, operationalization change should track theoretical change" (Machery 2007: 64). Consequently, it is important not to stop at the theoretical level without considering the practical implications of a mental representation model. A successful theory should be clear with regard to its scope and terms, but also needs to generate precise predictions. Conceptual Metaphor Theory, while clearly defined, has been accused of both vagueness (Murphy 1997) and lack of empirical focus (Gibbs 2007). A general model is perhaps acceptable in the beginning stages of theory development, but with its evolution the focus needs to be shifted towards the implementation of the model. What is more, if the model is meant to be applied in an interdisciplinary context it should demonstrate awareness of the developments in the range of fields it is trying to reach. In particular, models of conceptualisation that can be reconciled with what we know about the brain lead to a greater understanding between scientific disciplines. One of the theoretical frameworks that aims to be compatible with a range of fields in cognitive science is connectionism or, more specifically, neuroconstructivism (Westermann et al. 2006). Researchers that subscribe to this framework aim to produce cognitive level theories consistent with neu-

ral theories in order to increase dialogue opportunities between these disciplines. It is true that many models are meant to be interpreted as analogies or simulations. Nevertheless, they should go beyond that in order to be truly useful. While the network model for past tense acquisition (Rumelhart and McClelland 1987) and the connectionist model that accounts for syntactical processing (Elman 1990) are successful simulations of processes in these specific domains, they are not useful in terms of generating insight beyond limited sets of data. There is no doubt that simulations are informative. However, the main aim of cognitive models is to predict and explain, which requires that partial models fit within a broader, cohesive framework. If we review different models of mental representation this requirement is uncomfortable for the amodal symbol theory. Although some connectionist models assume amodal (arbitrary) representation without losing the capacity to fit in the broader neuroconstructivist framework, systems fully reliant on amodal representation are not psychologically feasible. Amodal representation is dissociated from findings in neurology, psychology and psycholinguistics that demonstrate sensory involvement in tasks involving imagining and understanding concepts (Hauk and Pulvermüller 2011). In contrast, grounded cognition based theories of representation, including prototype theory seem compatible with a variety of disciplines.

Because organisms need cognitive systems that deal with the world as a whole rather than separate situations (Edelman 2003) good models of particular cognitive processes need to be either compatible with other models, or scalable to include them. The capacity to generalise, make inferences, and abstract from experience is known as hierarchical abstraction. Edelman argues that, just as cognitive agents need hierarchical abstraction to scale up their understanding of the world, cognitive scientists need their models to possess this trait if they aspire to broaden the understanding of cognition (2003: 273). There is an ongoing debate whether amodal symbols are a prerequisite for hierarchical abstraction (Markman and Dietrich 2000b), or if this capacity can be achieved in dynamic systems (Beer 2000). However, although fascinating, it lies beyond the scope of this book[5]. For now let us agree that an adequate model of mental representation should be compatible with the existing empirical findings on the topic, follow a coherent theoretical framework, and be scalable so that inference goes beyond any specific cognitive function. Therefore, if CMT is to become a reliable conceptualisation model, the theory should fulfil the requirements stated above. The first step toward this goal is to look at its compatibility with studies outside cognitive linguistics. This naturally leads us towards the human brain.

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[5] For details see e.g. Edelman (2003) or Markman and Dietrich (2000a).

## 4. Neurolinguistic studies: finding concepts in the brain

Although on the surface the results of neurolinguistic studies regarding conceptual structure (Binder et al. 2005; Quinn and Eimas 2000) seem both promising and convincing, interpreting research results and comparing them to the predictions made by cognitive linguistic theories is not a straightforward process. Each of the methods used in neurolinguistic research (fMRI, ERP, PET) has its limitations, assumptions, and biases. Both between and within those disciplines we will find differences in definitions and beliefs. Therefore, before we can assess the congruency of cognitive theories and neurolinguistic findings it is important to discuss the extent to which the latter can be meaningful from an interdisciplinary perspective.

Broadly speaking, there are two types of noninvasive methods used in neuroimaging research on humans. Direct methods monitor electrical or magnetic fields linked to neural activity, indirect methods monitor changes in blood flow associated with neural activity (Ganis and Kosslyn 2002). Two of the most common direct methods used in neurolinguistic research are EEG and ERPs[6]. Electroencephalogram (EEG) provides information about the summed electrical events produced by individual brain cells. Event-related potentials (ERPs) are a variant of EEG often used in neurolinguistic research because they measure changes in the electrical activity immediately following the presentation of a stimulus or decision. EEG and ERPs are recorded from a set of electrodes placed on the patient's scalp. For a variety of reasons, these techniques are limited to measuring activity within the grey matter of the neocortex (Ganis and Kosslyn 2002). Although ERP is very effective in terms of measuring quick (shorter than 1 millisecond) changes in activation, it has limited spatial resolution because it can only measure signals outside the surface of the head. Interpreting surface data as indicative of internal processing within the brain is one of the issues with EEG and ERP data analysis (Savoy 2001). Methods that gather neural activation data from within rather than outside the skull include MRI, fMRI and PET. These methods are called hemodynamic or indirect because instead of measuring brain activity directly they measure changes in blood flow, oxygen and glucose consumption, and cerebral blood oxygenation levels correlated with neural activity (Ganis and Kosslyn 2002). Very generally speaking, these methods are based on the belief that oxygen consumption and blood flow temporarily increase in those brain areas that are involved in a given cognitive task which results in measurable changes in the adjacent magnetic field (Savoy 2001). The exact mechanism by which neurological processes cause

[6] For a more detailed introduction to ERP see Fabiani et al. (2000).

metabolic changes and influence the blood flow is unknown. However, the empirical relationship between brain activity and such changes is very reliable. Positron emission tomography (PET) is another method that applies this principle to measuring neural activity[7]. From an empirical perspective, PET has a number of limitations that directly influence its usefulness for conceptual research. First, it requires the subject to ingest a radioactive isotope which limits the availability of volunteers and the number of times per year any given volunteer may be scanned (due to ethical and medical constraints). Second, the produced images have a relatively low spatial and temporal resolution. In order to generate useful data participants need to perform the same task for an extended period of time (about 30 s before and 60 s during data collection) which limits the types of cognitive tasks that can be studied with PET. Because of these factors, PET has largely been replaced with functional magnetic resonance (fMRI) in neurolinguistic studies. Functional magnetic resonance imaging (fMRI) detects hemodynamic changes associated with neural activity using magnetic resonance imaging (MRI). Magnetic resonance was originally developed as a non-ionic radiation based (therefore less invasive) method of creating images of soft tissue. Functional magnetic resonance imaging is at present the most widely used neuroimaging technique. It exploits the optical and magnetic properties of deoxygenated and oxygenated haemoglobin, and the fact that any increase in local brain activity is marked by an increased concentration of oxygenated haemoglobin in that region (Ramachandran 2002). Although it is currently a very popular method in neurolinguistic research, fMRI is not perfect. It offers good spatial and temporal resolution and is less expensive than PET. However, the technique is very noisy and many subjects find spending time in the narrow tunnel of the machine uncomfortable. Also, it is very sensitive to motion. Even small movements of the head introduce artefacts into the data, which may make the collected information effectively useless. Also, even if an experiment produces usable results, whether they are comparable to the results of other studies is another question entirely.

It is often the case, particularly in popular scientific reporting, that the results of neurolinguistic studies are sensationalised. This is not surprising: the colourful 3D activation maps generated by neuroimaging software easily yield to enthusiastic misinterpretation. It is important to remember that the activation patterns recorded in the course of a neurolinguistic experiment are not "what happens in the brain" during a task. A general principle of functional neuroimaging studies is that the measured activations show rela-

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[7] For a more detailed look into these methods see Savoy (2001) and Ganis and Kosslyn (2002).

tive differences in neural activity between two or more brain states. The pattern of activation reported in a study that targets semantic processing not only depends on the cognitive processes the researcher intended to record during the task, but on the activation, or lack thereof, in the comparison task (Binder et al. 2009). In other words, because the brain is constantly active at some level, what is measured in functional neuroimaging research is not its activity in any objective sense (Ramachandran 2002). In order to eliminate the noise of normal brain activity researchers measure the difference in activation between two or more conditions, one of which serves as a benchmark. Once a basic activation level is established, researchers need to decide on the activation threshold, or how strong the change in activation needs to be before it is recorded. Therefore, if the participant is asked to look at pictures of their loved ones and emotionally neutral images of unfamiliar people what is measured is not the objective response to the images of family members, but rather the difference in brain activation when looking at familiar and unfamiliar people. Furthermore, in order to reduce the effects of individual variation in brain size and structure activation patterns of individual participants are normally mapped onto a default brain model. Naturally, this procedure lowers the accuracy of the findings. Therefore, when interpreting neurolinguistic study results it is best to err on the side of caution rather than overgeneralise. It is clear that neuroimaging research contributed greatly to the development of cognitive science. Nevertheless, we should bear in mind both the advantages and limitations of such studies when constructing theoretical models with an interdisciplinary scope (Poeppel and Embick 2005).

## 5. Conceptual structure and the brain

Concepts are elementary units of reason and linguistic meaning and have long been at the centre of cognitive science research. They are "the glue that holds our mental world together" (Murphy 2004: 1). Searching for parallels between conceptual structure, the brain, and bodily experience may seem an obvious direction for research in cognitive science, but is in fact a relatively recent development. Early cognitivism operated under a strong influence of the analytic tradition of the philosophy of language. In this tradition concepts were analysed on the basis of formal abstract models, in principle unrelated to the body. The assumption was that there is no involvement of the sensorimotor system in conceptualisation. Within this perspective, concepts were defined as abstract, amodal, and arbitrary representations stored in the form of "language of thought" (Fodor 1975). The mind

was conceived of as a system whose processes can be described by means of a set of formal syntactic rules affecting these amodal abstract concepts (Fodor 1983). Conceptualisation was studied as if it bore no relation to the brain and body. Naturally, as we have seen, this is no longer believed to be the case. Concepts and the structure of mental representations are now studied by psychologists, neurologists and linguists alike. To what extent the assumptions, methods and paradigms of these disciplines overlap is another matter.

Concepts are often defined as bodies of knowledge stored in long-term memory and used by default by our cognitive processes when we categorise, make inductions, understand languages, draw analogies, and so on (Machery 2007). However, although the notion of long-term memory sounds concrete and well-defined, in the context of the debate on lasting mental representations and dynamic systems it is no longer as clear cut as initially imagined. What does it mean that concepts are stored in memory? Are they semantic in nature, or are they simulations recreating patterns of activation in the sensorimotor system? Are they static, or do they change with experience and context? These are just some of the many questions that researchers on conceptualisation have been trying to answer.

Semantic processing, or access to knowledge about concepts is a central feature of human behaviour. It is not only important for language, but defines our ability to access stored knowledge and apply it to planning, decision making, and problem solving (Binder et al. 2009). The neural basis of semantic processing has been studied by analysing brain activation in patients suffering from brain disorders, including Alzheimer's, dementia, aphasia and schizophrenia. Semantic processing has also been the subject of many neuroimaging studies conducted on healthy volunteers with the use of positron emission tomography (PET), functional magnetic resonance imaging (fMRI) and event related potentials (ERPs). Neuroimaging studies on semantic processing distinguish between object (picture) and word recognition tasks. While word recognition is assumed to tap into conceptual knowledge, object recognition involves a more complex interaction between perception, abstraction and representation (Binder et al. 2009). This does not mean that the resources activated during object and word recognition tasks do not overlap, but there is evidence that these two processes are not identical (Reinholz and Pollmann 2005). It is unclear whether word comprehension necessarily means activating a detailed perceptual representation of the object to which the word refers (Chee et al. 2000; Bright et al. 2004; Gates and Yoon 2005). Patients with profound visual object recognition disorders may retain word comprehension abilities, which also suggests that the knowledge systems underlying word and object recognition are not the same (Davidoff and Debleser 1994). A review and meta-analysis of over

seven hundred semantic processing neuroimaging studies suggest that there is no one specific region involved in semantic processing, although there is a tendency for left hemisphere lateralisation (Binder et al. 2009). In fact, patterns of activation differ for different types of concepts and tasks. Similarly to cognitive linguistics, the difference between the processing of abstract and concrete concepts is often operationalised in neuroimaging research.

### 5.1. Are some concepts amodal?

In the beginning of this book it was mentioned that the process by which humans were able to develop abstract concepts from concrete perception has been the subject of a prolonged debate. Gallese and Lakoff argued in favour of the embodied view of conceptual knowledge (2005: 456). They believe that the sensorimotor system provides structure to both types of conceptual representations and constrains their semantic content. Some neurological studies mentioned the so-called amodal areas of the cortex as being associated with semantic processes in the brain, but this terminology is misleading. While researchers in neurolinguistics distinguish between modal and amodal cortices, this distinction was based on the primary functions of these regions. The input to the modal cortex comes from a dominant sensory or motor modality, whereas the amodal cortex likely plays a role in integrative processes which is why it is also called heteromodal or supramodal (Binder et al. 2009). Recent studies show that even the cortical regions formerly considered ''unimodal'' receive input from multiple sensory modalities (Schroeder and Foxe 2005). Binder and colleagues propose to define the ''modal'' cortex as regions where processing reflects a dominant sensory or motor modality, as opposed to the ''amodal'' cortex where input from multiple modalities is more balanced and highly convergent (2009: 2774). Semantic processes in the brain are associated mainly with the amodal part of the cortex, which is also bigger in the human brain than in any known primate (Binder et al. 2009). It seems that abstract concepts can only be amodal in the sense that their processing depends primarily on the integrating rather than unimodal areas of the neocortex. They are not amodal in the sense of being divorced from sensory and motor input.

Another relatively recent neurological discovery to corroborate the embodied grounding theory is that imagining and doing evoke similar activation patterns. This phenomenon is called motor resonance (Zwaan and Taylor 2006), referring to the observation that some words "resonate" in the sensorimotor system as if they were actions. For example, „when people close their eyes and visualize a simple object such as the letter „a", the pri-

mary visual cortex lights up, just as it would if the subjects were actually looking at that letter" (Doidge 2007: 203–204). The discovery of mirror neurons, neural cells located in the motor cortex which fire in response to seeing a performed action, increased the credibility of this theory even further. Although the existence of the mirror neuron system in humans is still considered a controversial topic, there is evidence of its existence in primates. Studies also show a possible relationship between language, gesture, and the mirror neuron system (Arbib 2006; Rizzolatti and Craighero 2004). We will discuss the mirror neuron theory of language development (MNT) in more detail further in this book. At this point, the hypothesis that conceptual representations of physical objects are grounded in experience stands relatively uncontested. Nevertheless, "how people mentally represent (...) abstract domains has remained one of the mysteries of the mind" (Casasanto 2010: 453). Unsurprisingly, this has been a vexing issue for neurolinguistics as well.

### 5.2. Abstract and concrete concepts in the brain. The concreteness effect

We have seen that most linguists draw a theoretical distinction between abstract and concrete concepts. Research suggests that we process these two types of concepts differently as well. Neurolinguistic studies show that words representing concrete concepts are remembered for longer (Paivio 1971; Fliessbach et al. 2006), recognised faster (West and Holcomb 2000), and are more resilient to brain damage (Katz and Goodglass 1990) than words representing abstract concepts. This phenomenon is known as the concreteness effect, and has been the subject of extensive research for the last 15 years (West and Holcomb 2000; Binder et al. 2005; Casasanto et al. 2001; Fliessbach et al. 2006). It appears that concrete concepts have a significant processing advantage over abstract concepts.

There are two main theories explaining the concreteness effect: the context-availability model and dual-coding theory (cf. Paivio 1991). According to the context availability theory comprehension depends heavily on context that is either present in the discourse or accessible through prior knowledge and associations that the speaker/listener possesses. This model argues that concrete concepts have access to more associations so that there is quantitively more available information, making comprehension easier and faster. The dual-coding theory, on the other hand, assumes that all verbal stimuli initially activate the representations in the mental lexicon. In addition, concrete words activate information in the nonverbal imagistic system to which they are connected. This part of the comprehension process is difficult, if not

impossible in case of abstract concepts. This model argues that there are differences in the type of information connected with concrete words compared to abstract words. Although both models have received empirical support, the scale seems to shift in favour of the dual-coding theory (Paivio 1991). In an ERP study by Kounios and Holcomb (1994) participants were asked to judge the concreteness of a set of concrete and abstract words. The recorded interaction between word concreteness and distribution of scalp activation indicated that the cognitive resources tapped into during the processing of abstract and concrete words are not identical. This suggests that, rather than using more of the same resource, abstract and concrete concepts are processed differently which goes against the context availability theory. What is more, West and Holcomb (2000) showed that abstract words are processed more slowly than concrete words in tasks that require semantic processing, but with the same speed in surface (orthographic) recognition tasks (for instance, answering the question whether the word "bird" contains the letter Y). This suggests that the differences in processing time should indeed be attributed to the semantic properties of the stimuli.

Without doubt there are observable differences between abstract and concrete concepts. However, the exact nature of the difference between the two types is elusive. It seems that neuroimaging studies have encountered the same difficulty with defining concreteness as cognitive linguistic research. A common method for measuring the concreteness of a given concept is conducting a questionnaire among a set of subjects who will not be involved in subsequent studies based on the tested stimuli[8]. Participants are asked to rate a set of concepts on a scale, and the data is used to compute the concreteness score of a given concept (Feng et al. 2011). Some studies draw information regarding concept concreteness from concept information databases like the MRC Psycholinguistic Database (Coltheart 1981). Such databases not only provide information about the perceived concreteness of a given concept based on multiple subject data, but also include information about word frequency and familiarity. However, the latter method is not without its problems. First, there are still no objective criteria for defining whether a concept should be classified as abstract or concrete. It is true that there are reliable differences between the two concept types. Concrete words are associated with traits such as imagibility, whereas abstract words are not (Feng et al. 2011; see also: Paivio 1971), but this can hardly be considered an objective criterion. Second, the concreteness (and imagibility) of a concept is calculated on the basis of subjective judgements of a group of people. The

[8] This is done in order to avoid lexical priming effects that may confound the results (Joordens and Becker 1997).

key question here is whether popular judgement can (and should) replace selection based on objective criteria. For example, many people say that a dolphin is a fish, but that does not necessarily mean it is true; many people claiming that MOUNTAIN is a concrete concept does not constitute proof that it is. Concepts are cognitive phenomena so introspection may seem like an intuitive methodological choice. Nevertheless, I would like to argue in this chapter that introducing a set of objective criteria as the basis for the abstract-concrete distinction is a prerequisite for a successful conceptual model, particularly if the model is to retain predictive power in different cultural contexts[9].

Another problem with the questionnaire method of concreteness evaluation is that experiments usually utilise concepts that are located on the far ends of the (perceived) concreteness spectrum, making no predictions about concepts located in the middle and, more importantly, without introducing a scale for comparison. We know, for instance, that the words "umbrella" and "shoe" stand for concrete concepts, but is one of them statistically more concrete than the other? Does this hold for all tested subjects? If we compare concepts from the beginning with ones from the middle of the spectrum the difference in perceived concreteness may not be statistically significant, which effectively means their rank on the concreteness scale is relative both to other concepts, and informants. When researchers freely use phrases like "highly abstract" (Lakens 2010), "more concrete" (Gibbs et al. 2004) and "effects of concreteness" (Binder et al. 2005) the apparent lack of definition regarding the property of concreteness seems like a gross methodological oversight.

## 6. Are abstract concepts like dinosaur feathers?

Up to this moment it has been stressed that the distinction between abstract and concrete concepts is not one that can be intuitively made. A deeper look into cognitive studies makes it clear that the concrete versus abstract divide should not be considered self explanatory. In cognitive linguistics the explanation offered for the difference in concreteness is often limited to the assertion that, in contrast to abstract phenomena, concrete concepts are "more familiar" and can be directly experienced by the speaker (Gibbs et al.

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[9] Unless we assume that answers to concreteness questionnaires would be similar for native speakers of Polish and English, which is unlikely due to differences in questionnaire design and vocabulary choices (en. concreteness vs. pl. konkretność, materialność). For a more detailed discussion see the next chapter of this book.

1997). This definition is problematic for a variety of reasons (Szwedek 2010). First, because it introduces a very subjective element into to concreteness judgements. For instance, the concept of war can be considered abstract and concrete at the same time for two different persons with different backgrounds. It can be concrete if that person experienced it directly, abstract if they had been lucky not to. The second issue is the lack of definition of direct experience. Does directness depend on the presence of sensory input? Is this input limited to a specific sensory domain, or perhaps one sensory modality has priority over others? How is it possible to reconcile the claim that we experience journeys directly, but love is an abstract concept, an argument that has been used as an explanation for the conceptual metaphor LOVE is A JOURNEY (Lakoff and Johnson 2003)? These and many other questions have so far been left unanswered.

Unfortunately, neurolinguistics is facing a similar dilemma. In neurological research the distinction between abstract and concrete concepts is often assumed to mirror the distinction between perceptually acquired and encyclopaedic knowledge (Binder et al. 2009). Some studies define concrete concepts as "readily imagined" in contrast to abstract concepts which presumably are not (Fliessbach et al. 2006). The first distinction is measured in the form of the Mode of Acquisition parameter (MoA) that indicates whether a concept was acquired perceptually, linguistically, or both (Della Rosa et al. 2010). Because concept acquisition in infancy is associated with vocabulary acquisition (Mandler and McDonough 1993; Mandler 1999), and due to the introspective nature of questionnaire studies (which would ask questions such as "how do you think you learned this concept"), the MoA approach is problematic. It is true that there are measurable differences between concepts on the opposite sides of the concreteness spectrum. At the same time, it is still unclear what exactly is being measured by the concreteness parameter. We know that the processing of abstract and concrete concepts in the brain is qualitatively different. We have also established that abstract concepts are often described in terms of concrete phenomena (cf. Lakoff and Johnson 1980; Lakoff 1993). Nevertheless, we do not know if abstract and concrete concepts are interdependent and, if so, what is the nature of their relation.

Cognitive linguistics maintains that cognition is embodied, which would imply that abstract concepts are rooted in sensory experiences. We have seen that Pinker, an opponent of this view, claims that although the understanding of abstract concepts might have been based on perceptual input, abstract concepts no longer have any direct connection to the sensorimotor system (Pinker 1997). Both of these theories agree on one point: abstract con-

cepts derive from the brain's capacity to acquire concrete concepts. What they disagree on is their current relationship.

If we assume that the concept acquisition mechanism relies on physical experience, it is possible that abstract concepts are simply a case of exaptation. Exaptation is an evolutionary mechanism that allows for recruiting existing structures for new uses (Gould and Vrba 1982; after Casasanto 2010). In this sense exaptation would explain the nature of the relationship between abstract and concrete concepts. Is it possible that the capacity for abstract thinking evolved on the basis of a mechanism meant for something different that took on a whole new direction? In other words: are abstract concepts like dinosaur feathers?

Fossil records suggest that feathers did not evolve for flying. Originally, they served to regulate body temperature in small running dinosaurs. It was only later that those of the creatures with feathered limbs that were small enough to fly used feathers for flying (Gould 1991). Through exaptation the complex epidermal growths became more than imperfect cooling devices: they allowed dinosaurs to fly.

In a similar vein, abstract concepts may have also been the result of exaptation. Abstract and concrete concepts appear to share at least part of the mechanism responsible for concept creation and understanding. Research on the concreteness effect shows that abstract concept comprehension mainly activates the amodal (supramodal) regions of the cerebral cortex, whereas concrete concepts activate both amodal and unimodal cortical regions (West and Holcomb 2000; Della Rosa et al. 2010; Kounios and Holcomb 1994; Casasanto et al. 2001). It appears that, much as was the case with dinosaur feathers, some parts of the human mechanism for getting to know the physical world became useful for understanding non-physical concepts. These results seem to go in line with the embodiment theory, which states that concrete concepts are grounded in sensory experience. However, as mentioned in the previous chapter, embodiment does not sufficiently explain how the gap between the domains of the sensual and the non-sensual has been crossed to allow abstract thought. How did minds that evolved to understand concrete concepts and basic level categories such as BERRY, CAVE, or STICK begin to conceive of concepts that are not only complex, but in principle removed from any sensory representations? Cognitive linguistics assumes that the answer is to be sought in metaphorisation.

Metaphor is a means to organise abstract concepts drawing on previous physical experience (Johnson 1987: XV). CMT claims that metaphor is not only a means of expression, but also a method for the categorisation and understanding of the world (Lakoff 1993; Gibbs 1996). We not only speak in metaphors, they guide our thought as well. Can we prove that metaphorisa-

tion is the process responsible for the distinction between abstract and concrete concepts? The answer is: probably, but there never was much emphasis within CMT to do so. This fact was commented upon by Szwedek (2002, 2008) who proposed to introduce a number of amendments into the CMT paradigm.

## 7. Conclusion

We have seen that the abstract/concrete distinction is both an important and neglected issue. Most researchers agree that in metaphorical expressions the abstract is usually described in terms of the concrete (Gibbs et al. 2004; Gibbs 1996). However, it is unclear where to draw the distinction between those two concept types; there is also no conclusive answer regarding the nature of the abstract-concrete spectrum on which conceptual metaphor supposedly operates. If understanding abstract concepts is, as CMT suggests, metaphorical then surely it is important to define the criteria on which we classify a concept into one of those two categories. Szwedek's Objectification Theory (2000a, 2002, 2004, 2005, 2008) sets out to do just that.

Chapter 3

# Introducing Objectification Theory

The development of metaphor and the development of abstract thinking have been compared before (Casasanto 2010; McGlone 2001). If we consider metaphor to be a type of categorisation during which one phenomenon is categorised in terms of another, it is easy to draw parallels between metaphorical and abstract thinking. In both cases the abstract is understood in terms of the concrete. In CMT this rule has been referenced multiple times (Gibbs 1996; Lakoff and Johnson 1980; Boroditsky 2000; Matlock et al. 2003). Embodied and situated cognition assume that abstract thinking is based on concrete physical experience (Fogassi and Ferrari 2007; Semin and Smith 2008), a view that is supported by mirror-neuron accounts of language and cognition (Arbib 2006; Fogassi and Ferrari 2007), connectionist models (Thomas and Mareschal 2001), psycholinguistic and cognitive linguistic research (Szwedek 2010; Reddy 1979; Boroditsky 2000), computational models of language (Elman 1990) and, more recently, gesture studies (Chui 2011). A consensus seems to be emerging that understanding abstract concepts is based on principles that resemble conceptual metaphor. CMT (Lakoff 1987, 1993; Gibbs 1996) proposed a number of solutions to the abstract conceptualisation problem, but is questioned on as many issues as it purports to resolve. For instance, in light of the studies above it is reasonable to claim that an abstract concept such as LOVE is understood in terms of a more concrete concept JOURNEY in the LOVE IS A JOURNEY conceptual metaphor. However, this account remains plausible only until we ask on what grounds is JOURNEY considered to be more concrete than LOVE. It does not necessarily fulfil the "concrete concepts are directly experienced" criterion posed by Gibbs (1996) because without a very specific definition it is difficult to claim that we experience journeys more directly than emotions. After all, while journeys happen in the physical world, emotions affect our body which hardly makes the experience indirect. We also cannot intuitively claim that a journey is "more readily imagined" (Fliessbach et al. 2006) than love.

In fact, is hard to imagine a scale that would reliably identify love as a phenolmenon less (or more) readily imagined than journeys. Perhaps the best way to describe the LOVE IS A JOURNEY metaphor is not as a concrete-to-abstract, but rather less-abstract-to-more-abstract type of mapping. This perspective could have interesting consequences for conceptual metaphor theory should CMT choose to address it. Instead we are left with a vague assertion that the concreteness of the source domain is greater than that of the target.

We have seen in this chapter that concreteness has certain benefits for concept understanding. Concrete concepts are understood faster and remembered for longer than abstract concepts. Having this in mind, one needs to wonder whether understanding an abstract concept like LOVE through another abstract concept such as JOURNEY makes psychological sense. Would it not be more beneficial for humans to base their understanding of abstract concepts on the most concrete concept possible rather than something vaguely "less abstract" than the complex idea they are trying to comprehend? An object is probably the most basic unit that we perceive in the physical world. It is reasonable to assume that it could serve as the most useful reference point for abstract conceptualisation Yet, in CMT literature the metaphor X IS AN OBJECT can hardly be found among a plethora of proposed mappings resembling the one discussed above. In an effort to rectify this mistake, Szwedek (2011) makes a compelling argument that the X IS AN OBJECT metaphor is the most basic and widespread conceptual mapping.

## 1. What is objectification?

The first comment from most researchers faced which the suggestion that objects may be the basis of human conceptualisation and that objectification is a conceptual process through which abstract concepts receive properties of physical objects is "Why should there be such a thing?". As we will see later in this chapter, objectification holds significant advantages for the conceptual metaphor framework. Before we get to the why, however, let us take a shot at defining objectification. In short, Objectification Theory proposes that human conceptualisation is based on the notion of a physical object. Objectification is a process through which non-physical concepts acquire the properties of physical objects in the mental lexicon which permits us to imagine, manipulate and talk about them as if they were concrete "things". In his research Szwedek insists that the term 'objectification' is applied in consonance with its definition in the Oxford English Dictionary, that is an "action of objectifying, or condition of being objectified; an instance of this, an external thing in which an idea, principle, etc. is expressed concretely (...) To make into, or present as,

an object" (Simpson and Weiner 1989). However, it becomes apparent that the term is applied specifically with reference to ontological metaphorization from concrete to abstract domains, which he understands as a fundamental cognitive operation. Szwedek proposes that concepts are coded as belonging to the domain of physical objects before any other metaphorical operation can be performed. Any further description in terms of ontology, orientation, and structure is possible only as a consequence of objectification. This approach is contrasted to what is proposed by Lakoff and Johnson (2003) in the latest edition of their book, namely that ontological, orientational, and structural metaphors[1] stand on a par with one another in that that they are applied simultaneously, and are of equal importance. Szwedek (2004) argues that orientation and structure are not independent properties: they are properties of objects. Therefore, „before any entity can be assigned structure or orientation, it must be objectified first" (Szwedek 2004: 121). In essence, objectification is what happens to concepts like 'the universe' or 'quantum' before we are able to use them in expressions such as "the universe is expanding" or "quantum mechanics". We need to understand the boundless expansion of space as a limited sphere to be able to imagine it expanding, like an object would in space. To talk (and think) about infinitely tiny elementary particles like quantum in terms that may as well describe the operation of a steam engine requires a huge cognitive leap. Objectification, I would venture to say, is what may have enabled us to make this leap.

## 2. Explanatory value of Objectification Theory

As we have seen, objectification could be a welcome addition to the CTM framework. Objectification Theory has the potential to increase the falsifiability of the theory, introduces constraints on possible metaphorical events and helps generate testable hypotheses rather than post-hoc justifications. It could be claimed that adding another conceptualisation mechanism explaining concreteness effects is unnecessary as there exists a broader, intuitive rule stating that "target domains tend to be more vague and incomplete than the source domains" (Gibbs 1996: 311). We have seen, however, that this rule is neither particularly helpful nor easy to operationalise. It is true that Objectification Theory is an addition to an already successful framework. However,

[1] Saenz (1998) proposed an additional type of metaphor: the situational metaphor where something is compared to a situation (for instance "I could do this with both hands tied" meaning "this is very easy"). However, because this type of statement is structured like a hypothetical rather than category judgement I excluded it from the present analysis.

we have seen from the many arguments against Conceptual Metaphor Theory voiced in the first chapter of this book that CMT faces some increasingly urgent criticism.

Critics have long taken issue with the apparent lack of constraints on metaphorical mappings between source and target domains. This means that, in principle, CMT allows any mapping between two concepts, provided that the target domain can be considered less concrete than the source domain. This kind of freedom has far reaching consequences: because all mappings are considered equally possible CMT is unable to predict which linguistic expressions generated from a given conceptual metaphor will be judged as infelicitous by language users. By introducing Objectification Theory, which only allows certain mappings and assumes that inheritance of features follows a hierarchical structure (i.e. the object metaphor receives priority, then it is possible to map structural features followed by orientation) we fulfil the requirement for pre-metaphoric structure voiced by CMT critics (Vervaeke and Kennedy 2004; Glucksberg 2001) and improve the theoretical standing of CMT. Experiments based on the Objectification-CMT paradigm predict certain aspects of feature mapping and test the accuracy of these predictions. Objectification, as evidenced by the increased salience of object features in abstract verbal metaphors (Jelec and Jaworska 2011) could well be interpreted as the source of the type of pre-metaphorical structure that Glucksberg, Vervaeke and Kennedy found missing in CMT.

The Invariance Principle (Lakoff 1990, 1993) was introduced into CMT to account for feature inheritance. In its strong version the IP states that all mappings are partial; metaphorical mappings preserve image schematic structure; and all abstract level inferences arise via the Invariance Hypothesis. Turner, who was also involved in the development of the Invariance Principle (Lakoff and Turner 1989), formulated this rule similarly in his own work, but with more emphasis on retaining target domain structure. Metaphorical mappings "import as much image schematic structure from the source as is consistent with the target" (Turner 1990: 254). IP significantly increased the explanatory power of CMT with regard to felicitous and infelicitous mappings. It also left the theory with an issue that Objectification Theory proposes to resolve. The IP relies on the assumption that structure is a property of both the target and source domains. However, if we assume that the structure of concepts is grounded in embodied experience, and abstract concepts relate to this experience through metaphorization, abstract target domains by definition cannot have pre-metaphoric structure. Therefore, CMT either needs to add another process through which abstract concepts acquire structure, or reject the notion that the structure of the target domain influences the mapping. Since Lakoff himself presented an over-

whelming amount of evidence that the structure of target domains constrains possible mappings (1993) we are left with the first choice. As we know, objectification applies before other metaphorical processes[2]. Objectification Theory postulates that concepts are fundamentally understood in terms of physical objects. If abstract concepts are understood in terms of concrete objects before they undergo further metaphorisation, objectification as a process may be considered the source of abstract target domain structure.

Another problem in CMT is posed by the incompleteness of mappings (Ruiz de Mendoza Ibáñez and Pérez Hernández 2011). As we know, not every feature of the target domain can be mapped onto the source domain. Also, there is usually more than one mapping associated with the understanding of an abstract concept. For instance, in the expression "I quickly fell in and out of love with him" the mapping used for describing love is LOVE IS A CONTAINER. However, it is equally acceptable to say "we encountered some obstacles on our way to happiness", which conforms to the LOVE IS A JOURNEY metaphor. Outside of the assertion that the structure of the target and source domains must be preserved CMT does not offer any tools to predict which conceptual metaphors are useful, and which mappings within these metaphors are plausible. In the above instance, there is no way to predict which of the mappings generated by the LOVE IS A JOURNEY conceptual metaphor will be considered acceptable, well structured, or easy to interpret by language users and which will not. We intuitively know that out of the two conceptual metaphors LOVE IS A JOURNEY is more acceptable than LOVE IS A POTATO ("I peeled my way into his heart") but CMT is unable to predict such judgements. Even with the addition of the Invariance Hypothesis, CMT cannot predict that "this relationship is going nowhere" is a felicitous mapping, but saying "I made the reservation for our future together" is less so. Although Objectification Theory in its current form does not make explicit predictions about mapping acceptability, it can be used to design testable hypotheses regarding mapping felicity in a way that CMT cannot.

What is more, it is so easy for CMT to generate post hoc explanations of metaphoric expressions that the whole theory becomes unfalsifiable. Discovering a phrase that does not adhere to any known conceptual metaphor does not disprove CMT because anomalous or novel metaphoric language can be attributed to a different conceptual metaphor. This makes it effectively impossible to produce linguistic evidence against CMT. It is undoubtedly exciting for CMT to be backed up by a growing mountain of evidence, but just how credible is a theory built in a way that makes it impossible to dis-

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[2] Given the assumption that objectification is a type of metaphoric operation, retaining the original term "pre-metaphoric level" seems problematic, however.

prove? Empirically-minded sciences usually require theories to produce testable hypotheses and the theories themselves to be falsifiable, which puts CMT at a disadvantage. Objectification Theory introduces the hierarchical structure of metaphor which may be used as a step-by-step verification procedure for assessing mapping validity. In many ways, Objectification Theory can be considered a service pack that fixes known issues discovered within the CMT operating system. We have seen that its application may improve the applicability and reliability of CMT. What remains to be shown is whether OT adds significant explanatory power to the CMT framework.

We have seen that there are real differences between abstract and concrete concepts in terms of memory, speed of recognition, ease of comprehension, and associated brain activation. The concreteness effect, demonstrated in a number of neurolinguistic studies (eg. Della Rosa et al. 2010; Kounios and Holcomb 1994; Casasanto et al. 2001), prompted us to ask what was the best method for gauging concept concreteness. Researchers in the field of cognitive linguistics assert that abstract domains are more "vague" and "incomplete" than concrete domains, but are reluctant to provide specific criteria on which this judgement is based. Objectification Theory proposes the domain of physical objects as a benchmark for assessing the position of a concept on the concreteness scale. Classifying a concept on the scale of concreteness requires a platform of comparison valid for all conceivable concepts, or a *tertium comparationis* (Krzeszowski 1984). Szwedek proposes to use "density as experienced by touch" (2011) as a distinctive feature of concrete phenomena, using boundedness and structure as additional criteria. In this context the domain of physical objects is identified as the most basic source domain without which abstraction cannot be comprehended, and which does not undergo further metaphorization. The first step in concept understanding is the mapping of features that occurs between the concept and the source domain of physical objects. Structure and orientation are subsequently inherited from the source domain. Based on the notion of concreteness as experienced by touch, Objectification Theory introduces an amended conceptual metaphor typology.

## 3. Conceptual metaphor – an objectification based typology

We have seen that postulating the existence of pre-metaphorical structure of abstract concepts resolves many internal inconsistencies in CMT. Objectification Theory proposes that the domain of physical objects is the source of this structure. Concepts would acquire structure through objectification, a conceptual process where any abstract target domain is mapped

onto the broadly defined domain of physical objects. Szwedek suggested that other types of metaphorical processes depend on objectification and are hierarchically related to it. Consequently, he put forward a three level metaphor typology that includes metonymy-based, concrete-to-abstract and abstract-to-abstract metaphors (Szwedek 2011).

### 3.1. Metonymy based metaphor

The first metaphor type is metonymy-based metaphor. It accounts for mappings between two concrete concepts such as "Captain Thelwal is a perfect iceberg". This type of mapping involves a metonymic relation rather than a metaphorical one. Here we do not compare the whole of Captain Thelwal to an iceberg but rather his/her personality to a feature of the source domain (Szwedek 2011). According to Objectification Theory, a non-metonymic concrete-to-concrete mapping would be impossible because it would boil down to thinking that an OBJECT is ANOTHER OBJECT. Such a statement, Szwedek argues, not only isn't a metaphor but also cannot literally be true as objects cannot be other objects. Thus, he infers, it is impossible for the domain of objects to become the target domain of any metaphor (2011). Metonymy-based metaphors correspond in many ways to ontological metaphors (Lakoff and Johnson 1980), which were renamed by Lakoff and Turner as The Great Chain Metaphors (1989). These metaphors are based on a cultural model of the Great Chain of Being which establishes a hierarchical relation between objects, plants, animals, humans, and (in some versions) a deity, and attributes various features to concepts at these levels. Objects are assigned structural properties and behaviour, plants – natural, animals – instinctual, humans – higher level cognition and behaviour. The Great Chain metaphors highlight specific features of concepts in a mapping (Ruiz de Mendoza Ibáñez 1997), which makes them essentially metonymic. Metaphorical expressions such as "Captain Thelwal is a perfect iceberg" and "She has an eagle eye for details" would be classified as Great Chain (ontological) metaphors in CMT, and metonymy-based metaphors in Objectification Theory. In the broader framework, metonymy-based metaphors are more complex than metonymies, which are the easiest to comprehend among non-literal language expressions (Van Herwegen et al. 2013).

### 3.2. Concrete-to-abstract metaphor

Next on the complexity scale are concrete-to-abstract metaphors, a key component of Objectification Theory. In fact, Szwedek (2011) defines all metaphors of this type as objectification metaphors. Concrete-to-abstract meta-

phors are mappings where an abstract concept is understood as an object. For instance, when talking about thoughts we usually describe them in terms reserved for physical objects: "my mind is in pieces", "I have to gather my thoughts", "I'll toss you an idea or two" and so on. Szwedek suggests that the reason for this lies in evolution because objectification made it possible to account for increasingly abstract phenomena. When humans needed to understand concepts more complex and less tangible than APPLE or BRANCH they used their existing mental representation system to do so. Because the system was not developed for entertaining abstract thought these new types of concepts were processed in the object framework. "The new abstract entities were identified, conceptualized, and verbalized in terms of the only world that had been known to our ancestors, the world of physical objects" (Szwedek 2011: 345). Objectification Theory is in agreement with Casasanto's exaptation hypothesis (2010) which also states that abstract concepts are understood through a conceptual system that developed to cope with the physical world. However, while Szwedek identifies the domain of physical objects as the most basic source domain, Casasanto and many others (see Bloom et al. 1999; Gentner et al. 2002; Talmy 1983) say that ultimately conceptualisation relies on space. The space versus objects as the ultimate source domain debate will be analysed in more detail in the chapters on conceptual metaphor in gesture.

### 3.3. Abstract-to-abstract metaphors

Metaphorical mappings from an abstract source to an abstract target are the most frequently discussed type in cognitive literature. Papers investigating the conceptualisation of war in the media (Fabiszak 2007) or metaphoric expressions in music (Zawilinska 2013) almost exclusively focus on metaphoric mappings of this kind. In CMT these metaphors are usually classified as structural because the structure of the source domain is mapped onto the target domain in accordance with the Invariance Principle. For instance, the conceptual metaphor ARGUMENT IS WAR should actually be represented as STRUCTURE OF AN ARGUMENT IS STRUCTURE OF WAR (Szwedek 2011) because the mapping applies the structural properties of war to arguments. Participants in a discussion are described as opponents, arguments are weapons, beliefs are trenches that should be defended etc. (for a more detailed analysis see Lakoff and Johnson 2003). However, because neither wars nor arguments have the properties of physical objects, they are classified as abstract concepts. Abstract concepts do not have preexisting structure, therefore for this mapping to be possible both the target and source domains need to be objectified first.

Orientational metaphors belong mostly to the abstract-to-abstract category. Orientational metaphors are mappings between concepts that stand in some spatial relation to each other. Again, because of their lack of physical structure orientation is not a natural property of abstract concepts (Szwedek 2011). Therefore, concepts in orientational metaphors need to undergo objectification before they can acquire spatial properties. Metaphors of states such as HAPPY is UP in Objectification Theory are classified as abstract-to-abstract because, as Szwedek argues, the word "happy" stands for the state of happiness, and states are routinely conceptualised as objects. Fictive motion expressions such as "the line ran across the yard" are not categorised as metaphorical in this sense because movement is a natural property of physical objects.

## 4. Why we objectify. Source domains, abstract concepts and the dinosaur feathers question.

Objectification and the resulting metaphor typology can be seen as steps towards developing a coherent account of conceptual metaphor. If OT is to play a non-trivial role in developing an account of mental representation, objectification needs to be both possible and plausible. It needs to be demonstrated whether OT is a better account of categorisation than other theories. For this purpose let me hypothesise briefly how objectification could operate as a function of the cognitive system.

According to prototype theory, human beings have the capacity to identify the features of the phenomena they encounter. Based on these features new objects are assigned to categories. Any time a certain phenomenon is categorised, it is stored as an exemplar of the category. We are able to form prototypical representations on the basis of these features and exemplars. These representations are basically abstractions from experience, and do not have to resemble any one exemplar of the category. For instance, we may have come in contact with a variety of dogs of different shapes and sizes, but the prototypical idea of a dog would be a mixture of their individual features. This theory regarding the structure of mental representation received support from empirical studies (Rosch 1973, 1999; Rosch and Mervis 1975; Rosch et al. 1976; Rosch 2011) and computational models (Chandler 1991). Prototype theory has two consequences for conceptual metaphor. First, it reinforces the connection between concept creation and categorisation. Second, the model is feature-based: concepts are composed of feature sets. As we know, metaphorical mappings are parallels drawn between the features of two (or more) concepts. However, it is impossible to construct an exhaustive

set of features characteristic for any given category because concepts can be characterised by an infinite number of features[3]. For instance, dogs can be described as furry (or not), barking (or not), four legged (unless they are not), heavy, subject to gravitation, alive and so on. In principle, it is possible to draw an infinite number of parallels between any two concepts. Any two things are infinitely similar. Consequently, all mappings are theoretically possible but not all mappings occur. Because CMT alone seems unable to explain this let us look at concept creation and metaphoric processes according to Objectification Theory.

Our minds developed in a way that makes us proficient in dealing with concrete concepts. Concrete concepts are learned faster and remembered better than abstract ones (Casasanto et al. 2001; Fliessbach et al. 2006; Kounios and Holcomb 1994). In the embodied cognition framework understandding abstract concepts is assumed to be grounded in concrete experience. However, neuroimaging studies show that abstract concepts primarily activate the amodal (supramodal) cortex and not the unimodal (sensorimotor) cortex (Whatmough et al. 2004). The sensorimotor cortex is responsible for processing sensory and motor input (vision, touch, smell etc.), whereas the supramodal cortex is a region primarily devoted to the integration of various types of input (Kounios and Holcomb 1994). Patterns of activation recorded during comprehension tasks are different for abstract and concrete concepts, although there is some overlap (Whatmough et al. 2004). Objectification Theory explains this distinction by stating that abstract concepts are metaphorically understood in terms of physical objects. Abstract concepts do not need to be directly grounded in sensory experience because they are objectified – understood as if they had the features of a physical object. Thus, they are represented primarily in the supramodal cortex.

Objectification Theory provides an interesting perspective on the development of abstract concept understanding. OT rejects the notion that metaphorisation is a separate conceptual process and fits in with evolutionary models (Casasanto 2010) that propose a common mechanism for conceptualisation instead. Objectification Theory gives a resounding "yes" as the answer to whether abstract concepts resemble dinosaur feathers in that they evolved from a general cognitive capacity through exaptation. Szwedek (2002) does not focus on providing a model or explanation of the mechanism through which abstract concepts acquire object properties. However, Objectification Theory appears to be uniquely suited to both empirical, and computational analysis which will be explored in more detail in the following chapter.

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[3] This has been one of the arguments against the classical representation theory later used to critique CMT.

## 5. Questions for Objectification Theory

The previous sections served to show how implementing Objectification Theory into the CMT framework solves a number of previously identified issues, including falsifiability, predictive power, and insufficient explanation for concreteness effects. It also provides criteria for a metaphor typology that is internally consistent and compatible with other approaches. However, introducing modifications to an established approach rarely resolves all issues and there are still questions that OT cannot answer at a purely theoretical level.

### 5.1. The ultimate source domain

Identifying the concrete domain in which abstract thinking is ultimately grounded has been the subject of a number of papers (see Szwedek 2011, 2000b). There are three major contenders for the position of the ultimate source domain: structure (Grady et al. 1996), space (Radden et al. 2007; Vervaeke and Kennedy 2004) and object (Szwedek 2000a). We have already seen that structure is not a viable candidate, if only for the fact that the ultimate source domain imposes its structure on concepts. Adopting structure as the source of structure is not only a tautology, but also not a very useful one. Many accounts of abstract concepts, particularly those focused on the notion of time, argue that space is the most universal source domain (Gentner et al. 2002; Casasanto 2010). Both fictive motion and spatial reference systems for time have been presented as evidence that space provides structure to abstract concepts. On the other hand, space can only be understood in relation to physical entities such as the observer or other objects (Szwedek 2011). Objects play a more primary role in conceptualisation than space because it is impossible to understand space without understanding physical objects. Interestingly, it is not uncommon for blind children to conceptualise the notion of space in terms of time (Marek 1997), which would not be possible if space was the basis of conceptualisation. Blind children consider time (for instance, the time it takes to move between two points in a room) a more basic experience than space. This is presumably because seeing persons experience space visually, while spatial orientation in blind children develops primarily through touch[4], both directly and with the aid of the white cane. One blind primary school student said they believed that

[4] Spatial orientation and orientation exercises with a cane form an autonomous part of the curriculum in the educational process of blind and seeing impaired students (Dąbrowski 1964).

non-blind people see into the future. This perspective may appear baffling until we understand that if we put a seeing person and a blind person at the same distance from an object, the former will be able to experience it immediately by sight, while the latter would have to walk to the object to touch it. From their perspective, the blind person would experience that object later than the sighted person. Clearly, blind and seeing speakers relate both time and space to tangible objects. In line with these observations, Objectification Theory proposes that the source of target domain structure should be sought in the domain of physical objects. Szwedek also points out that touch is the first sense to develop in the human foetus (Szwedek 2000b) so it is potentially a good point of reference for subsequent sensory-based processing. Although touch and tangibility constitute a useful tertium comparationis for gauging concreteness, the objective importance of touch for conceptualisation needs more proof. Touch is by no means the only channel for receiving information about the external world available to children, nor can it be presumed the most important one. While Objectification Theory may accurately describe the relation between abstract and concrete concepts, more data is required before deciding if the role of touch is as great as postulated, or if tangibility is a useful device for assessing concept concreteness with little neurological validity beyond that.

### 5.2. Internal consistency

Although for the most part OT remains internally consistent, a few questions regarding permitted mappings, mapping permanence and the role of metaphor in conceptual processing need to be asked. In his latest work on objectification, Szwedek mentions that he considers the object concept to be primary in a sense that it cannot undergo further metaphorisation. After objectification is applied to abstract concepts, the metaphoric relations between concepts are classified as abstract-to-abstract. However, if both concrete and abstract concepts are ultimately concrete because of the primacy of objectification, should all mappings not be ultimately classified as concrete-to-concrete (which Szwedek says is forbidden)? Another issue that needs to be addressed in OT is its cognitive status. Defining objectification as a basic conceptual process is problematic because it cannot at once be a metaphor and the source of premetaphoric structure. In an attempt to resolve this issue, the following chapter takes a closer look at objectification's status as a cognitive procedure and compares it with an alternative approach in which it is classified as an emergent feature in a dynamic system. Finally, the status of objectification needs further analysis with regard to its permanence

and the effect on processing. The philosophical discussion regarding the status of metaphor as an ontogenetic vs phylogenetic process provides an interesting starting point for debate. "Is ontogenetic concept acquisition isomorphic with phylogenetic concept formation? In the case of abstract concepts, is conceptual metaphor equally indispensable in both processes?" (Krzeszowski 2002: 267). Without doubt, to retain credibility OT needs to be established in a broader cognitive context.

## 6. Is CMT better off alone?

Occam's razor is a methodological principle stating that science prefers the simplest explanation able to account for all the data (Myung and Pitt 1997). Before introducing a new approach to abstract concept understanding it is necessary to demonstrate that there is an actual need to do so, and that the new theory is more coherent than the previous paradigm. I would argue that Conceptual Metaphor Theory plus Objectification Theory (CMT-OT) paradigm is better than existing theories of conceptual metaphor in that it is more empirically-focused, internally and externally consistent, and has a bigger potential in terms of generating interdisciplinary research.

As demonstrated in the first chapter, CMT has been accused of circularity of argumentation and lack of predictive power (Murphy 1997). After the addition of Objectification Theory, metaphorical mappings follow a set of constraints introduced gradually in a metaphorical process chain. Objectification can be tested by comparing its predictions to actual linguistic expressions. For instance, OT would predict that physical structure mappings occur in all metaphor types. Therefore, they should be judged as acceptable for any metaphoric expression that has been constructed in accordance with Objectification Theory. CMT-OT is conducive to empirical research in a manner impossible for unconstrained CMT.

What is more, CMT is primarily an account of declarative knowledge because it analyses metaphor in terms of (conceptual) feature mapping. Cognitive semantics accounts for procedural knowledge via separate theories including image schemata (Rohrer 2005) and blending (Coulson and Oakley 2000). By proposing an explicit link between perceptually acquired knowledge (physical properties of objects) and encyclopaedic knowledge (characteristics of abstract concepts), Objectification Theory ties procedural and declarative representations in a coherent framework.

It has been also mentioned that structural metaphors are both the most frequent, and the most frequently analysed type of conceptual metaphor. CMT alone cannot explain their prevalence in language. In the OT metaphor

typology, however, structural metaphors are classified as abstract-to-abstract metaphors. The remaining two categories: metonymic metaphors and objectification metaphors are far less frequent than structural metaphors. Metonymic mappings focus on one salient feature of a concept which limits their usefulness and expressive power. Objectification metaphors are rarely identified as metaphoric because the objectification process is usually unconscious. Clearly, abstract-to-abstract metaphors are the most fertile and flexible which increases their likelihood of appearing in discourse. The CMT-OT paradigm provides a plausible explanation for the prevalence of structural metaphors over others.

Finally, while CMT is difficult to implement in a computational framework, CMT-OT provides the type of structural constraints that may be used to guide the development of computational models. The fourth chapter focuses on reconciling computational and non-computational approaches to mental representation in CMT-OT without being reductionist.

Having reviewed the strengths and weaknesses of Objectification Theory, we can begin to entertain the idea that it constitutes a welcome change to the conceptual metaphor research paradigm. Introducing specific grounds for the abstract/concrete distinction may seem like a philosophical endeavour, but the resulting coherence in terminology has the potential to improve relations between linguistics and neurolinguistics, making experimental designs less subjective. Studies that use stimuli classified as concrete or abstract based on a relatively stable criterion may also prove easier to replicate. While their usefulness for study design cannot be overrated, databases of concept features are a way to circumvent the problem that Objectification Theory proposes to resolve.

## 7. Conclusion

Objectification Theory opens up new avenues for studying the relationship between concrete concepts and abstract reasoning, a question that has not received a conclusive answer. In doing so, OT reconciles different approaches to mind and brain studies. One could hope that this will become a stepping stone between cognitive research paradigms already overlapping in terms of the studied domain, but much less so with regard to methods, assumptions, and terminology. Nevertheless, a number of issues need to be addressed in order to define the usefulness of Objectification Theory. These issues, including its status as a process or feature, falsifiability, and general usefulness are the subject of chapter four.

Chapter 4

# Objectification as an emergent feature of conceptual metaphorization

*"To understand categorization it is necessary*
*to further understand processes of perceptual feature creation"*

*(Markman and Dietrich 2000a: 472)*

We have seen in the previous chapters that the existing accounts of mental representation cannot provide a satisfactory account of abstract concept understanding. It has been demonstrated that the distinction between abstract and concrete concepts, although operationalised in a variety of experiments, is not based on a set of objective criteria. We have considered potential alternatives to the existing accounts and identified tangibility as a useful abstract/concrete distinction criterion following Szwedek's Objectification Theory (Szwedek 2000a, 2002, 2008, 2011). We have also considered the plausibility of OT as a conceptualisation model. Objectification Theory was found to be an improvement over Conceptual Metaphor Theory consistent with both the theoretical accounts of mental representation (Ritchie 2003; Martin 2007) and experimental research (Della Rosa et al. 2010; Casasanto et al. 2001). Furthermore, OT has been shown to increase the predictive and explanatory power of CMT as an account of conceptualisation. This chapter focuses on assessing the plausibility of Objectification Theory in the context of research on abstract concept creation, in particular its compatibility with connectionist cognitive models. In order to place it in the more general framework of cognitive semantics we consider two contrasting implementations of the theory: objectification as an emergent feature and as a process. Feature emergence is a topic particularly well researched in connectionist modelling, where artificial neural networks are built as analogies to human conceptual systems.

# 1. What are neural networks for? Connectionist models in cognitive science

The idea that neural networks can be used to advance our understanding of the mind dates back to cognitive connectionism[1], a computational modelling approach to cognition. The name connectionism describes those approaches in the fields of artificial intelligence, cognitive psychology, cognitive science, neuroscience, and philosophy of mind that create models of mental and behavioural phenomena as processes that emerge from the activity of interconnected networks of simple units. Many connectionist traditions use neural networks as models of the brain and/or mind. Network models of cognitive functions changed the study of natural semantics and conceptualisation, becoming a major step in rethinking the nature of concepts. Research on concept learning has been revolutionized by neural networks that showed learning is possible in the absence of negative examples (Regier 1996), complex rules can be learned on the basis of simple premises (Elman et al. 1998), and that simple networks (perceptrons) learning to categorise patterns arrange them into "concepts" with prototypical structure resembling the one proposed by Rosch (1999). By demonstrating that abstract symbols and explicit rules are not necessary for higher-level cognitive processing connectionist models have been instrumental in undermining the classical theory of mental representation (Markman and Dietrich 2000a). Although neural network models do not claim to reflect actual brain architecture, they do try to emulate its computational properties and structural constraints and serve as analogies of the cognitive processes they perform (Westermann et al. 2006).

Connectionism attempts to shed light on a variety of cognitive functions by taking into account the relationship between the structure and functions of the brain. For instance, Regier's (1996) model of spatial language learning based on the principles of cognitive semantics learned spatial terms from a variety of natural languages through a set of videos that showed objects in different spatial relations and displayed the names of those arrangements. For instance, one object hovering over another would be accompanied by the word "above". The network learned those spatial relations and their de-

[1] Connectionist modelling has a lengthy and fascinating tradition the description of which unfortunately lies beyond the scope of this book. After the cognitive revolution, the theory functioned under the name New Connectionism to underscore that the discipline espouses connectionist assumptions but can be applied in agreement with cognitive semantics (Brugman 1990; Lakoff 1987; Talmy 1983). The discussion in this book pertains mainly to New Connectionism.

scriptors, and demonstrated its knowledge by naming relations in videos that were not part of the teaching set. The model is a structured connectionist network based partly on cognitive semantic research on concepts, and partly on the mechanisms of human visual perception. Regier's study is of tremendous importance for cognitive science because it demonstrated that even complex conceptual operations can be learned on a purely neural and cognitive basis without the necessity for explicitly stated rules or abstract symbols.

Conceptual Metaphor Theory revealed that spatial relations are not merely used to reason about space, but constitute a vital part of abstract reasoning through metaphoric mappings (Talmy 1983). Regier's model shows that spatial relations can be learned without recourse to rules and symbols. By showing that those representations are employed for abstract reasoning, CMT effectively dismantles Markman and Dietrich's (2000b) argument that amodal concepts are prerequisites of abstract thinking. Clearly, such circumstances make CMT and connectionist modelling great allies in the quest for understanding abstract conceptualisation.

Although constrained neural networks are usually based on neurological and psychological data regarding brain behaviour and structure, they are not meant as simplified replicas of the brain. Even such relatively well researched brain mechanisms as visual perception are far too complex to be replicated in this manner (Tadeusiewicz 1974). The main aim of neural networks is explanatory. Connectionist models are constructed to shed light on a given cognitive process, and should be considered analogies or approximations of brain states rather than attempts to replicate brain structure (Duch 2009). Interestingly, while network models are informative when they perform successfully, the most insight is gained from their mistakes. A successful model in this sense is not one that outperforms its human equivalent, but rather one that performs on a similar level of accuracy and makes similar types of errors. For instance, Elman (1990) designed a network that had to predict the next phoneme in a string of sounds constituting a grammatical sentence. The network was fed a set of sentences in order to determine the statistical likelihood of a phoneme appearing in a given context. The learning algorithm then used the difference between the predicted phoneme and the actual sound to improve the accuracy of its predictions. In the course of the experiment the network learned to accurately predict sounds. But that was not all it learned! In addition, it began to identify word boundaries. Perhaps the most interesting "side effect" of the experiment was that when the model identified word boundaries incorrectly the mistakes it made were remarkably similar to those made by young children learning to speak. Its mistake was separating sounds into non-words and articles. This type of error is

common in children's language, for instance "a nelephant" or "a dult". By drawing analogies between a simple network and the human mind such experiments improve our understanding of human conceptual processes.

## 2. Emergence of meaning

Elman's experiment brought to light another important aspect of connectionist models: the phenomenon of feature emergence. Finding boundaries between words was not a task pre-programmed into the network, nor was it intended by its creators. Splitting sentences into words was a consequence of the learning and adjustment processes taking place in the network. The observation that some complex systems manifest higher level properties that are not attributable to their components is called emergence (Sawyer 2002). Emergence of meaning is one way to explain the fact that simple electric activity in a network of interconnected neurons leads to the infinitely complex phenomenon that is human thought.

As a cognitive approach, connectionism claims to be based on the architecture of the human brain. Its main assumption is that cognitive functions can be modelled with the help of artificial network structures (Thagard 2005). Cognitive processes are represented as activation spreading through the units of a network, the organisation of which may be constrained to provide a better analogy to brain function and/or structure. In principle, neural networks are only composed of units and weighted connections between them, making simplicity an important advantage of this approach. All connectionist models can be deconstructed into four elements: units, connections, activations, and connection weights (Mareschal et al. 2007). The units of a connectionist model are basic information processing structures similar to neurons in biological networks. One unit can represent the function of one neuron, or a group of neurons (Thagard 2005: 116). Connectionist models are typically composed of many units arranged into layers to mimic the structure of the brain. In most models units are organized in three layers: the input, hidden and output units. The input units supply information, which is computed by the hidden layer and the solution can be read from the output units. If we want the network to learn, this solution is used to adjust the weights between units and achieve a more accurate output. As a result, neural networks can operate on arbitrary amodal symbols (the "mental" representation is removed from the "sensory" input having been computed in the hidden layer) as well as perceptual representations ("mental" representations remain dependent on the input) (Gibbs 2000). Generally speaking, neural networks can be built with a capacity for handling abstract concepts.

## 2.1. Concepts and prototypes

There are two ways to represent concepts in a connectionist network. Older connectionist models were localist (Elman et al. 1998: 90) because each concept was represented by a single unit or node. In contrast, most current network models rely on distributed representations. In such networks propositions and concepts are dynamically represented as patterns of activation. If we think of a network like a string of christmas lights, localist representation would be assigning meaning to one bulb flashing while distributed representations would be interpreting flashing as meaningful only if it followed a certain pattern. Distributed representations have important advantages over localist networks for modelling conceptualisation. One set of units (neurons) may be used to represent a variety of concepts through different activation patterns like a single chain of lights flashing in different rhythms. Brain activation resembles distributed networks more than localist ones. Distributed representations also use the space of a network more efficiently, because neurons can be used to signify a variety of concepts rather just the one they are permanently assigned. This property makes them consistent with the prototype theory of the mental lexicon (Rosch 2011). A concept does not consist of a single activated node, but rather an averaged pattern of activation that occurs when a typical set of features is given as input (Thagard 2005: 116). Activation spreads over many units that may represent features, so concepts that are similar will cause similar patterns of activity (Elman et al. 1998). Therefore, the network may begin to cluster similar concepts together resulting in the emergence of a prototypical representation, one that is composed of the features most common in the cluster. In a way, prototype structure can be seen as a property that emerges during conceptualisation.

## 2.2. Feature emergence

Connectionist networks are probably the most straightforward examples of feature emergence. We construct a network to learn a certain task and sometimes that network acquires additional skills in the process. Feature emergence is a common phenomenon. When building hives, bees construct bubbles in which they store honey. Initially every bubble has a round shape which is changed by the pressure from the walls of the six neighbouring cells. The hexagonal shape of a cell in a honeycomb is not something the bee intended to make but rather a feature that emerged in the construction process. Feature emergence can also be seen in linguistics. In metaphor under-

standing we talk about emergence when a non-salient feature of the target or source domain becomes salient in the metaphor (Utsumi 2005; Terai and Goldstone 2011). Non salient features are features that are not readily associated with a given concept (Becker 1997). For instance, the salient features of an animal such as a bear would include "large", "furry", "dangerous" while "cuddly" would not necessarily be the first thing to come to mind. However, a non-salient feature might become salient in a metaphoric setting, eg. if we say "He is such a bear" to mean someone large and relatively harmless. It could be argued that this type of emergence and emergence in a connectionist sense are only superficially related. A thoughtful look at both definitions shows that the similarities between connectionist and metaphoric definitions of emergence run much deeper.

Let us assume that metaphor is a categorisation process, and objectification is a primary type of metaphorisation. Because objectification is a largely unconscious phenomenon it would conceivably be difficult to study. It appears that both definitions of feature emergence can be applied to objectification. Objectification can be understood as an emergent feature of conceptual metaphorisation in the connectionist sense if we can show that it is an emergent function of the conceptual system. OT claims that objectification is a primary conceptual mechanism, and conceivably one that is a by product of applying the human capacity to understand physical concepts to interpret abstract phenomena. Hence, it is an emergent property in the connectionist sense. In the context of metaphor studies objectification may be considered an emergent property if we demonstrate that the object-ness of a concept is more salient in metaphor than outside a metaphoric context. Investigating this hypothesis is the subject of the study presented in this chapter. Both connectionist and linguistic definitions of feature emergence can be applied to investigate whether objectification is a plausible solution for the abstract conceptualisation dilemma. Should it be possible to show that objectification is a natural consequence of the structure of the conceptual system and simultaneously demonstrate its effects in language, OT would gain powerful evidence from two converging domains of cognitive science.

## 3. Objectification as an emergent feature

The previous chapter reviewed some of the arguments for introducing objectification as an additional conceptual process that facilitates the comprehension of abstract concepts and enables their further metaphorisation. At this point there are two possible interpretations of objectification: as a process and a feature. The process view is the one originally proposed by

Szwedek (2004) who defines objectification as ontological metaphorisation from concrete (physical) to abstract (phenomenological) objects. However, from a cognitive modelling viewpoint it is possible that acquiring object features does not require an additional process. My previous work on this subject suggests that if objectification is a consequence of using an object-focused conceptual system for the comprehension of abstract topics there is no need for a separate process because object-features naturally emerge during categorisation (Jelec 2009, 2013; Jelec and Jaworska 2011). Furthermore, defining objectification in terms of features rather than processes helps integrate it into a more general cognitive framework. Shifting the perspective from process- to feature-focused makes OT more relevant to research on conceptualisation because, rather than add an additional process that needs to be examined, we are proposing a property common for the whole conceptual system.

In my view there is no need for an object concept. In its original version, Objectification Theory points out that all concepts have object features which must have been inherited from an object concept during the objectification process. However, the conceptual system does not need an object *concept* if it already understands experience in terms of objects and relations between them. To propose the existence of an object concept is redundant because ultimately all concepts are object-concepts.

Neuroimaging research demonstrates that information about the salient features of an object (exterior characteristics, its movement and applications, structure etc.) is stored in the form of sensorimotor representations (Martin 2007). Objects belonging to different categories are represented in distinct, but overlapping neural networks. Consequently, we could argue that object properties emerge from the activity of those networks. If we apply this principle to abstract concepts, which are coded in the supramodal cortex and not directly connected to sensorimotor regions, what happens closely resembles objectification (Szwedek 2002; Jelec 2009; Jelec and Jaworska 2011).

## 4. Going beyond the object-concept

Language is a reflection of our psychological experience. Researchers in the cognitive linguistic tradition work on the assumption that access to information about conceptual structure is gained through language. Assuming this conceptual structure depends on the structure of the brain, we see that studies of the mental lexicon need to take into account a complex network of relations between the brain, the mind, language, and experience. Successful accounts of conceptualisation need to be compatible with neural network models. Approaches such as perceptual symbol systems (Barsalou 1999) and

dynamic cognition (Beer 2000) already take brain structure into consideration. As demonstrated in earlier studies (Jelec 2009, 3013; Jelec and Jaworska 2011), Objectification Theory is easily implemented into a network-based paradigm.

Let us postulate that the neural mechanism for categorisation and concept formation is a neural network that developed to cope with concepts directly accessible to the early humans such as physical objects. Its task would be to convert sensory data about objects into their multi modal representations in the brain. The sheer amount of sensorimotor stimuli accessible for any perceived natural object is overwhelming[2], therefore a mechanism for data filtering and compression is implied in the model. In a neural network this function may be performed by a hidden unit layer that has a slightly smaller capacity than either the input or the output layer. It has been shown that a visual perception network of this kind can learn to accurately label patterns (Schellhammer et al. 1998) and form prototypes[3]. The compression of data facilitates recognition of prototypical examples and inhibits the recognition of peripheral representations. What happens if a system developed for object understanding is required to cope with concepts increasingly removed from physical experience? One probable solution is that if a neural network designed to cope with tangible concepts is tasked with understanding non-physical concepts the data compression mechanism would still process any given notion as if it were an object (Jelec 2009), treating it as if it had physical properties, orientation and structure. In short, the concept would become objectified. Objectification is in this sense both a process and an emergent property of the neural mechanism for conceptualisation. Abstract language phenomena including conceptual metaphors are a consequence of this system rather than evidence for inherently metaphoric reasoning. In order to test the validity of this hypothesis we have studied objectification effects in concept understanding in an empirical study that is the subject of the second part of this chapter.

## 5. Objectification effects in concept understanding

As we have seen in the previous sections, there are two interpretations of feature emergence: connectionist and linguistic. The connectionist imple-

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[2] This may not be immediately obvious to neurotypical individuals but most sensory data is tuned out of our conscious perception. Studies involving children diagnosed with ASD (Autistic Spectrum Disorder) show that a disruption in this filtering mechanism leads to serious consequences, beginning with difficulties in language comprehension and concentration and ending in attempts at self harm as an effort to control the overflow of sensory input (cf. Bogdashina 2003).

[3] Of course our conceptual mechanisms are infinitely more complex than such models.

mentation makes it possible to view objectification as a process and feature in conceptualisation. The metaphor comprehension view permits for objectification to be interpreted as a feature that emerges during metaphor understanding. In this experiment we hypothesised that if objectification, as understood by Szwedek (2002), is an emergent feature of metaphorisation then abstract concepts would be judged as more object-like in a metaphorical context than outside of context. To investigate if object-ness is more salient at the metaphor level than at the word level we asked people to provide tangibility ratings for two sets of abstract concepts. This work follows the methodology developed by other emergent feature studies (Utsumi 2005; Becker 1997).

Because of its implicit nature conceptual metaphor is notoriously difficult to study at the mental representation level. One disadvantage of CMT is that conceptual metaphors underlying metaphoric expressions are elusive. If natural language expressions are used as stimuli there is virtually no means to ensure that a stimulus in the form of a metaphoric expression taps into the same conceptual metaphors in all subjects. On the other hand, conceptual metaphors in the form used by cognitive linguists (for instance LOVE IS A JOURNEY) are not ideal experimental stimuli. First, these are meant to represent the underlying mapping and would not necessarily be recognisable to participants in that form even if they were familiar with related metaphorical expressions. Second, these mappings rarely occur in natural language in that form which limits the psychological validity of such studies. Testing objectification, a process that we assume is unconscious and pre-metaphoric (in the sense that it is applied before abstract-to-abstract metaphors), faces additional challenges. If we assume that objectification is unconscious then conceivably it will not be salient enough to use in an elicitation paradigm which is the standard procedure in emergent feature studies (Becker 1997; Utsumi 2005). What is more, if objectification is the first step in a chain of metaphors then it is necessary to ensure that the method we use taps into the relevant level rather than further metaphorical mappings. With these considerations in mind, we decided to base the study design on metaphor comprehension and appreciation models (Terai and Goldstone 2011; Utsumi 2005) but use a Likert scale rating rather than an elicitation paradigm.

79 participants (12 male and 67 female) agreed to participate in the study. The participants were undergraduate students at the Adam Mickiewicz University in Poznań and Wyższa Szkoła Języków Obcych in Poznań aged 19-45 (mean age 24). All were pursuing higher level education, and most have participated in an introductory course to linguistics. All participants were native speakers of Polish. In order to ensure normal distribution of the data several participants had to be excluded from the analysis because

they submitted incomplete questionnaires or clearly misunderstood the task. We based the stimuli on 21 conceptual metaphors chosen from the Master Metaphor List (Lakoff et al. 1991). Each conceptual metaphor was used to generate two sentences containing conventional metaphorical expressions. The complete list of metaphors and sentences used in this experiment is provided in Tables A and B in the Appendix together with their literal English translations. These metaphors have 21 abstract target domains and 21 source domains that are identified as concrete on the basis of Szwedek's tangibility criterion (2011). In order to control for any effects of sentence structure two sentences were generated for every conceptual metaphor. For instance, BEAUTY is A FLOWER was the underlying conceptual metaphor used to generate the following sentences "Even the most expensive facial cream will not return her wilting beauty[4]" and "I do not trust him: he is overly invested in cultivating his beauty[5]" (Jelec and Jaworska 2011). Sentences containing conventional metaphorical expressions were assessed for their understandability and conventionality.

The participants were divided into two groups. There were two tasks. The first task was rating single concepts. The stimuli were topics or vehicles extracted from metaphors and presented alone, interspersed with some distractor words. In the single concept rating task the participants were asked to rate words on four 7 point Likert scales with regard to: familiarity, formality, valuation, and tangibility[6]. The values used in the analysis were tangibility and familiarity, the rest was used as filler scales in order to prevent participants from guessing the purpose of the study. Participants were given instructions at the beginning of the task, and the values on the scale were explained both orally and in writing. There was no time limit on the task. The second task was a metaphor rating task similar to the first one. The stimuli were conventional metaphorical expressions based on the conceptual metaphors identified for this study. Participants were shown sentences where one word was underlined and asked to rate the expression containing the underlined word on another set of four 7 point Likert scales. These scales measured familiarity, understandability, metaphoricity and tangibility[7]. The underlined word always represented the target domain of the conceptual metaphor.

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[4] This is a translation of the Polish sentence "Nawet najdroższe kremy nie będą w stanie przywrócić jej przywiędłej urody". The study was conducted in the participants' native language (Polish).

[5] "Nie ufam mu, on nadmiernie pielęgnuje swoją urodę".

[6] In the experiment these features were named "znajomość", "formalność", "wartość", "materialność" respectively.

[7] The Polish equivalents are "znajomość", "zrozumiałość", "dosłowność" and "materialność".

Again, there no time limit was set for the task. The second task was designed in a way that made each group receive sentences with concepts they have already assessed in the first task (primed) and with new concepts (unprimed). For both groups these concepts were different. All participants did both tasks (with different stimuli) and saw all concepts (but in different contexts).

A paired-samples t-test was conducted to compare tangibility ratings in metaphorical context and no context conditions. There was a significant difference in the scores for metaphorical context in both unprimed ($M = 3.09$, $SD = 1.3$) and primed ($M = 2.85$, $SD = 1.3$) conditions, and no context ($M = 2.32$, $SD = 0.94$); ($t(64) = -5.021$, $p < 0.001$). The study found no significant differences between the mean tangibility ratings for primed and unprimed instances, except in the case of the word "success" (sukces) ($t(63) = 2769$, $p = 0.008$). A graphic representation of the findings is shown in Figure 1. These results suggest that a metaphorical context does influence the perception of abstract concepts. Specifically, abstract concepts in conceptual metaphors are judged to be more tangible (concrete) than abstract concepts on their own. These results seem to support the hypothesis that objectification is an emergent feature of conceptual metaphorisation.

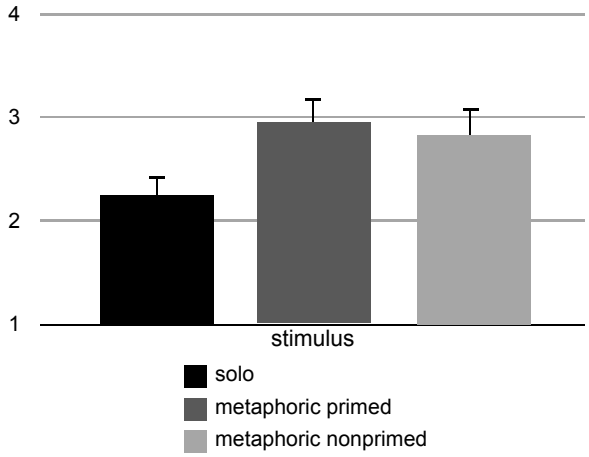


**Fig. 1.** A comparison of tangibility ratings for concepts judged separately (solo) and in a metaphorical context

Although the difference in tangibility judgements supports the OT hypothesis, some problems remain to be resolved. First, the objectification effect may be due to the sheer influence of sentence context on tangibility judgements and must not necessarily be metaphor related. We did try to control this factor by using two different contexts for each underlying con-

ceptual mapping. Also, preparing the scale names and sets of instructions that would not prime the participants or reveal the purpose of the study proved to be challenging. Indeed, some respondents seem to have interpreted the Polish word for tangible ("materialny") as money related, and rated the stimuli accordingly. These data points were excluded from the analysis. The issue, however, is a source of valuable insight for future studies.

## 6. Conclusions

Up to this point we have seen that Objectification Theory is an amendment to Conceptual Metaphor Theory not only increasing its empirical validity, but also compatible with a variety of cognitive paradigms including connectionist modelling and neurolinguistics. We have seen objectification effects in a language comprehension study. Machery's principle of operationalization change states that amendments to empirical paradigms should track theoretical change. In other words, changes in theory should bring about changes in empirical frameworks and theoretical change should translate into operationalization change (Machery 2007). The extent to which Objectification Theory will influence cognitive research methodology remains to be seen. Nevertheless, the predictions it makes need to undergo further testing. In the end, we need to remember Gibbs' (2000: 352) warning that "cognitive linguists should be conservative in both interpreting empirical data as evidence on mental representations, and in positing complex mental machinery that may not always be necessary to capture even complex facets of thought and language". Objectification Theory may provide an elegant solution to questions heretofore unanswered, but its reliability needs to be tested further before confirming its introduction into the CMT research paradigm. Due to the limitations of the experiments based solely on linguistic data it is difficult to convincingly demonstrate the existence and properties of those cognitive processes that we believe are unconscious (Murphy 1997). The linguistic evidence for objectification as an emergent feature presented in this chapter may be considered inconclusive. Research has reliably shown that language, gesture and cognition are interdependent (Sweetser 2008), and that conceptual metaphors are consistent in gesture and language (Cienki and Müller 2008). Therefore we turn to gesture for additional evidence supporting Objectification Theory. The following chapters focus on the relationship between language, cognition, and gesture as a source of non-linguistic support for Objectification Theory.

Chapter 5

# Conceptual metaphor, objectification and gesture

*"Speech and gesture together provide a more complete picture of mental representations than does speech alone"*

*(Alibali et al. 1999: 327)*

Despite centuries of research on the subject, human capacity for abstract thought largely remains a mystery. We may know the brain activation patterns evoked by the word love, but we are far from understanding how they translate to the meaning of the concept. We have seen in the previous chapters that abstract concepts are most likely based on references to physical experience. Research demonstrates that a vast majority of abstract concepts in language and gesture is represented in concrete terms (Lakens 2010), and many abstract subjects are commonly described as sensorimotor experiences. Let us take communication as an example. We speak about hurtful words and force of argumentation as if speech had a physical effect on the listener; we define communication as exchange of information as if meaning was an object that can be handed over. Everyday language suggests that abstract concepts are understood in terms of concrete experiences. Conceptual Metaphor Theory postulated that abstract concepts are metaphorical, which remains a controversial claim. Studies on conceptualisation have so far depended on linguistic data but there is an emerging consensus among researchers that language is no longer sufficient as the sole source of support for cognitive models (Murphy 1997: 101). As explained in the previous chapters, this crisis is largely due to the methodological limitations of CMT. One of its biggest challenges is demonstrating through language analysis that a specific mapping objectively exists. Lexical and syntactical priming, omitting information that is difficult to verbalise, vocabulary and memory limitations are all factors that influence linguistic performance in a cognitive task. Based on a certain set of linguistic expressions we can speculate about the existence of a specific conceptual metaphor, but if the source domain is implicit identifying the exact underlying mapping is virtually impossible. This

is both curious and unfortunate in a theoretical framework that puts linguistic expressions at the centre of interest (Gibbs 2011: 531).

On the other hand, spontaneous co-speech gesture is not constrained by the same factors as speech. Gestures are not influenced by the syntax of the test question or the manner in which the researcher worded the task. They convey visuospatial information in a way that is nearly impossible for speech, accompanying speech and filling in the blanks where language is inadequate. Gestures are so useful, in fact, that nearly everyone gesticulates. Spontaneous speech of most language users is accompanied by gesture (Goldin-Meadow 2003). Gesture has recently been identified as a valuable source of information about cognitive processes, particularly those that are not readily expressed in speech.

The previous chapter concluded that, although Objectification Theory has the potential to become an important step forward for conceptual metaphor research, more evidence is necessary to support it. I have shown that OT is consistent with CMT and with methodological approaches from outside cognitive linguistics. Objectification has been analysed as a process and an emergent feature. Research has shown that there is an "objectification effect" in conceptual metaphorisation, wherein abstract concepts are judged to be more tangible in metaphorical expressions than outside of context. However, due to the elusive nature of implicit mappings these results need to be approached cautiously. Before recommending the introduction of Objectification Theory into the CMT paradigm we need to look for further support for the theory. For this reason we turn to studies in metaphorical gesture.

## 1. The importance of gesture studies for cognitive science

It is almost impossible for people to talk without gesturing (Goldin-Meadow 2005). Gesture produced spontaneously alongside speech becomes integrated with that speech. In this way, both speech and gesture are manifestations of the same set of cognitive processes. One of the main assumptions of CMT is that metaphors are mappings between conceptual domains. These mappings are studied on the basis of linguistic expressions in which they appear. However, if metaphors are entrenched in the conceptual system then language should be just one of their possible manifestations. In other words, we should be able to see conceptual metaphors in various forms of human behaviour. Metaphorical mappings are present in a wide variety of fields, including visual media, music, and dance (Cienki 2008). Gesture studies show that spontaneous gestures produced alongside speech can also be metaphoric, demonstrating the ubiquity of metaphorical mappings in

human behaviour and thus providing CMT with a new source of support. In this chapter I will introduce some basic notions regarding metaphorical gesture studies, focusing on the conceptual aspect of gesture. We will analyse Objectification Theory in the context of gesture studies and dynamic multimodal communication.

## 2. What is gesture?

It is impossible to define gesture without mentioning language, and difficult to do so without referring to deeper cognitive processes. The first chapter of this book discusses embodiment as a theory of mental representation. We know that Embodiment Theory aims to explain the basis of mental representation by postulating that conceptual structures have developed from perceptual processes and remain influenced by this fact (Goldstone and Barsalou 1998: 234). In simple terms: cognition depends on bodily experience. "Without the cooperation of the body, there can be no sensory inputs from the environment and no motor outputs from the agent – hence, no sensing or acting. And without sensing and acting to ground it, thought is empty" (Robbins and Aydede 2009: 4). Conceptual Metaphor Theory is a marriage of Embodiment Theory and linguistic analysis, in that it postulates that everyday language reflects thought and is demonstrably embodied. Another important way in which embodiment manifests itself is spontaneous gesture accompanying speech (Barsalou 2008: 628). The relationship between language and gesture, however, is complex and depends upon how these words are defined. In a broad sense, the word "gesture" can refer to any wilful bodily movement (Cienki 2008). Gestures have also been defined as classes of coordinated movements that achieve some end (Kendon 2000). For the purpose of this book, however, we will focus on gestures of the hands and arms. We will also disregard the second part of the definition because it is difficult to conclusively identify the purpose of any given gestural movement.

Although gestures look like continuous movements, for research purposes they are usually deconstructed into smaller analysable chunks. In one of the earliest works on the topic Kendon (1972) introduced three distinctions: gesture units, gesture phrases, and gesture phases. A gesture unit is the largest unit identified in Kendon's hierarchy. It is the period between when hands are first raised to perform a gesture and their subsequent rest. Gesture units are composed of gesture phrases. One unit may contain one or more phrases. A gesture phrase is what we would intuitively call a gesture. Phrases have three main phases: the preparation, stroke, and retraction

(Kendon 2004)[1]. The preparation phase occurs when the gesturer moves their hands from the rest position to the position where the gesture will be enacted (the gesture space). The preparation phase may end in a pre-stroke hold (Kita 1990) during which the hand briefly hovers in the air in anticipation of a gesture stroke. Strokes are the meaningful phases of gesture. Strokes are required for a movement to be classified as a gesture (Kendon 2004). Although strokes are synchronous with co-expressive speech ninety percent of the time (McNeill 2005), the information expressed in gesture does not necessarily repeat the information conveyed in language. For instance, when we say "he hit him" the accompanying gesture could provide additional information about the manner of movement, such as whether the action was a slap or a friendly pat. A subtype of stroke is a stroke hold (McNeill 2005). A stroke hold occurs when the meaningful part of the gesture is not a movement, but a prolonged hold, for instance raising the hand into the gesture space (preparation), and holding it there. If the gesture contains a stroke, the stroke phase may end in a post-stroke hold. The hand freezes before a retraction, maintaining the position and posture of the stroke. The final phase of gesture is the retraction phase which marks the moment when meaning is completely discharged (McNeill 2005, 1992). The hand leaves the gesture space to enter the rest position. The retraction phase is optional because in some cases gesturers begin a new stroke immediately after the previous one. This temporal division of gestures will be applied throughout the rest of this book.

## 3. Types of gesture – Kendon's continuum

The first person to systematically distinguish between different types of gestures was Adam Kendon (1988). These types were arranged on a scale by McNeill (1992) who introduced them under the term "Kendon's continuum" to honour Kendon's contribution. It is worth remembering, however, that Kendon's continuum is actually McNeill's. Gesture types located along Kendon's continuum differ in terms of optionality and similarity to spoken language. The degree to which speech is an obligatory support for gesture decreases from gesturing to signs while the degree to which gesture has language-like properties increases. Although we will be focusing primarily on gesture co-occurring with speech, let us briefly review the gesture types introduced by Kendon to set the context for further discussion and analysis.

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[1] These are the original phases introduced by Kendon. Subsequently Kita (1990) added the notions of pre- and post-stroke hold phase. Stroke hold phases are also used to describe motionless strokes.

At one extreme of Kendon's continuum are signs, the units of meaning in a sign language (McNeill 1992). From very basic communication systems, such as those used by sawmill workers to communicate in a noisy environment, to fully developed sign languages, signs are typically used by persons who are deaf, or whose hearing is temporarily or permanently impaired (Kendon 2000). Sign languages have their own linguistic structure, which does not have to resemble the structure of spoken languages used in a given area. For instance, ASL (American Sign Language) and American English differ in terms of vocabulary, morphology and grammatical patterns they use. Similarly, the linguistic code of Polish Sign Language (PJM) is quite unlike that of spoken Polish (Tomaszewski and Rosik 2002). Sign languages have developed in a way that did not require coordination with speech. In fact, hearing users of sign languages find that attempting to simultaneously produce spoken language and sign is detrimental to both (McNeill 2005).

Further along the continuum is pantomime, a sequence of gestures performed in the absence of speech that conveys a certain story. Although pantomime does not dependent on language, Arbib (2006; 2006) cites it as evidence for a common evolutionary background of gesture and language and their joint dependence on the mirror neuron system.

Next on Kendon's continuum we will find emblems. Emblems are formulaic, quotable gestures. This type of gesture is what first comes to mind if the topic of gesture comes up in casual conversation. In contrast to gesticulation and speech-linked gestures, emblems have highly conventionalised meanings which makes them culture specific (Ekman and Friesen 1972). Examples include conventionalised signs such as thumbs-up (meaning "OK"), scratching one's chin (to indicate thinking), or Kozakiewicz's gesture (widely known in Poland as gesture of defiance, performed by sticking forward a bent elbow with the arm positioned vertically up). Emblems are relatively independent of language. They may occur in discourse, but they may also stand alone.

The final two categories, speech-linked gestures and gesticulation, are the ones most connected with speech. Speech-linked gestures are those movements that constitute parts of sentences by occupying a grammatical slot in a sentence (McNeill 2005). The gesture completes the sentence structure and adds to its meaning. For instance, describing a cat that fell of the edge of a couch we might say "And then the cat went..." and add a gesture suggesting an object rapidly falling down. This type of gesture completes sentence structure in an almost word-like manner. These gestures are often called non-redundant, supplementary, or mismatching gestures because the information they convey is not present in the accompanying speech (Hostetter 2011: 298).

Finally, gesticulation or gesturing is a motion that conveys a meaning related to co-occurring speech. Gestures of this type are often produced unwittingly while speaking (Cienki 2008). Gesticulation is the most frequent type of gesture, one that we witness and use on a daily basis (McNeill 2005). It is usually performed with the arms and hands, but it can also involve the head if hand movement is restricted (McClave 2000). Co-speech gesture presumes the primacy of spoken language as an information channel. Therefore, the information conveyed in gesture is secondary, and not as precise as that expressed in speech (Sweetser 2008: 359). Because they are largely unconscious and have no predetermined meaning, gestures of this type can provide insight into the cognitive processes accompanying language production. For this reason cognitive gestural analysis usually focuses on co-speech gesture.

Spontaneous gesture with speech is further divided into four subtypes: beats, deictics, iconics and metaphorics (Cienki 2008; McNeill 1992). Beats are rhythmic gestures which indicate that a word or phrase is significant in terms of discourse or pragmatics. A teacher lowering one of his palms onto the other along the rhythm of a children's rhyme is making a beat gesture. Deictics are pointing gestures aimed at concrete entities or spaces. For instance, a police officer may direct oncoming traffic by pointing in relevant directions with her extended finger or palm. Iconic gestures depict physical entities by demonstrating their form or movement, or representing a physical relation between objects. We may represent a tennis ball by holding out a palm with the fingers curved in its shape, by mimicking a throwing movement, or by representing the relation between a tennis ball and a racket using both hands to simulate playing tennis. Finally, metaphorics are gestures whose content presents an abstract idea. Arranging invisible objects on a table is a good example of a metaphorical gesture if accompanied by speech that indicates the speaker/gesturer is sorting things out in the non-literal sense. Interestingly, Müller (1998) demonstrated that gestures termed iconic and metaphoric by McNeill (1992) are equally iconic. The difference between them lies in the referent. Iconic gestures have a concrete reference to an entity, action, or relation; metaphorical gestures refer to an entity, action, or relation in terms through which the topic is characterized (Kendon 2000). This observation goes in line with CMT amended by Objectification Theory where both abstract and concrete concepts are viewed as embodied and distinguished only by the type of reference. Outside of the distinctions introduced in Kendon's continuum, gestures can be categorised according to a number of criteria. For the purpose of investigating conceptualisation it is important to be aware of the many, oftentimes subtle distinctions between gesture types.

## 4. Spontaneous and deliberate gestures

We know from the previous section that gesticulation is spontaneously and unconsciously produced during speech. Gesture analysis may lead to deeper insight regarding cognitive processes, particularly metaphor (Cienki 2008). However, in the age of body language seminars it is increasingly difficult to find speakers whose gestural repertoire is uninfluenced by some kind of gesture instruction. In contrast to spontaneous gesture, acquired gesture is not a reliable source of information about conceptual processes, particularly if taught with explicit focus on co-speech gestures. Even experienced researchers find it difficult to tell apart gesticulation that occurs spontaneously and gestures that are the result of training. One way to ameliorate this problem is to focus on analysing the gestural repertoire of people whose gestures are less prone to outside influences, such as the blind and severely visually impaired. The implications of this choice, as well as some methodological consequences are discussed in the following chapter.

## 5. Conventionality and discourse function

We have seen in the previous sections that gestures have varying levels of conventionality and cultural dependence. Different gesture types also perform different functions in discourse. The study described in the following chapter focuses mostly on gestures classified as spontaneous and referential. Gestures follow a gradient of conventionality; beginning with those that have fixed meanings in the culture in which they are used to spontaneous, often unconscious gestures the meaning of which highly depends on the context (McNeill 1992). The more conventional a gesture, the less it can tell us about the underlying mental processes. It is the spontaneous gestures that are the most informative, particularly because they are visibly interrelated with speech. In contrast to conventional gestures which remain the same throughout conversations in a given culture, spontaneous gestures may evolve even within the course of one conversation. Discourse function (Müller 1998) is another way to classify co-speech gesture. This typology distinguishes between gesture types on the basis of function, and introduces three new categories: discourse, performative and referential gestures. Discourse gestures serve to structure an utterance. Counting points on the fingers of one hand, or emphasizing a point in discussion with a beat are discourse gestures. Performative gestures serve a similar function to speech acts. Examples include asking for something by holding an expectantly open hand, or dismissing an argument by sweeping it away. Finally, referential

gestures denote concrete or abstract concepts. Because the present book focuses largely on the conceptual correlates of abstract and concrete concepts, the analysis of experimental data will revolve around referential gestures that have most likely been spontaneously produced alongside speech. We have seen that gesture and language can be separate, related or completely intertwined. It is also worth noting that these two modes of communication have many features in common.

## 6. Language and gesture: complementary modalities or separate systems?

Language and gesture are so intertwined that there is a range of hypotheses about their common origin (Arbib 2006). If our aim is to understand conceptualisation we must not only focus on how gesture is used in relation to speech, but also find in which circumstances their organization is different, and the ways in which they overlap (Kendon 2000). A number of parallels can be drawn between language and gesture at both extremes of Kendon's continuum. On the other hand, gesture and speech differ with regard to conventionality of symbols, monitoring of performance, and concreteness (Sweetser 2008).

Language is conventional in that most words have fixed meanings unrelated to their form. Spontaneous co-speech gesture, on the other hand, is non-conventional and flexible. A spontaneous gesture for "ball" may take many different forms: we can pretend to hold a ball, draw a ball in the air, pretend to throw it as a basketball or even bounce a ball-shaped bit of air a couple of times off the floor. Likewise, a gesture used to denote a ball in one context may mean something else in another. Much like spoken languages, sign languages typically have fixed signs for particular words or concepts. With the exception of culturally transferred quotable gestures (emblems) such as "thumbs up", co-speech gestures denoting particular concepts are not fixed and may even change in the course of one conversation (Kendon 2004). For instance, when describing a tree you might trace the trunk in the air, or represent a tree trunk as a hand, where extended fingers act as branches. Both of these gestures would be understood in the context of the utterance, and neither would be considered "wrong". However, the former is the sign for "tree" in Hong Kong Sign Language, while the latter approximates the lexical sign for tree in American Sign Language. Neither of the languages considers the other gesture for tree correct (Sweetser 2008). When gestures constitute units of language their meaning is quite rigid, while co-speech gestures are more flexible in form and in use.

Another difference between spoken language and gesture is how consciously we use them. In comparison to language gesture seems to be a channel of communication that is less consciously monitored. While we are often unaware of performing co-speech gestures, we rarely speak without knowing about it. However, it remains to be seen whether this depends on the type of medium used for communication or the communicative intent. Sign language users are as unlikely to sign unconsciously as speakers are to use their native language without realising it (Sweetser 2008).

Finally, out of the two modes of communication language is commonly seen as the more "abstract" and gesture as more "concrete." Gesture is more concrete not only in the sense that there is physical movement involved, but also because it employs object-focused representations. It relies heavily on representing concrete objects and relations between them, while abstract meanings are conveyed metonymically or metaphorically. Nevertheless, both spoken language and sign languages are concrete in that they are sets of muscular movements the results of which are physically experienced by the listeners. The difference is that sign language is a set of muscularly performed routines that are visible, whereas spoken language affects hearing (Sweetser 2008: 359). It remains to be seen whether this distinction can be operationalised in empirical studies of conceptual metaphor and objectification.

Another important question regarding the relation between gesture and language is whether they represent two separate systems, or are separate modalities in a common communicative framework. Proponents of the first view cite evidence for a common evolutionary background of language and gesture (Arbib 2006). Although gesture and language rarely express exactly the same information, they are often seen as manifestations of one underlying conceptual system (Cienki 2008; McNeill 2005, 1992; Goldin-Meadow 2005). Spontaneous gesture and speech are often coordinated (Cienki 2008) and their temporal arrangement suggests that language and co-speech gesture participate in the construction of meaning according to a shared plan (Kendon 2000). The "two modalities, one system" hypothesis is particularly well backed by studies showing that gesture reveals information that cannot be conveyed in language, yet is complementary to what was said by the respondent (Alibali and Goldin-Meadow 1993).

As we have seen in the previous section, the further a gesture type is classified along Kendon's continuum, the bigger its similarities to language. If we follow Saussure's definition of language, sign languages can be classified as languages rather than movements. That is, as long as we can prove that signs form arbitrary form-meaning pairs organised syntagmatically and paradigmatically, sign languages are just as language-like as speech (Kendon 2000: 47). Sign languages also tend to be independent of spoken languages, in

that most speakers cannot use the two simultaneously. Gesticulation, on the other hand, usually occurs together with spoken language. Gestures of this type are the least word-like and the most dependent on spoken language. It is these spontaneous co-speech gestures that are considered a source of evidence for mental representation complementary to linguistic data. Together with speech, gestures participate in the construction of meaning (Kendon 2000). They serve different but complementary roles. In the absence of speech gesture acquires the characteristics of language to serve the primary communicative role (Sweetser 2008). "When gesture is used routinely as the only medium of utterance (…) it rapidly takes on organizational features that are very like those found in spoken language" (Kendon 2000: 61). If gesture can take over the communicative role of language it is logical to assume that they must tap into a common conceptual system rather than be two separate communication frameworks. Therefore, gesture and language provide converging evidence for the structure of mental representation.

## 7. Investigating conceptual metaphor through gesture

Earlier chapters described the issues in conceptual metaphor research and enumerated some solutions. One of the issues in question was circularity of reasoning. In general, linguists infer cognitive structures (specifically conceptual structures) from metaphoric linguistic expressions. These conceptual structures, called conceptual metaphors, are in turn used to explain linguistic metaphors. A number of researchers found this rather obvious circularity problematic (Müller 2008; Vervaeke and Kennedy 1996; Murphy 1997). Moreover, the use of language data as the primary source of evidence for conceptual representations encounters a number of obstacles, particularly because linguistic performance in a cognitive task is influenced by many factors. Effects of lexical and syntactical priming, tendency to omit those parts of the message that the speaker finds difficult to verbalise (Ericsson and Simon 1993), individual variation in terms of known vocabulary, and limitations on memory capacity introduce noise into results of psycholinguistic studies. It is clear that speech provides us with only a fraction of information about underlying cognitive processes and is a channel that can be easily influenced by the experimental protocol. We need an additional modality that is not subject to these limitations. Many of the limitations that affect linguistic research do not apply to studies using spontaneous co-speech gesture. Participants will not mimic the text of the task in gesture as they would in speech. Gestures convey visuospatial information simultaneously with speech, becoming a valuable source of evidence about the mental

representations of the speaker. Finally, information that is not conveyed in speech may be conveyed in gesture. For example, children's gestures show their understanding of a mathematical task before they are able to convey it in words (Alibali and Goldin-Meadow 1993). This makes metaphoric gesture an important source of evidence for Conceptual Metaphor Theory. By demonstrating online metaphorical thinking outside of language, gesture studies support the claim that metaphor is both pervasive in communication and embodied (Chui 2011; Müller 2008; Cienki 2008). Gestures may serve as indicators of metaphorical mappings activated in speech. For instance, a speaker's gestures may refer to some aspect of the source domain of a metaphorical linguistic expression they are using. When someone talks about an event in the future and simultaneously extends one hand horizontally forward they unwittingly inform us that they are using the TIME is SPACE metaphorical mapping, or conceptualising events ahead in time as objects ahead in space. The metaphorical mapping that generated their linguistic expressions manifests itself in gesture, suggesting that it must have been accessible to modalities outside speech (Müller 2008).

One of the fundamental questions for CMT is how to distinguish verbal expressions that are metaphoric from those that are literal. Metaphors demonstrate various degrees of conventionality, and the more conventional the metaphor, the more likely it is to be recognised as such. For instance, it is much more common to see life described in terms of a journey than in terms of a banana (Cienki 2008). If we want to use the latter mapping, however, we usually make sure that the metaphorical meaning is salient enough to be understood. Increasing the salience of metaphorical meanings is possible through the application of lexical tuning devices that draw attention to the expression. For instance, once we say that life and bananas are related we might add the expression "so to speak" in order to ensure that our interlocutor understands the metaphoricity of the statement (Cameron and Deignan 2003). Highlighting metaphoricity is also possible in gesture. Gestures that are more dynamic than is usual for the speaker, gestures that refer to the source domain already expressed in speech, directing the eye gaze at the gesture, and marking one part of the utterance with gesture and sound (such as pitch changes, but also beats[2]) are all means to direct interlocutor's attention to the metaphorical meaning being expressed (Cienki 2008). We can see that gestural data do not merely replicate what is already known about conceptual metaphor from language data, but rather significantly contribute to the understanding of metaphor as a conceptual process.

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[2] For more on beat gestures and their role in highlighting aspects of an utterance see the last chapter of this thesis.

Clearly, there are many ways in which gesture can become an important source of evidence for CMT (cf. Langacker 2008). The prevalence of metaphoric gesture supports the view that metaphor is a fundamental aspect not only of language, but of conceptual organization (Chui 2011). Gestures conveying novel information (not expressed in language) confirm that metaphors do not depend on specific linguistic expressions (Alibali and Goldin-Meadow 1993; Alibali et al. 1999). The form and use of metaphoric gestures confirms one of the founding hypotheses of CMT, namely the embodiment of meaning in physical experience (Hostetter and Alibali 2008). Finally, co-speech gestures may be used to support or disprove a particular interpretation of linguistic metaphors in terms of their underlying cognitive mappings.

## 8. Concrete and abstract concepts in gesture

We have seen that gestures can provide important insight into the mind (McNeill 1992; Alibali et al. 1999; Kendon 1994; Casasanto and Lozano 2007; Hostetter 2011). When gesture studies became part of cognitive science this also meant that they inherited some of the theoretical problems of CMT, notably the lack of defining criteria for concreteness. For instance, on a certain level, one can make an argument that any gesture without a concrete referent is metaphoric simply by "virtue of representing an ontological metaphor, showing something abstract as concrete" (Cienki 2008: 16). Müller proposes that iconic and metaphorical gestures differ only with regard to the concreteness of the referent (1998), but others argue that abstract concepts can be depicted by iconic (non-metaphoric) gestures (Fricke 2004; after Cienki 2008). If true, this observation would go against both CMT and Objectification Theory which rely on the assumption that abstract concepts are always understood metaphorically. Therefore let us analyse the argument in detail. Fricke claims that a non-metaphoric gesture depicting an abstract concept occurs, for instance, when a teacher arranges her fingers in the shape of a triangle to evoke the abstract concept of a triangle. However, there are two possible classifications of triangles with regard to concreteness. Triangles are only abstract to the extent that they mean the abstract geometrical concept and not the physical representation of a triangle. That is to say, the *idea* of a triangle is abstract but a drawing or a model is not. Arguably, the gesture in question does not refer to the abstract concept directly but rather metonymically, much as the drawing of a triangle on a blackboard would. Therefore, what Fricke termed an abstract concept represented through an iconic gesture was actually a metonymic representation. The above example demonstrates that both Szwedek's metaphor typology and Objectification

Theory are potentially useful for gesture studies, because they provide a coherent framework with which such controversial statements can be discounted.

The beginning of this chapter reviews a number of gesture classification systems. The commonly used iconic versus metaphoric gesture distinction is based on the notion of concept concreteness: metaphoric gestures depict concepts that are not directly experienced by referring to concrete concepts that serve as the source domain for the relevant abstract concept (Müller 2008). As the previous paragraph shows, this definition can be problematic. What is more, the very notion of concreteness is inadequately defined in cognitive research. Previous chapters of this book discuss the consequences of introducing an object-based criterion for assessing concreteness, following Szwedek's work on Objectification Theory (2002, 2011). That criterion would be object tangibility experienced by touch. We have seen how introducing a practical benchmark for concreteness judgements ameliorates many issues in CMT when it is studied through language. In my view, Objectification Theory would also make a valuable contribution to gesture studies on conceptual metaphor.

## 9. Szwedek's metaphor typology applied to gesture

The metaphor typology introduced by Szwedek (2011) consists, as we know, of three basic metaphor types: metonymy based metaphor, objectification metaphor and abstract-to-abstract metaphor for which Szwedek uses the terms Type 1, Type 2 and Type 3 metaphor respectively. This objectification-based typology is a useful tool for cognitive linguistic studies because it operationalises the abstract/concrete distinction in a manner that is innovative, clear, and conducive to further analysis. Such a hierarchical framework could prove very useful for metaphor studies as it does not seem to be limited to just one modality. Thus, let us analyse the applicability of Szwedek's typology to gesture.

Type 1 metaphors (metonymy-based metaphors) account for mappings between two concrete concepts. The example used by Szwedek is "Captain Thelwal is a perfect iceberg", a mapping considered metonymic because it focuses on one feature of the target (in this case the personality of the captain) and compares it to the source domain. A similar phenomenon can be seen in spontaneous gesture. Fricke (2004: 180; after Cienki 2008) produces two examples that seemingly disprove the hypothesis that abstract concepts are always understood metaphorically. We have seen that the first example, the triangle gesture, could be metonymic. The second example resembles Szwedek's Captain Thelwal metaphor in that a metaphorical meaning is ex-

pressed as a mapping between two concrete concepts. In Fricke's example a person insultingly refers to someone as "this donkey" (in German: "Dieser Esel!") while holding hands up at the sides of her head in a manner that imitates donkey ears. The meaning is clearly non-literal, yet expressed via a concrete referential gesture. Cienki (2008: 9) interprets this to mean that metaphoric mappings can be expressed by non-metaphoric gestures, a claim that would undermine the basic assumptions of CMT. I would like to propose that instances highlighted by Fricke (2004) should be classified as Type 1 metaphors because the relation between domains is clearly metonymic. Consequently, the "donkey ears gesture" is treated similarly to the Captain Thelwal metaphor in that both are considered metonymies where one aspect of the target domain (captain's personality or the insulted person's intelligence) is highlighted, and compared to the source domain (an iceberg or a donkey). The "donkey ears gesture" refers to the concept of a donkey through features that are distinctive for this type of animal (long ears) and is, therefore, metonymic. By identifying these types of expressions as Type 1 metaphors we are able to show that CMT assumptions are not violated, while providing a theoretical analysis of the mapping.

Type 2 metaphors are a key component of Objectification Theory. They are concrete-to-abstract mappings where an abstract concept is understood in terms of a physical object. These metaphors are usually overlooked in language because of their ubiquity. Also, due to the fact that they apply at the beginning of a chain of metaphors, objectification metaphors are likely to be overshadowed by the more saliently metaphoric Type 3 expressions. The situation in gesture is quite the reverse, as object-based metaphorical gestures are the targets of a significant amount of attention (Cienki 2008). Object-based gestures are gestures in which the hands are shaped as if holding or supporting an object. They are often used to refer to an abstract notion such as an idea being discussed. Interestingly, Type 2 mappings are much more visible in gesture than in speech. In fact, gestures reveal that people understand non-physical events as objects (Chui 2011: 439). Gestures can depict spatial elements of mappings in a manner that is impossible in language (Gibbs and Berg 2002) because of the externalisation of meaning. Only in gesture is it possible to depict an idea by holding out an arm with an open curved palm, compare it to another idea depicted by the shape of the other hand by pretending to weigh them, and offer the chosen meaning to the interlocutor by means of extending the palm which "contains" the relevant object. All of these features make gestures powerful means to demonstrate the effects of objectification.

Metaphorical mappings of the third type discussed by Szwedek (2011), that is from an abstract source to an abstract target, are the most frequently

discussed in cognitive literature and arguably the rarest in gesture. Gestures generated when describing abstract concepts usually refer to the physical domain and are quite congruent across age groups and cognitive levels (Hurtienne et al. 2010). The embodied nature of gesture leaves no room for abstract-to-abstract metaphorical gestures because, as we have seen, abstract concepts are depicted by metaphorical referential gestures. Thus, they are essentially Type 2 metaphors. While attaching another metaphoric layer in language does not pose a problem, metaphoric chains are difficult if not impossible in gesture. In language abstract concepts are denoted by words, in gesture they are depicted by reference to concrete concepts. Consequently, the source domain of gesture remains entrenched in physical reality.

## 10. Conclusions

The iconic manifestations of thought in gesture prove that metaphoric thought is not lexicalised, supporting the idea that conceptual metaphor is a neurally based cognitive phenomenon (Lakoff 2008). Psycholinguistic studies have already shown that even highly conventionalised metaphors are analysable, and their meaning is embodied rather than simply retrieved from the mental lexicon (Gibbs 2008: 295). It is clear that the study of gesture can make a number of important contributions to conceptual metaphor research. First, it addresses the critical comments regarding circular logic applied in CMT, a criticism voiced often (Murphy 1997; Vervaeke and Kennedy 1996) and reviewed extensively in this book. Gesture provides an independent source of evidence regarding the psychological reality of conceptual metaphors. Second, gesture provides support to the embodied cognition theory (Hostetter and Alibali 2008) by demonstrating that many, if not all, concepts are ultimately embodied. Spontaneous co-speech metaphoric gestures are grounded in physical experience, but sign languages also have long been known to depict metaphoric source domains as physically grounded (Taub 2001). By extension, research on metaphorical gestures supports CMT, particularly if Objectification Theory is assumed. On a certain level it is possible to argue that any gesture without a concrete referent is metaphoric because it shows a non-physical concept in physical terms (Cienki 2008). Interestingly, a statement like this comes very close to the definition of objectification, which describes the process as ontological metaphorisation from a concrete to an abstract domain (Szwedek 2005). It seems that just as Objectification Theory brings important insight into CMT, gesture can become a source of evidence for objectification. Nevertheless, both the theory and the medium pose additional challenges for empirical research.

Chapter 6

# Objectification effects in the gesture of blind and visually impaired children and young adults[1]

*"When people talk, they gesture. With movements of their hands, speakers indicate size, shape, direction, and distance, lend emphasis to particular words, and highlight essential phrases"*

(Iverson and Goldin-Meadow 1997)

Gestures are primarily understood as communicative hand movements, and it is reasonable to assume that they are learned and used on a visual basis. But, as we have seen in the previous chapter, their function is not limited to communication. We gesture in situations where the interlocutor cannot see our movements: in telephone conversations (Cohen and Harrison 1973; Cohen 1977), when obscured from our interlocutor's view (Alibali et al. 2001), or separated from an audience by a booth located behind their backs during simultaneous interpreting (Mol et al. 2009). Both blind and seeing persons use gesture, even in conversations with an interlocutor whom they know to be blind. Gestures seem to play a role far beyond that of communication. A phenomenon called the speech-gesture mismatch demonstrates that sometimes our gestures show a deeper understanding of a problem than we consciously admit (Alibali and Goldin-Meadow 1993). A student may show in gesture that they have progressed in solving a task, even if they are not yet able to explain it in words. Quite literally, there is more to gesture than meets the eye.

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[1] This chapter describes the results of a study about the relation between gesture, language and cognition that has been conducted at the School for Blind and Visually Impaired Children in Owińska. The study was conducted thanks to the help and enthusiasm of the staff and students of the school, with financial support from the Polish National Science Centre through research grant 2011/01/N/HS6/04050 „The cognitive role of gesture in the language of blind and seeing-impaired children". I designed and conducted the project together with my colleagues, Dorota Jaworska and Zuzanna Fleischer whom I would like to thank for their critical input and hard work.

In the course of this chapter we will review a number of studies on gesture, metaphor and blindness in order to assess their usefulness as sources of evidence for mental representation. I will argue that the gesticulation of blind and severely visually impaired persons can bring important insight into the nature of spontaneous gesture because the outside influences on their gestural repertoire are minimised. We will go through the results and methodology of an empirical study analysing instances of spontaneous gesture of blind and severely visually impaired children and young adults describing abstract and concrete concepts. Finally, we will see whether the study supports or rejects hypotheses built on the basis of Objectification Theory.

## 1. Gesture and vision impairment

We have seen that gesture may give us insight into cognition. However, there are certain constraints on the types of gesture we can use to draw inferences about the mental representation system. In short, this type of research requires gestures that are indicative of underlying cognitive processes, but minimally influenced by the sociocultural background in which gestural behaviour was acquired. The first condition is satisfied if we choose to analyse co-speech gesture (gesticulation). As indicated in the previous chapter, this type of gesture occurs spontaneously and is a reliable source of information for a variety of non-linguistic cognitive processes (Alibali et al. 1999). Gesticulation and discourse are interdependent, and the analysis of metaphorical expressions in language and gesture shows that abstract concepts are characterised similarly in both (Cienki 2008). Also, spontaneous gesture does not depend on the physical presence of an interlocutor, on their level of vision, or the interlocutor's access to visual information (Iverson and Goldin-Meadow 1997, 2001, 1998). Second, in order to remove gesture analysis as far as possible from the sociocultural context it is important to find persons whose gesture has been minimally influenced by their environment. Gesture is a universal feature of communication. This is also true for people whose opportunities to acquire gesture in a social context were limited, such as the blind and severely visually impaired. Although the language, learning strategies, and mental representations of blind children and adults have been intensely studied both in Poland (Majewski 1983; Piskorska et al. 2008; Jaworska-Biskup 2009, 2010b, 2010a, 2011), and internationally (McGinnis 1981; Sato et al. 2010; Roch-Levecq 2006; Iverson and Goldin-Meadow 2001), the relationship between language, categorisation and gesture in blindness is a relatively unexplored research topic. By studying the gestures of persons who are congenitally blind, severely visually impaired, or those who lost

sight at an early age, researchers can extricate the cognitive aspect of gesture from its social function. Although this approach requires solving a number of methodological challenges, analysing the gestural repertoire of blind and severely visually impaired children seems, for the reasons listed above, to be a worthwhile endeavour.

### 1.1. Language and gesture in typical and atypical development

Children's gestures and language develop from their interactions with objects (Bruce et al. 2007). Both deaf and blind children receive less information about language than their seeing peers, but they exhibit different learning strategies. Whereas deaf two-year olds perform class consistent behaviours such as sorting toys into categories, no such tendencies were observed in their blind peers (Dunlea 1989: 61). Class consistent behaviour is a prerequisite for constructing basic conceptual categories. Problems with categorisation may delay language development. Consequently, blind children are more likely to develop mental representations of concepts that are primarily acquired through language later than their seeing peers. Two of such concepts are particularly interesting for gesture research: objects and space. Both have been suggested as candidates for the ultimate source domain.

There are two opposing theoretical positions regarding the conceptualisation of space in blindness. The Inefficiency Theory proposes that congenitally blind people develop concepts and representations of space, but those concepts are inferior to those of the seeing and late blind in that space is conceptualised as a series of paths rather than an overall plane. The Difference Theory suggests that spatial relations of blind persons are functionally equivalent to those of the seeing, but are acquired later and by different means. The latter assumes that, when provided with sufficiently diverse input, visually impaired people develop spatial concepts and representations using their intact senses (Ungar et al. 1996: 247) such as hearing, touch and movement (Millar 1988). Although Inefficiency Theory initially received strong empirical support from research showing that the congenitally blind find it difficult to pinpoint their own position when exploring a new environment (Rieser et al. 1990), researchers increasingly subscribe to the view that the mental representations of a blind child can become as useful and complex as those of their seeing peers (Piskorska et al. 2008; Jaworska-Biskup 2009). Generally, blind youth acquire spatial competence equivalent to that of their seeing peers by mid-adolescence (Juurmaa 1973). A number of studies show that the visually impaired perform poorly on spatial compe-

tence tests relative to blindfolded seeing participants. However, these results may have been influenced by the choice of experimental stimuli which were highly familiar to the seeing, but less so to the visually impaired participants (Juurmaa 1973). The picture emerging from this and the previous chapters of this book is that conceptualisation of space is object-dependent. This is consistent with OT, which suggests objects are better candidates for the ultimate source domain. Studies in the language and behaviour of blind children appear to corroborate this view.

### 1.2. Viewpoint: people, objects and space

One aspect of space that is important for gesture studies is viewpoint. In general, gesticulation represents the world from two perspectives: that of an observer (observer viewpoint, or O-VPT), and of a character (character viewpoint, C-VPT) (Cassell and McNeill 1991). Observer viewpoint gestures are usually representative or iconic and denote something from a third-person perspective. For instance, moving a hand quickly along a path when describing the route of a car presents the situation from the point of view of an observer – someone who is outside the car. Character viewpoint in gesture is represented when the speaker/gesturer assumes the role of the protagonist. A good example is a person who describes the unfortunate accident of a colleague saying "and then he hit himself on the head" while slapping their own forehead with an open palm. Character viewpoint gestures are sometimes called simulation gestures. The two types of viewpoint are distinguished by the point of reference in space assumed by the speaker/gesturer, which is related to spatial coding strategies. Most congenitally blind children assume character viewpoint. They primarily use a spatial coding strategy with reference to their own body, which may be related to the phenomenon known as egocentrism, that is using self as the main point of reference (Heller and Kennedy 1990). Sighted children, in contrast, tend to code spatial position and movement using an external frame of reference (Hermelin and O'Connor 1971). Visual experience prompts children to attend to external cues (e.g. the relationships between locations), which influences viewpoint. In contrast to their congenitally blind peers, seeing blindfolded children and late blinded children display a tendency to assume observer viewpoint. Congenitally blind children tend to neglect external cues, and use themselves as a reference point in space. Mental imagery studies provide further support for the argument that visually impaired children can acquire spatial representations which are not the same, but functionally equivalent to those of seeing people.

Importantly for Objectification Theory, egocentrism is a convincing argument against space as the ultimate source domain. The concept of space clearly differs between persons who rely primarily on sight and those who do not, demonstrating that space cannot be a basic domain. When congenitally blind persons default to the egocentric perspective, they use the self as a reference point for space which extends around it. Seeing persons are able to understand space in relation to themselves or any other object. It seems clear that, as Szwedek (2011) pointed out, space is object dependent. Adopting this view would require a deeper understanding of objects and their importance for typical and atypical development. A study conducted on a number of typically developing children showed that early gestures emerge from two sources: parent-child interaction and experience with objects (Acredolo et al. 1999). Researchers found that the vast majority of gestures represent objects, and actions performed with objects. As shown in the previous chapter, even metaphorical gestures have a concrete referent and usually imply the existence of an object. These findings seem to be consistent with Objectification Theory which puts objects and the acquisition of object-like features at the centre of mental representation.

### 1.3. Do blind people gesture?

Gesture is viewed primarily as a means of visual communication, an opinion that is supported by the use of sign languages among deaf speakers whose communication needs to rely on vision in the absence of hearing. However, as we have seen, the role of gesture extends far beyond visual communication. Speakers without access to visual information, who have never seen distance, space, or shape coded as movement use gesture in conversation freely and spontaneously. Congenitally blind speakers gesticulate despite their lack of a visual model for gesture (Iverson and Goldin-Meadow 1997; McGinnis 1981), even if they know their conversational partner to be blind (Sharkey et al. 2000). Studies show that blind speakers gesture at the same rate as their seeing interlocutors (Iverson and Goldin-Meadow 2001, 1997, 1998). Blind speakers' gestural repertoire contains relatively few culturally transmitted gestures, which makes them ideal informants for cognitive processing studies. However, if we decide to analyse gestural behaviour of blind and severely visually impaired persons, there are some considerations that need to be taken into account.

While blind and seeing people have been found to gesture at a similar rate, their gestures do not always look the same. Visual impairment makes it difficult to monitor the usage of conversational gesture. Congenitally blind

persons frequently use atypical gestures because they do not have access to the visual feedback necessary to mirror the movement of others, reinforce socially acceptable gestures, and monitor their own behaviours (Eichel 1979: 128). Congenitally blind persons rarely produce conventional gestures because these gestures are culturally transferred, and learning them depends on the availability of visual information. However, they are able to learn conventional gestures if instructed and use them in appropriate contexts. Blind and visually impaired persons do engage in spontaneous gesticulation (Magnusson and Karlsson 2008), making them seemingly perfect informants for studying the conceptual correlates of gesture.

Nevertheless, it is worth noting that the gestures of blind persons have certain characteristics that would influence the results of gesture analysis. A large part of the gestural repertoire of blind persons, especially congenitally blind and early blinded children, is composed of adaptors and blindisms. What is more, blind youth in Poland undergo revalidation training that influences their gesture strategies, in particular the number and types of gestures they spontaneously produce. Finally, blind children typically refrain from using posture and other non-verbal signals in communication.

As mentioned before, blindisms constitute a large part of blind persons' gestural repertoire. Most studies on the topic are quantitative analyses comparing the performance of blind and seeing participants (Iverson and Goldin-Meadow 1997, 1998; Sharkey and Stafford 1990; Sharkey et al. 2000). In many cases, hand movements are split into adaptors and gestures. In contrast to gestures, which are usually defined as having some relation to speech, adaptors are described as "self- stimulating body-focused hand motions that are not related to speech" (Magnusson and Karlsson 2008: 72). Sharkey and colleagues (2000) identified three types of adaptors: self-adaptors, when the hand comes in contact with some part of the body; object adaptors, when the hand comes into contact with an object; and alter-adaptors when the hand is in contact with someone else's body. Self-adaptors are can be further divided into body touching and finger manipulation (Blass et al. 1974). Blind speakers engage in adaptors of a particular kind. These self-stimulation behaviours are called "blindisms", "mannerisms", or "stereotyped behaviours" (Brambring and Tröster 1992; Eichel 1979). Like self-adaptors, blindisms can be further classified into self touching and finger manipulation. There is limited evidence that a preference for finger manipulation over self touching is positively correlated with cognitive development (Blass et al. 1974).

Blindisms are thought to have roots in infancy. Cutsforth (1951) theorised that, because of the lack of visual stimulation, a child who is blind or has severely low vision will turn inward with acts of "automatic self-stimulation" (self-adaptors). Other stereotypical behaviours in blind babies

include: eye pressing, gazing into the light, pointing out body parts, offering objects to others (Dunlea 1989). A seeing child receives stimulation from the sense of hearing, touch, smell and vision – and engages in interaction with the environment. A child who is visually impaired has fewer avenues for establishing and maintaining contact, making the body the source and the object of stimulation (Cutsforth 1951; Sharkey et al. 2000).

Blind persons cannot monitor their own movements through visual feedback. To an untrained eye blindisms may resemble the uncoordinated movements typical for many patients with brain damage. As a result, blindisms have a stigmatising effect. For this reason many educational facilities in Poland offer revalidation classes. These courses focus on teaching blind students control over their body language. Such lessons necessarily have a restrictive impact on the gestural repertoire of participants. Although they may be controlled with revalidation training, blindisms are unconscious and quite difficult to tell apart from other gestures. Both blindisms and the effects of revalidation on spontaneous gesture are a factor that comes into play in the analysis of blind individuals' gestures. Although blindisms have traditionally been interpreted as bearing no meaning outside of possibly stimulating cognitive function (Blass et al. 1974; Eichel 1979), preliminary results described in this chapter suggest that their importance might have been underestimated.

So far we have been using the definition of gesture as a movement of the hands or arms. The methodological considerations for this choice were briefly mentioned in the first chapter. Other bodily movements, however, can also be classified as gestures. Similarly to hand gestures, posture changes can have communicative functions (Ekman and Friesen 1974). By shifting our posture we can decide whose turn it is to speak in a conversation or direct our interlocutor's attention and focus (McClave 2000). Blind children do not have access to the type of visual feedback that allows seeing children to learn posture cues. That is not to say blind children are unable to communicate through posture. Quite on the contrary, congenitally blind infants have been reported to use posture to participate in routines, request things and deny actions. For instance, the rejection gesture in which the child turns his or her face away from something and pushes it aside is typical for both seeing and congenitally blind toddlers (Dunlea 1989: 152). Nevertheless, without revalidation training congenitally blind individuals are likely to maintain non-typical posture, lowered gaze and atypical arm movements (Blass et al. 1974). This is normally not an impediment to conversation. To govern turn taking in conversation blind speakers use the same vocal turn-taking strategies reported in research on seeing individuals, but different non-vocal strategies with less focus on gestures and posture shifts (Sharkey and Stafford 1990). These differences in body language between blind and

seeing persons prompted the decision to define gesture in this book strictly as movement of the hands and arms. Naturally, a variety of hand and body movements can be considered gestures, and multiple authors sought to describe and define these different gesture types (e.g. Kendon, 2004; McNeill, 1992). Here we limit our discussion to representational gestures and blindisms. By representational gesture we will understand movements that refer to the content of an utterance by pointing to objects in physical space (deictic gestures), directly refer to an object with the motion or shape of the hands (iconic gestures), or indirectly represent an abstract idea by using a concrete referent or a spatial location (metaphoric gestures). In the quantitative analysis these three gesture types have been conflated into a single category. Nevertheless, it is worth noting that views on where distinctions should be drawn in gesture typologies vary.

## 2. Cognitive role of gesture in blind and severely visually impaired students

The previous chapters investigated the relationship between abstract and concrete concepts in the context of Conceptual Metaphor Theory. I have demonstrated that the application of Objectification Theory results in establishing a reliable criterion for the abstract/concrete distinction in the form of tangibility. An empirical study was conducted, and the results were interpreted as supporting Objectification Theory, although with some reservations. Some doubts were expressed with regard to the use of language data as sole proof for CMT. As a result we have turned to the analysis of spontaneous co-speech gesture to seek further support for both CMT and OT. More specifically, I have proposed to ask individuals who are blind or severely visually impaired from birth or an early age to participate in a study on abstract and concrete concepts. Together with colleagues, I have gathered and analysed data from blind and severely visually impaired children and young adults, as well as a control group of seeing young adults (Jelec 2014, Jelec and Jaworska in press). The following sections focus on the methodological considerations, experiment design and analysis of this study.

### 2.1. Methodology and theoretical assumptions

The study investigated the co-speech referential gestures and blindisms produced by blind and severely visually impaired primary and secondary school students. The goal was to see if concept concreteness has an effect on

the rate and type of gestures that the participants made when explaining a given notion. The number of gestures produced by the blind participants for abstract and concrete concepts was considered indicative of objectification effects for two reasons. First, blind persons do not normally use culturally dependent and turn taking gestures (Sharkey and Stafford 1990). While it is nearly impossible to differentiate between gestures that have, and ones that have not been learned through observation in seeing persons, early and congenitally blind and severely visually impaired persons – due to their limited exposure to visuo-gestural input – can be assumed to produce gesture that is largely spontaneous, in the sense that the shape of the movement remains relatively uninfluenced by factors external to the gesturer. Therefore, changes in gesture type can be taken as indicative of cognitive processing. Second, because blind persons use relatively few conversational and turn-taking gestures, changes in the overall number of gestures made in different discourse types can be assumed to reflect cognitive functions.

Previous studies have shown that blind and seeing participants' gesture rates during piagetian tasks are similar (Iverson and Goldin-Meadow 2001, 1998; Alibali et al. 2001). Following those results, we predicted that there would be no quantitative difference between the overall number of gestures produced by blind and seeing age-matched participants with regard to concrete concepts because they would be the easiest to convey. The potential difference between the number of gestures produced during descriptions of abstract concepts was identified as a topic for exploratory analysis, as blind persons seldom produce referential metaphoric gestures which may reduce their gesticulation rates for this condition. Furthermore, we were interested in seeing whether there would be a developmental difference between the number and type of gestures produced by children and young adults, and if it depended on concept type.

The secondary purpose of this study was to observe whether the source domains in referential gestures of the blind participants would be consistent with the predictions voiced in Objectification Theory, namely that both concrete and abstract concepts contain object features as measured by a preference for the domain of touch over other senses. This part of the analysis focused on the performance of fully congenitally blind children and young adults as a group least likely to exhibit culturally acquired gestures. The speech and gesture of the respondents were analysed to identify instances where they were used congruently. I hypothesised that in such instances there would be visible object traits in the gesture of the participants, although (consistent with the predictions of Objectification Theory) such traits may not necessarily be present in speech.

## 2.2. Study design: participants, tasks, procedures

The entire study was conducted in three stages over the course of thirteen months. During the first stage the researchers focused on observing the natural interactions between congenitally blind, early blind and severely visually impaired children and young adults in a boarding school for blind students. This stage consisted of class observation and supervised teaching, as well as the organisation of extracurricular activities for the students, answering ethical as well as practical concerns. It is important to note that research involving participants from underprivileged groups and communities needs to be conducted with their best interest in mind. It would be unethical to ask children and young adults from a vulnerable population to participate in a study that analysed their verbal and non-verbal behaviour but did not benefit them, or their community. Therefore, the authors decided to devote six months of their project to voluntary work supporting members of the community with whom they wanted to work. The time spent volunteering allowed the researchers to observe the communication behaviour of blind and visually impaired children and young adults, and establish relations with potential participants in a relatively stress-free environment. In this way, the researchers hoped to reduce the impact of their presence on the psychological validity of the study. Data gathered during this stage were used to adjust the experimental design. After the observation period, the study moved to its experimental and analytical stages. The experimental stage of the project was conducted on the premises of the boarding school in which the observations took place. Finding an environment both familiar and friendly to the participants was treated as a priority. Well-known surroundings empowered the blind and visually impaired students to use gesture, which otherwise might have been inhibited by such considerations as fear of hitting or hurting oneself or others, shyness or reluctance to use gesture in unfamiliar circumstances. The third phase of the project consisted in data annotation and analysis. Some of the conclusions drawn from the experimental part of the project will be presented in the results and discussion section of this chapter.

The design of the study included an unstructured observation period and an experimental stage. Having completed the observations, the researchers invited twelve blind and severely visually impaired children and young adults to participate in the study. They were divided into two age groups: six children (7—11 years old) and six young adults (16—19). Eight girls and four boys agreed to participate, all of them either congenitally functionally blind or diagnosed with early vision loss. All were either fully or functionally blind; most had some residual vision in the form of light or

movement perception. Although vision loss and cognitive impairment are often co-morbid, none of the blind participants were diagnosed with cognitive impairments. A control group of seven seeing age- and gender-matched young adults was recorded at a later stage of the project.

The stimuli used in the experiment were audio recordings of Polish words for abstract and concrete concepts. 21 abstract and 21 concrete words[2] pre-tested for understandability, frequency and tangibility in the course of a previous study (Jelec and Jaworska 2011) were used in two experimental conditions. In both conditions the participants were asked to explain a given concept to a computer. A computer programme was written by the author specifically for this study in Psyscript, a programming environment developed for psycholinguistic research (Bates and D'Oliveiro 2003). The programme had two tasks: interact with the informant (by choosing and playing words, hints, and questions) and keep track of the concepts that were played for each person. Concepts were randomly chosen from a list and played through a set of speakers. Each participant explained 10 concrete and 10 abstract concepts. Both conditions of the experiment employed a free speech and gesture elicitation paradigm. In the first condition, the participant's task was to explain the meaning of each concept verbally and by means of gesticulation. In the second stage, the task remained the same but the computer asked four additional questions: "Show me what it is", "Show me what it is like", "Show me where I can find it" and "Show me what you think of it[3]". The participants were told that the aim of the study was to teach the computer the meaning of concepts by explaining them verbally and in gesture.

The motivation behind using computer interaction rather than conducting directed interviews with the participants was twofold. First, it gave the researchers greater control over the experimental procedure. As two out of the three groups of participants involved in this study (blind children and young adults) were expected to exhibit great individual variability (Majewski 1983), attempts were made to control other conditions and variables in the experiment. Second, following extensive observations and preliminary interviews with potential participants, the authors decided that interaction with a computer was preferable to researcher directed interviews. Because the experiment was conducted in a school setting, the students tended to automatically fall into familiar student-teacher interaction patterns with the researchers, which negatively affected both their answers and their gestural

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[2] A full list of words/concepts used in this part of the study can be found in the Appendix.

[3] These sentences are translations. The Polish phrases used in the experiment were "Pokaż mi co to jest", "Pokaż mi jakie to jest", "Pokaż mi gdzie mogę to spotkać", and "Pokaż mi co o tym sądzisz" respectively.

repertoire. Reversing the roles had the benefit of making the young participants feel in charge of the experiment, and most of them were more than happy to play the role of a benevolent teacher.

At the beginning of the experiment, each participant was seated in front of a computer screen, with their palms resting on the surface of a table in front of them. Before instructions were given, participants were informed that the study was recorded. Care was taken to familiarise the participants with the nature of the study in order to get their informed consent[4]. The participants' speech and gesture were recorded by two cameras: the iSight camera built in the laptop used in the experiment, and a digital camera placed on a tripod at a distance from the participant. No visual cues were used in the experiment. Figure 2 shows a schematic drawing of the experimental setup.

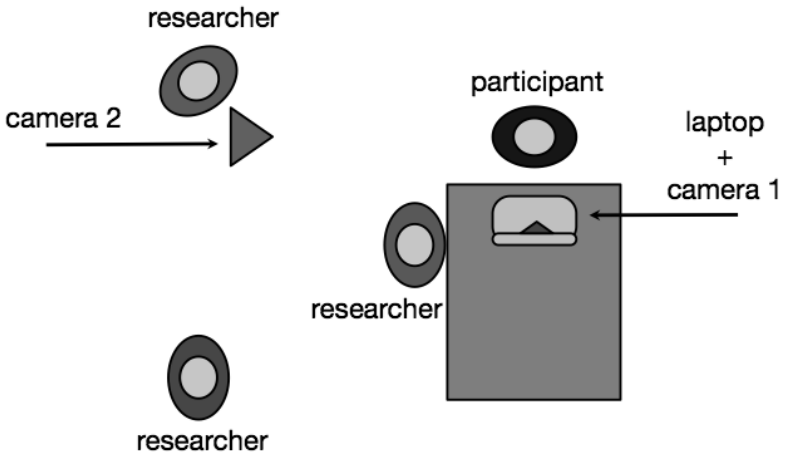


**Fig. 2.** A schematic drawing of the experimental setup

### 2.3. Annotation and data analysis

The presented gesture analysis is based on the methodology developed in the McNeill lab (McNeill, 1992, 2005). Before looking for gestures, the researchers transcribed the speech of the respondents in ELAN[5], a professional software for multimodal research (Brugman and Russel 2004). Responses

[4] If the participant was underage, consent had to be given by their parents or legal guardians as well.

[5] ELAN software is available for download courtesy of the Max Planck Institute for Psycholinguistics, The Language Archive, Nijmegen, The Netherlands at http://tla.mpi.nl/tools/tla- tools/elan/

were transcribed orthographically, and the occurrence of gestures was marked in relevant spaces. Then each clip was analysed to find gestures synchronised with speech. Annotation was performed by three trained researchers whose unanimity concerning gesture identification was randomly checked. Most clips were analysed by two people, a third rater was invited to comment in case of any disagreements. Kendon's temporal gesture anatomy (Kendon 1972) described earlier in this book provided the basis for gesture annotation. Participants' full response to a question was considered to be a gesture unit, as responses reliably began and ended with the participant's hands in a resting position on a table. A gesture phrase was defined as a movement that began in the preparation phase and ended with the retraction phase, unless it ended at the beginning of the preparation stage for another gesture. In case of blind and severely visually impaired participants, blindisms were included as gestures in the annotation. Adaptors were not counted as gestures in the control group[6].

## 2.4. Results

The analysis aimed to answer a series of questions. First, the authors conducted a statistical analysis to find out whether the gestural performance of blind and seeing participants was comparable in both conditions, or whether significant differences precluded generalisation of the results onto the general population. To answer this question we conducted an exploratory statistical analysis of means, comparing the number of gestures produced per gesture unit by each of the groups for abstract and concrete concepts. Data distribution was analysed, and responses obtained from one participant excluded from further analysis as an outlier. Figure 3 demonstrates that, although the overall number of gestures and words produced by the two young adult groups (blind and seeing) was comparable, the youngest age group was much less expressive in speech and gesture. All three groups exhibited considerable individual variation, which means that the obtained

[6] The reasons for this follow extensive consultations and are twofold. There is no reason to believe that adaptors were synchronic, or interdependent with speech in healthy participants, while the small pool of research on the conceptual correlates of blindisms suggests that their occurrence is related to speech fluency and cognitive effort in the blind (Blass et al., 1974). Also, the visual nature of adaptor gestures and blindisms recorded in this study differed significantly, with the latter displaying a far greater variability in shape, type and frequency of use. Both of these arguments were taken to indicate that, while adaptor gestures in healthy participants may be discarded as relatively non-informative, it is impossible to do so with regard to blindisms as evidence of their broader function would need to be wilfully ignored.

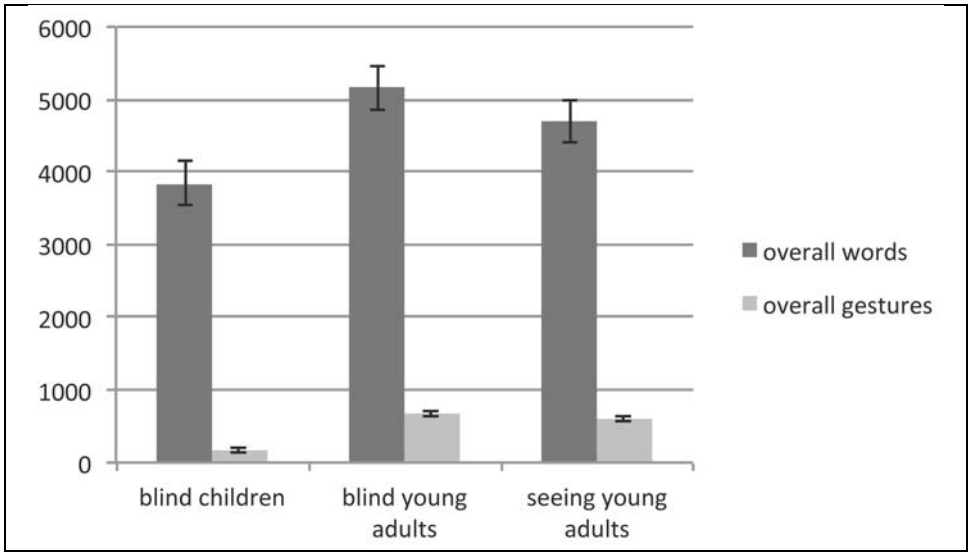


**Fig. 3.** Comparison of the overall number of words and gestures produced in each of the interviewed groups

statistical results need to be treated with caution. The quantitative analysis focused on the number of gestures per response for concrete and abstract concepts.

We have initially assumed that blind and seeing people of similar age would gesture at a similar rate. Indeed, there was no statistically significant difference in case of abstract concepts, but a small effect was found in concrete concepts where the blind group gestured more. Analysis of means showed that, out of the two young adult groups, blind participants performed more gestures per response. Their mean gesture rate for abstract concepts was 4.96 (SD = 3.94), while the mean of the control group was 4.212 (SD = 4.34). This effect was even more pronounced for concrete concepts. A statistical analysis using a T-test for Significance for Two Unknown Means and Unknown Standard Deviations (assuming normal distribution) showed that the difference for concrete concepts reached statistical significance: the blind participants performed more gestures (M = 5.14, SD = 3.35), than the seeing controls (M = 3.62, SD = 3.70) ($t(65) = 2.34$, $p > 0.05$). This may be the consequence of including blindisms in the analysis of blind participants' gestures, although it would be interesting to see why the effect did not spread across both concept types. Another possibility is that blind persons knowledge of concrete concepts is significantly more embodied (in the sense that it is based on tactile rather than visual experiences), which has an effect on gesture rates for concrete, but not abstract notions.

A separate analysis of the two blind groups showed differences in the gestural performance of children and young adults. In both conditions, children made fewer gestures than adults. Interestingly, blind children's gesture rates dropped even lower when they were describing abstract concepts (for abstract concepts, M = 1.70, SD = 1.76; for concrete concepts, M = 1.96, SD = 1.95). This effect could be due to the developmental gap between the younger and the older group. While concrete concepts are acquired relatively easily and early in development, studies show that the acquisition of abstract concepts occurs gradually, and follows concrete concept acquisition (Mandler and McDonough 1993; Mandler 1999). This would affect both the gesture rate and word output of the youngest group of participants.

### 2.5. Blindisms, simulations and referential gestures. Qualitative analysis of gesture types

Having completed the quantitative analysis of the results, the researchers investigated the gestures of the blind participants in more detail. This revealed several interesting phenomena. This section will focus on the gestural performance of the blind and seeing-impaired groups, in particular that of the three congenitally blind participants: one young adult (female) and two children (one boy and one girl). We have seen from the results of the quantitative analysis that both groups of blind participants used gestures in their descriptions of abstract concepts, which supports our assumption that gesture facilitates the understanding of non-physical concepts. Theories regarding conceptual and language development in blindness reviewed earlier in this chapter suggest that persons with a specific sensory impairment develop mental representations that are similar to those of typical adults, although they may take a longer time to do so (Ungar et al. 1996; Iverson and Goldin-Meadow 1998). The analysis revealed that descriptions of abstract concepts were accompanied by blindisms, referential gestures, and an interesting phenomenon that the researchers termed simulations, or simulation gestures.

As mentioned earlier in this chapter, blindisms are a class of gestures specific to the early and congenitally blind and seeing impaired. Early research on the topic suggested that blind persons engage in body-focused movements much more frequently than object-focused movements (Blass et. al 1974). Qualitative analysis of gesture reveals this to be true of all our congenitally blind participants. Recorded instances of blindisms included repeatedly rubbing two fingers together throughout a response, rhythmically rotating the fist, rubbing oneself with one finger or a whole hand, eye-pres-

sing, pinching oneself, stroking one's leg or arm and swaying. Blass and colleagues observed that finger-touching movements were correlated with verbal fluency, and that there was a reverse correlation between fluency and body-touching (1974: 281). In other words, blind participants who employed finger-touching gestures were more articulate and produced more complex sentences than those who frequently performed body-focused movements. This appeared to be true for our participants as well. Although of small consequence to Objectification Theory, the observation that despite revalidation training all our blind participants engaged in adaptors of various kinds seems to confirm Kendon's (2012) intuition that these gestures have a heretofore unexplored cognitive function. Further research is necessary to explore the potential of blindisms as a cognitive tool for blind and severely visually impaired learners.

Second, all of the participants in the older, and one child from the younger experimental group used referential gestures. Previous studies demonstrated that blind and seeing persons use referential gestures similarly (Iverson and Goldin-Meadow, 1997, 2001). Both blind and sighted young adults in the study engaged in concrete referential gestures in the descriptions of concrete concepts. This goes in line with previous findings. Studies show that blind students exhibit a broad knowledge of non-literal associations with concepts (Jaworska-Biskup 2009, 2010b). In a study by Jaworska-Biskup, children asked for definitions of certain visually-based concepts produced a whole range of non-literal of associations, for instance death and sadness as descriptors for the colour black. On the whole, the use of metaphoric gesture by blind participants in the present study was limited to the young adult group, with individual instances of metaphoric gesture used by children. In one of their early studies, Iverson and Goldin-Meadow (1997) observed that, while seeing children produced a very small number of metaphoric gestures, congenitally blind children did not produce any metaphoric gestures at all. They speculated that blind individuals may be unable to produce metaphoric gestures and concluded that further research is needed to explore "the breadth of the blind individual's gestural repertoire'' (Iverson and Goldin-Meadow 2001: 422). The results of the present study demonstrate that older blind children can and do perform metaphorical gestures. For instance, a female young adult described marriages as "when one person gives their love to another person" and illustrated this metaphorical expression with a gesture: both palms curled into fists slowly being drawn together across the table. What is interesting in this example is the seeming discrepancy between the mappings presented in language and gesture. While the gesture presents love as "two objects getting together", in speech love is described as a transfer of an object. Another instance of a metaphorical gesture

was a male young adult describing the concept of knowledge ("wiedza") by saying "knowledge is gathered in the head" and simultaneously tapping his forehead with an open palm. Because instances of metaphorical gestures were few and far between, it was surprising to see that some concrete concepts were described metaphorically. A girl from the younger group described a weight ("ciężar") to the computer by saying "[weight is] if you have some games inside you (…) or if you have some music" while stroking the computer case, clearly indicating her concreteness judgement about computer files in what seems to be an intriguing application of objectification.

What is more, the descriptions of abstract phenomena produced by the blind participants in the present study showed a tendency to use analogy as an inferencing strategy. A similar observation was made by Jaworska-Biskup who noticed that blind students relied much more on analogous descriptions of such phenomena as stars, fog, dust and veins in comparison to their seeing peers (2009). This strategy was visible in the performance of several participants, most notably one boy from the young adult group who explained nearly all the concepts by analogy and example, using the phrase "for example" ("na przykład") 58 times in a 30 minute interview. It is worth noting that all concepts identified by Jaworska-Biskup as understood via analogy are phenomena that cannot be easily explored by touch. Objectification Theory would classify them as abstract concepts, which makes the tendency to describe them in more concrete terms seem natural. Interestingly, in her experiment, seeing children were less reliant on analogy when describing those ideas, a fact that may lead us to infer that concreteness of a concept is influenced by more complex factors than simple tangibility. Although tangibility remains a reliable criterion for concreteness judgement, the presence of absence of visual information about a concept clearly has an influence on its method of acquisition.

Finally, simulation, or simulation gesture is a new term introduced in this book. By simulations we will understand gestures and speech that together constitute a reenactment of an event or scene, which the gesturer performs from a character viewpoint. They are similar to pantomime in that they reproduce rather than represent actions, but unlike pantomime, simulations are accompanied by sound. For instance, in response to the word "life" ("życie"), a girl from the blind children group acted out a conversation between her mother, father and herself using different voices for each of the participants and even making a squeal to indicate the presence of a newborn. Simulations may include other sound effects, such as the sound of a closing car trunk or footsteps. Simulations resemble referential gestures in that they convey information through both gesture and speech. Unlike refe-

rential gestures, they do not use physical objects as referents but rather give an example of a situation that in the speaker's mind is representative of a concept. For example, one male young adult pretended to look into a wallet, and subsequently acted out a sequence of moves and sounds that indicated he found nothing and walked to a bank to get a loan. This particular simulation was meant to explain the concept of a crisis ("kryzys"). The simulation included third person narration ("Crisis it is something very bad"), character dialogue ("Uh-oh. My wallet is empty"), sound effects (mimicking the sound of footsteps by tapping on the table with open palms), referential gesture (pretending to look into an empty wallet by holding out both hands in front of his face, posed as if holding, and subsequently opening a wallet) and was accompanied by blindisms. Simulations were a particularly prominent strategy for explaining abstract concepts. All simulations were characterised by a strong tactile component. In fact, sound and touch seemed interdependent, with some participants incorporating touch into an auditory description.

### 2.6. Which senses make up a concept?

Previous studies on the conceptual representations of blind children show that their descriptions of phenomena with a strong visual component are not quantitatively different than those of their seeing peers (Jaworska-Biskup 2009). However, blind children are expected to incorporate descriptors from multiple sensory domains more often than seeing children. We predicted that the descriptions produced by blind students would refer to multiple sensory source domains. While a great variety of sensory expressions was found both in language and gesture, one sense appeared to be completely ignored by all blind participants. Sensory domains identified as important predictably included different aspects of sound, touch, and vision with the notable absence of smell. None of the descriptions contained expressions or gestures referring to the sense of smell, which is surprising as the stimuli included concepts with a strong olfactory component such as flower ("kwiat"), or wine ("wino"). It is possible that the informants did not consider this type of information to be relevant for their interlocutor (which was, after all, a computer). However, they did provide the computer with other types of information potentially redundant to a machine, including descriptions of tactile sensations and demonstration of actions.

Perhaps predictably, sound and touch were the sensory domains most frequently represented in language. In many instances they occurred together in language, gesture or across domains. For instance, one child described the

word success ("sukces") as "when someone says I think I cannot sing and then they sing anyway". Another child, described a career ("kariera") as "For example the career of a singer. We can go to concerts and sing there... play an instrument". This description was accompanied by a gesture imitating violin playing. It is clear that sound plays an important role in the life of our participants, which is perhaps due to the education system. The presence of sound in descriptions went beyond language, with participants enriching their responses by adding onomatopoeias and simulation gestures. Interestingly, sound and touch seemed to have a discourse function. A number of blind young adult respondents used sounds to add rhythm to speech or stress parts of sentences. In particular, one young adult female marked ends of sentences and phrases with a knock on the table, but others used sounds to add emphasis to questions and lists. This observation could perhaps explain research results showing that blind people do not employ posture and bodily movements as conversational cues (Sharkey and Stafford 1990). Clearly, it is possible to replace visual cues with perfectly timed knocks.

References to touch usually accompanied descriptions of shapes and sizes of objects. Nearly all of the blind participants used their hands to indicate how big or small something was. Most of the gestures were two-dimensional (tracing a shape on the surface of the table), with a significantly smaller number of three dimensional gestures. For instance, a young adult female described a flower by tracing the outline of a stalk vertically upwards from the table and, having reached the top of the stalk, drawing petals in the air with two pinched fingers. This gesture was accompanied by a linguistic description of a flower as having a stem and some petals.

In conclusion, touch and hearing appeared to be the dominant modalities in both language and gesture of blind children. They were employed in a variety of different strategies and purposes, whereas the remaining senses of taste or smell were virtually absent from our data. Descriptions produced by blind children were full of tactile information, simulations, verbally recalled situations and sound. Visual and taste-oriented descriptions, although present to a bigger extent than smell, were rare in language and practically non-existent in gesture. These results partly confirm the findings of other studies, namely that seeing children use visual descriptions, while blind children are more modality independent.

In summary, findings from this experiment do not go entirely in line with studies showing blind children's inability to employ metaphoric gesture. Participants in the present experiment reliably used metaphors and analogies in language and gesture. These results suggest that metaphoric gesture does not depend on sight but rather on the intrinsic structure of con-

cepts, which supports Objectification Theory. Furthermore, we have found no evidence against OT in the form of a lack of object features. Failure to find object features in metaphoric concept descriptions would effectively disprove OT, as according to the theory their understanding and objectification are co-dependent. Thus we may reject the null hypothesis, namely that Objectification Theory is false. Naturally, this does not necessarily mean the reverse is true. More research is needed to yield support to OT beyond this preliminary study.

## 3. Discussion. Objectification Theory in view of gesture studies

The conceptual structure of blind and severely visually impaired participants has been studied by both Polish, and international researchers. The tendency is for these types of studies to have a practical focus because of the ethical considerations described in the previous sections of this chapter. Although there are few comparable studies concerning blind persons use of gesture and conceptualisation, methodological approaches vary significantly. Research investigated blind persons' gestures in monologues (Blass et al. 1974; Iverson and Goldin-Meadow 2001), in conversations with experimenters (McGinnis 1981) and between participants (Sharkey et al. 2000). Blind children's language and conceptual development was the subject of longitudinal (Dunlea 1989) and case studies (Jaworska-Biskup 2009). Language learning is another topic of particular interest, with Bogusław Marek paving the way for both research and innovative teaching practice (Marek 1999, 2000).

From the point of view of Objectification Theory, perhaps the most interesting results are found in a series of papers by Jaworska-Biskup, who focused on conceptualisation and its effect on language learning of Polish blind and visually impaired children (Jaworska-Biskup 2009, 2010b, 2011). The study focused on blind children's understanding of concepts from the following groups: colours, textures, materials, natural objects, visual traits, and living organisms (Jaworska-Biskup 2009). The concepts were chosen on the basis of having a visual component, or being normally acquired through vision. The results show that blind children are likely to employ a variety of sensory modalities in their descriptions, while seeing children depend more on vision. What is more, studies show that blind children differ greatly in terms of language competence, and may display surprising gaps in conceptual knowledge (Marek 2000, 1997). The results of the present study fall in line with these findings. Most of the blind respondents failed to define at

least one concept because they were unfamiliar with its meaning – something that occurred in the control group only twice. This conceptual competence gap may have had an influence on the performance of the younger group of participants, who gestured significantly less for abstract concepts, most likely not because they did not have an embodied basis, but because the children did not understand them.

As was the case in our study, research involving blind and visually impaired participants finds great individual variation between the respondents both in terms of knowledge and behaviour. Cognitive strategies employed by participants with a visual impairment vary to a great extent, as do their learning preferences. In her study on concept understanding of blind primary school children, Jaworska-Biskup noted that individual variation was much greater among the visually impaired than the seeing group (2009). She attributed those differences to the disparities in the level of education and sensorimotor stimulation these children received from a very young age. Similarly, studies on the conceptual development of blind children note that individual differences can be significant, and often cite parenting strategies as the reason for delays in conceptual development (Hermelin and O'Connor 1971; Millar 1988; Dunlea 1989 and others). Individual differences were also clearly visible in the results of the present study, where the highest gesture per response ratio in the blind group was 5.45 (in the monologue condition) and the lowest was 0 (also in monologue). Clearly, all results obtained through analysing the performance of such a diverse population need to be treated with caution. While the preliminary analysis yields some results that are equally exciting as they are promising, care must be taken not to overgeneralise the findings. Blind persons, both as a social group and within the presented study exhibit great individual variation.

## 4. Conclusions. Gesture, language and the object-concept in blind children's conceptual development

The relation between conceptual development, language and gesture has been a recurring topic throughout this book. This notion is particularly important in the education of blind and seeing impaired children, because for them language has an additional compensatory function. Foreign language learning prevents blind persons from being deprived of social, economic and learning opportunities (Krzeszowski 1993). Brain studies have shown that language is the main way through which neurotypical persons acquire knowledge about abstract concepts. This relation strengthens in blindness, where language becomes a supplementary source of information for visually

based concepts such as colours, or intangible phenomena such as dust. Blind children constantly ask questions that test and adjust their understanding of concepts. For instance, "what is rust", "what is the difference between wrinkles and spots", "what do I look like" etc. Studies show that gestures can be indicative of language competence. Children who are the first to combine a single word and a single gesture to make sentences (for instance saying "mommy" and pointing at a hat) are likely to be the first of their peers to use two word combinations such as "mommy hat" when they see their mother putting on a hat (Goldin-Meadow and Butcher 2003). In the present study both the qualitative and quantitative analyses of data demonstrate that participants who used more referential gestures spoke more fluently and had a greater understanding of presented concepts. However, it is necessary to remember that correlation does not equal causation. Language, gesture and conceptual competence may be interdependent, but more research is needed prior to drawing any final conclusions.

The present study investigated the role of gesture in describing abstract and concrete concepts. Quantitative analysis showed some differences regarding the number of gestures produced per response for these two concept types, and qualitative evaluation of the data revealed a number of interesting phenomena. Both gesture and language clearly demonstrate the importance of touch for conceptualisation, supporting Szwedek's hypothesis that objects constitute a primary source domain. Furthermore, based on the presence of metaphorical gesture with a tactile component we cannot reject the null hypothesis posed by Objectification Theory, namely that abstract concepts are understood through basic ontological metaphorisation from abstract to concrete domains. On the other hand, the sense of hearing appears to rival touch in importance, with sound prominently featured in language and gesture while other sensory domains are represented marginally. Perhaps OT needs to be adjusted to permit the object concept to be established on a complex multi-sensory basis rather than tangibility alone. Blind participants' use of analogy and object-based metaphor in the descriptions of abstract concepts, and a lesser reliance on these strategies for concrete objects provides support for Objectification Theory. Nevertheless, further research is needed to show whether these findings are systematic and generalisable, something that cannot be ensured for the present study due to a limited sample size and individual differences.

# Conclusion.
# Are abstract concepts like dinosaur feathers?

One of the key points in the discussion on Lakoff and Johnson's Conceptual Metaphor Theory was the question whether metaphoric thought requires premetaphoric conceptual structure. In fact, two questions in cognitive linguistics remain unanswered. Do all concepts share the same intra-conceptual structure? Is there any kind of shared conceptual structure that governs inferencing and thought? These questions require more than a simple yes or no answer; they require a conceptual model. Postulating the existence of a hierarchical metaphorical conceptualisation mechanism and proposing a developmental model of inter-conceptual network structures for metaphorical and metonymic reasoning is an approach that bridges the structural gap between concrete and abstract concepts. Objectification Theory not only makes it possible to find the answer to the questions above, but also provides a framework that facilitates interdisciplinary approaches to conceptual modelling. The resulting theory makes predictions about language and other behaviours which may be tested using different methodological assumptions and approaches. It is no longer enough for a logically skilled armchair linguist to develop an elaborate account of cognition from the comfort of his or her own chair, nor is introspective data considered enough to support a theory of cognition. A well developed account of cognition requires empirical evidence to support it, meaning that increasingly such theories need to yield to empirical testing. In Gibbs' words: an acceptable theory needs to be "good psychology" (Gibbs 2000). An aspiring account of cognition needs to fulfil several requirements to qualify as good psychology. I would venture to claim that Objectification Theory is able to successfully pass these tests. Let us, therefore, review Gibbs' criteria and scrutinise objectification against them.

First, the theory needs to account or have the potential to account for a wide variety of linguistic and conceptual phenomena. As shown in this book, Szwedek's objectification-based metaphor typology accounts for most,

if not all metaphor types and puts them in a coherent framework with metonymy.

Second, a theory should pay explicit attention to meaning construction, not just meaning processing. Objectification Theory is applied at the concept creation level, thus accounting for the generation of meaning.

Third, Gibbs requires a good theory to be dynamic and place emphasis on the emergent properties of meaning and cognition. As we have seen throughout this book, Objectification Theory proposes a model of conceptualisation that fulfils both of these requirements excellently.

Finally, any useful theory needs to be shown as empirically valid by ``producing testable hypotheses, supported by empirical research. Although we are at the very early stages of research on objectification, both studies conducted for this book are designed to test the hypotheses produced by Objectification Theory. Furthermore, the results of these studies yield support to the theory. Nevertheless, it is clear that further research is necessary, most notably to compare the predictions made by Conceptual Metaphor Theory alone and in conjunction with Objectification Theory. This book hopes to demonstrate that Objectification Theory is a valid model of conceptualisation, which displays the following advantages over other paradigms: falsifiability, as it produces verifiable hypotheses; interdisciplinary appeal, because it incorporates evidence from a number of fields; multi-modality, because it allows for multiple sources of evidence; and internal and external consistency with previous research findings. If abstract concepts are indeed like dinosaur feathers, the author hopes that reading this book will be like finding a dinosaur feather fossil in your garden suggesting certain interpretations of available data while evoking the curiosity to do more digging.

# Appendix

TABLE A — topics of conceptual metaphors (with translations)

| | **English translation** |
|---|---|
| KŁOPOT | trouble |
| ŻYCZLIWOŚĆ | kindness |
| ZŁOŚĆ | malice |
| SUKCES | success |
| UŚMIECH | smile |
| MYŚL | thought |
| KRYZYS | crisis |
| POMYSŁ | idea |
| STABILIZACJA | stabilisation |
| ŻYCIE | life |
| URODA | beauty |
| WIEDZA | knowledge |
| CHOROBA | illness |
| INTERNET | internet |
| STRES | stress |
| MAŁŻEŃSTWO | marriage |
| NADZIEJA | hope |
| WŁADZA | power |
| MIŁOŚĆ | love |
| KARIERA | career |
| BIEDA | poverty |

TABLE B – conceptual metaphors (with translations)

| **metaphor in Polish** | **English translation** |
|---|---|
| KŁOPOT TO CIĘŻAR | trouble is a heavy object |
| ŻYCZLIWOŚĆ TO PREZENT | kindness is a gift |
| ZŁOŚĆ TO POJEMNIK | malice is a container |
| SUKCES TO PRZYSMAK | success is a delicacy (snack) |
| UŚMIECH TO PRZESYŁKA | smile is a package |
| MYŚL TO BAGAŻ | thought is a baggage |
| KRYZYS TO DRAPIEŻNIK | crisis is a carnivore |
| POMYSŁ TO PTAK | idea is a bird |
| STABILIZACJA TO PŁASKOWYŻ | stabilisation is a plateau |
| ŻYCIE TO CZŁOWIEK | life is a person |
| URODA TO KWIAT | beauty is a flower |
| WIEDZA TO STUDNIA | knowledge is a well |
| CHOROBA TO ROBAK | illness is a worm |
| INTERNET TO KSIĄŻKA | internet is a book |
| STRES TO PRZECIWNIK | stress is an opponent |
| MAŁŻEŃSTWO TO UKŁADANKA | marriage is a puzzle |
| NADZIEJA TO ZWIERZĘ | hope is an animal |
| WŁADZA TO TORT | power is a cake |
| MIŁOŚĆ TO WINO | love is a car |
| KARIERA TO SAMOCHÓD | career is wine |
| BIEDA TO DZIURA | poverty is a hole |

TABLE C– metaphorical expressions (with translations*)

| underlying conceptual metaphor | metaphorical expressions in Polish | English translations |
|---|---|---|
| TROUBLE IS A HEAVY OBJECT | 1. Nie dajcie się obciążyć cudzymi kłopotami!<br>2. Ona tylko czeka, aby przerzucić swoje kłopoty na innych. | 1. Don't be burdened by other people's troubles!<br>2. *She is ready to throw her trouble onto other people. |
| KINDNESS IS A GIFT | 1. Zależało jej na tym aby prasa nie odebrała jej swojej życzliwości.<br>2. Z miejsca obdarzyła go życzliwością. | 1. *She did not want the press to take back their kindness.<br>2. *She immediately gave her kindness to him. |
| ANGER IS A CONTAINER | 1. Przestań miotać się w złości i wyjdź do ludzi.<br>2. Objęła wzrokiem sytuację i natychmiast wpadła w złość. | 1. *Stop being in anger and go out to meet people.<br>2. *She took one look at the situation and immediately fell in anger |
| SUCCESS IS A DELICACY (SNACK) | 1. Wystarczyło, że zasmakowała sukcesu aby stała się inną osobą.<br>2. Dzięki sytuacji w kraju udało mu się liznąć sukcesu. | 1. It was enough for her to taste success to become a different person.<br>2. *Thanks to the situation in the country he managed to take a lick of success. |
| SMILE IS A PACKAGE | 1. Jego uśmiech na widok plakatu odebrała jako osobistą porażkę.<br>2. Spuściła wzrok i posłała mu tylko uśmiech w głąb sali. | 1. *She received his smile when he saw the poster as her personal failure.<br>2. *She kept her gaze down and sent him a smile into the room. |
| THOUGHT IS A BAGGAGE | 1. Wprowadzenie do rozdziału zawiera duży ładunek myśli.<br>2. Nie można po prostu upychać myśli jak popadnie w zdania. | 1. *The introduction to this chapter contains a heavy load of thought.<br>2. You can't just stuff thoughts willy-nilly into sentences. |
| CRISIS IS A CARNIVORE | 1. W ich związku już od jakiegoś czasu na horyzoncie czaił się kryzys.<br>2. Niektóre państwa już zostały zaatakowane przez kryzys. | 1. *Their relationship has been stalked by a crisis on the horizon for some time.<br>2. *Some countries have already been attacked by crisis. |
| IDEA IS A BIRD | 1. Kilka dni temu miał całkiem dobry pomysł, ale wyleciał mu on już z głowy. | 1. He had a good idea several days ago but it flew out of his head. |

* To keep the most accurate representation of the conceptual metaphors used in Polish linguistic expressions the translations are kept as close as possible to their Polish equivalents (in terms of word structure and vocabulary choices). Asterisks mark sentences that are not correct in English.

| underlying conceptual metaphor | metaphorical expressions in Polish | English translations |
|---|---|---|
| | 2. Miała wrażenie, że wykluje się jej jeszcze kilka pomysłów. | 2. *She had the impression that she will manage to hatch some more ideas. |
| STABILISATION IS A PLATEAU | 1. Z perspektywy obecnej stabilizacji gospodarczej na inne kraje możemy tylko współczująco popatrzeć.<br>2. Po wielu latach udało nam się wreszcie osiągnąć stabilizację w związku. | 1. From the perspective of the current economic stabilisation we can only look at other countries with compassion.<br>2. After a number of years we have managed to reach stabilisation in the relationship. |
| LIFE IS A PERSON | 1. Nie powinna się martwić tą decyzją, życie jej to wynagrodzi.<br>2. Zawsze sprawiał wrażenie oszukanego przez życie. | 1. *She shouldn't worry about this decision, life will remunerate her for it.<br>2. He always made the impression of being cheated by life. |
| BEAUTY IS A FLOWER | 1. Nawet najdroższe kremy nie będą w stanie przywrócić jej przywiędłej urody.<br>2. Nie ufam mu, on nadmiernie pielęgnuje swoją urodę. | 1. Even the most expensive creams will not restore her wilted beauty.<br>2. I don't trust him, he excessively cultivates his beauty. |
| KNOWLEDGE IS A WELL | 1. Przez całe studia starała się systematycznie pogłębiać swą wiedzę.<br>2. Jego wiedza na temat górskich kozic jest bardzo płytka. | 1. Throughout her studies she tried to systematically deepen her knowledge.<br>2. His knowledge about mountain goats is very shallow. |
| ILLNESS IS A WORM | 1. Ku przerażeniu najbliższych okazało się że w organizmie dziecka zalęgła się choroba.<br>2. Nawet najlepsi lekarze nie byli w stanie poradzić sobie z chorobą, która ją toczy. | 1. *To the family's horror it turned out that the child was infested with an illness.<br>2. Even the best doctors could not get rid of the disease that plagued her. |
| INTERNET IS A BOOK | 1. Cały wieczór potrafiła przeglądać strony w internecie.<br>2. Tę ciekawą informację wyczytał w internecie. | 1. *She could browse the pages in the Internet all night.<br>2. *He read that interesting information in the internet. |
| STRESS IS AN OPPONENT | 1. Nieważne, jak bardzo się starała, nie była w stanie pokonać stresu.<br>2. Zazwyczaj przegrywamy w walce ze stresem. | 1. No matter how she tried she wasn't able to defeat stress.<br>2. We usually lose the fight with stress. |
| MARRIAGE IS A PUZZLE | 1. Mimo wizyt u terapeuty widziała już że ich małżeństwo się rozpadło. | 1. Despite visiting the therapist she knew that their marriage has fallen apart. |

| underlying conceptual metaphor | metaphorical expressions in Polish | English translations |
|---|---|---|
| | 2. Ich małżeństwo coraz gorzej się układa. | 2. *Their marriage is more and more difficult to assemble. |
| HOPE IS AN ANIMAL | 1. W duszy hodował nadzieję na szczęśliwe zakończenie sytuacji.<br>2. Mimo wszystko wciąż żywiła nadzieję, że jej kudłaty pies wróci. | 1.*He was breeding some hope for a happy ending in his soul.<br>2. *Despite everything she was still feeding the hope that her furry dog will return. |
| POWER IS A CAKE | 1. Zawsze myślała, że w domu to ona będzie trzymać władzę.<br>2. W duchu obiecywał sobie że z nikim nie podzieli się władzą. | 1. *She always thought she will be holding the power in the jome.<br>2. *He promised himself in his mind that he will not share his power with anyone. |
| LOVE IS WINE | 1. Tak był spragniony miłości, że logował się na portale randkowe.<br>2. Biegł przez park upojony miłością. | 1. He was so thirsty for love that he logged onto dating sites.<br>2. He ran through the park intoxicated with love. |
| CAREER IS A CAR | 1. Z niepokojem zauważyła, że jego kariera zmierza w niewłaściwą stronę.<br>2. Doskonale wiedział jak pokierować swoją karierą. | 1. She noticed with anxiety that his career is moving in the wrong direction.<br>2. *He knew perfectly well how to steer his career. |
| POVERTY IS A HOLE | 1. Kilka złych decyzji sprawiło, że znalazł się na krawędzi biedy.<br>2. Ludziom z ubogich regionów trudno jest wydostać się z biedy. | 1. Several bad decisions caused him to stand on the edge of poverty.<br>2. It is difficult for people from poor regions to get out of poverty. |

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# Glossary of terms

**Blending Theory (BT)**: Conceptual blending, or conceptual integration is a theory of cognition developed by Gilles Fauconnier and Mark Turner. According to this theory, objects and relations from different scenarios can be „blended" in a subconscious process. Blending is assumed to be ubiquitous in thought and language.

**concept:** elementary unit of reason and linguistic meaning. Concepts are bodies of knowledge stored in long-term memory and used by default by our cognitive processes when we categorise, make inductions, understand languages, draw analogies etc.

**category:** a class of concepts.

**conceptual blending:** see: Blending Theory (BT)

**conceptual domain:** the representation of any coherent segment of experience, such as LOVE or JOURNEY.

**conceptual metaphor**: a conceptual domain that is understood in terms of another.

**conventional metaphor**: a metaphor that is common in everyday language use in a given culture.

**cross-domain mapping**: another term for conceptual metaphor; understanding one domain in terms of another.

**Invariance Hypothesis (IH):** the idea that a metaphor only maps those components of meaning from the source domain that are coherent with the structure of the target domain.

**Invariance Principle (IP):** see: Invariance Hypothesis (IH).

**linguistic expression:** a spoken or written utterance in a given language.

**mental space:** one of the key components in Blending Theory; a theoretical construct proposed by Gilles Fauconnier and Armen Khederlarian. Mental spaces are idealised cognitive models based on the speaker's knowledge about the world. In BT building mental spaces and establishing mappings between those mental spaces are the two main processes involved in the construction of meaning.

**mirror neurons:** neural cells located in the motor cortex firing in response to seeing a performed action.

**novel metaphor**: a metaphor that is uncommon in everyday language use in a culture. Novel metaphors are typically unfamiliar to the interlocutor and more difficult to interpret than conventional metaphors.

**semantic processing:** access to knowledge about concepts.

**shared entailment:** a common property of the source and target domains.

# Czy pojęcia abstrakcyjne są jak pióra dinozaurów?

## Teoria Metafory Pojęciowej i strategie poznawcze w geście dzieci niewidomych i słabowidzących


Streszczenie

Ewolucja ludzkiego układu nerwowego pozwoliła nam na wykonywanie skomplikowanych czynności fizycznych. Wciąż jednak nie wiemy, jak i dlaczego człowiek nabył zdolność abstrakcyjnego myślenia. Jedna z teorii sugeruje, że myślenie abstrakcyjne i konkretne opiera się na jednym mechanizmie, osadzonym w doświadczeniu fizycznym. Zadając postawione przez psychologa Daniela Casasanto pytanie „czy pojęcia abstrakcyjne są jak pióra dinozaurów", zastanawiamy się nad tym, jakie procesy ewolucyjne doprowadziły do tego, że jesteśmy w stanie opisać nawet bardzo abstrakcyjne zagadnienia w odniesieniu do konkretnych zjawisk. Opisując świat, często posługujemy się przybliżeniami, metaforą czy analogią. Mówimy „zawrzeć myśl w słowach", jak gdyby myśl była przedmiotem, który można schwytać w słowie-pojemniku. Teoria Metafory Pojęciowej posuwa się o krok dalej, mówiąc, że nie tylko mówimy o pojęciach abstrakcyjnych w kategoriach fizycznych, ale również myślimy w ten sposób. Teoria ta jednak została poddana surowej metodologicznej krytyce, związanej głównie z trudnością udowodnienia stawianych przez nią tez. Autorka książki proponuje nowe spojrzenie na poznawczą rolę metafor. Przedstawiając wyniki badań nad mową i gestem osób widzących, słabowidzących oraz niewidomych, dowodzi, że podstawy zrozumienia wielu pojęć abstrakcyjnych szukać można w doświadczeniu fizycznym.

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