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Are abstract concepts like dinosaur feathers? Objectification as a conceptual tool: evidence from language and gesture of English and Polish native speakers.

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1. Oryginalny tytuł pracy dyplomowej

Are abstract concepts like dinosaur feathers? Objectification as a conceptual tool: evidence from language and gesture of English and Polish native speakers.

2. Tłumaczenie tytułu pracy dyplomowej na język polski

Czy pojęcia abstrakcyjne są jak pióra dinozaurów? Obiektyfikacja jako narzędzie poznawcze w świetle badań nad gestem i językiem osób mówiących po Polsku oraz Angielsku.

Podpis promotora

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Podpis studenta

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Miejsce i data

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Maj 2013

Poznań, dnia 6.05.2013

OŚWIADCZENIE

Ja, niżej podpisana Anna Jelec, studentka
Wydziału Anglistyki Uniwersytetu im. Adama Mickiewicza w Poznaniu oświadczam, że przedkładaną pracę dyplomową pt: „Conceptual Metaphor Theory and objectification. A hierarchical model of metaphorical structures based on evidence from language and gesture studies of English and Polish native speakers" napisałam samodzielnie. Oznacza to, że przy pisaniu pracy, poza niezbędnymi konsultacjami, nie korzystałam z pomocy innych osób, a w szczególności nie zlecałam opracowania rozprawy lub jej części innym osobom, ani nie odpisywałam tej rozprawy lub jej części od innych osób.

Oświadczam również, że egzemplarz pracy dyplomowej w formie wydruku komputerowego jest zgodny z egzemplarzem pracy dyplomowej w formie elektronicznej.

Jednocześnie przyjmuję do wiadomości, że gdyby powyższe oświadczenie okazało się nieprawdziwe, decyzja o wydaniu mi dyplomu zostanie cofnięta.

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(czytelny podpis)

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Introduction

Historically, people have a tendency to search for the meaning of life. Questioning the significance of our existence seems to be deeply ingrained, and there is a plethora of works of cinematography, music, poetry, literature and art in general that explore this topic. Events in one's life are clearly meaningful, yet there is no widely accepted theory as to how that meaning is derived. Perhaps the most interesting questions seek to explain not the meaning of life, but meaning itself. In other words, what is the relation between life experiences and our conceptual structure. 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 2007: 1) therefore conceptual structure is grounded in an experiential foundation: specifically the sensory-motor system. However, the connection between the body and the mind is still far from perspicuous, and research insight is still intertwined with metaphors specific for researchers' methodologies (Eliasmith 2003). One direction of exploring the mind-body relationship, often applied to cognitive linguistics research, is to study metaphors produced in language and other modalities in order 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[1] proposes that human con-

[1]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.

ceptual system is inherently metaphorical in that abstract notions are conceptualised in terms of concrete phenomena. Although CMT is an important development in exploring the relationship between the body, language, and mind it has been criticised vigorously for a number of methodological shortcomings, most notably lack of falsifiability and predictive power (Vervaeke and Kennedy 1996, 2004). It is the opinion of the author of the present thesis 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 processes to conceptual metaphor research. Within this conceptual model, Objectification, or the ontological metaphorization 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 thesis 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 an 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 and its implications for cognitive science research.

1.1. Introduction

Human beings are very much limited by habits developed from perception and experience. Imagine a simple box with an opening in front and a mirror on one of its sides. The box is constructed in a way that allows the user to put their hand inside where it becomes occluded so that one can only see its reflection in the mirror. If, having inserted the dominant hand inside this contraption, we try to trace even the simplest of shapes with a pen on paper (a circle, a triangle, or a schematic drawing of a house) the task turns out to be surprisingly difficult. The information we receive from the mirror image of our drawing hand is counter-intuitive 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 we need to try and consciously ignore the very type of feedback that became the default source of information for our brain. Only by learning to position the hand in relation to external landmarks, rather than fall 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, and speculates that meaning is derived from experience. Meaning in the sense of mental representations is grounded in embodied experience in that sensory and motor information are 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 neurons in the brain's visual areas re-enacting visual experience of cars (Thagard 2005: 192). A growing body of research corroborates this view: from studies showing infants' capacity for cross-modal inferencing 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). At this

point we need to resolve one vital issue. If we consider human bodies to be physical systems operating within a material world then, conceivably, the mind should only be able to perceive and conceptualize physical phenomena. Nevertheless, we are able to conduct complex mental operations on a daily basis, whether it is planning ahead to purchase dog kibble 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. Still, mental representations of abstract domains have remained one of the mysteries of the mind. It is possible that abstract reasoning relies on basic "spatial perceptual mechanisms present in lower animals" (Lakoff 1990: 74) that underwent evolution. Consequently, one solution to the abstract concept origin problem could be that "the mind recruits old structures for new uses" (Casasanto 2010: 453–454). Sensory perception constitutes a plausible basis for more advanced processes of abstract reasoning. A question that remains is how the gap between the domains of the sensual and the nonsensual was crossed. One answer to this is: through metaphorization.

1.2. What is metaphor

It is a widely held belief that in ordinary circumstances people talk in literal terms. Figurative language use is often perceived as an exception rather than the norm. Outside of cognitive linguistics the term "metaphor" is accepted to mean poetic language, language that is out of the ordinary and used for the sake of originality or evoking emotions. Although there exist many more nuanced definitions even within cognitive linguistics itself, metaphor can be broadly defined as thinking or talking about something in terms of something else. Metaphor first became a known object of inquiry in the Antiquity, and took a prominent place in the rhetoric works of Aristotle. However, detailed descriptions of the historical beginnings of metaphor studies lie outside the scope of this thesis. Instead, let me briefly summarize the developments which led to the birth of Conceptual Metaphor Theory.

1.2.1. Definition of metaphor; similes and category inclusion statements

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 for two reasons. First, there needed to be an agreement whether metaphors are just distinctive iterations of existing language phenomena such as similes or category inclusion statements. Second, regardless of the answer to the first question, it was not easy to pinpoint the reason behind the distinctive linguistic form of metaphorical expressions. As far as classification of metaphor in language is concerned, answers varied to a great extent. Proponents of the view that metaphor was just a new way of expression rather than a separate phenomenon took one of the two positions: metaphors are distinct cases of comparison or analogy (Keysar et al. 2000) or metaphors are just untypical categorisation processes (Thomas et al. 2001; Glucksberg 2003). The comparison view argues that in order to understand anomalous expressions such as "his 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. "his 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 and juxtaposition are different 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 merely 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, any two things can be alike in innumerable ways so it impossible to identify precisely those ways that are intended in any given context (Glucksberg 2003: 92). An alternative view is that metaphors are anomalous class inclusion statements, where one thing (the target domain) is included or classified within the other (the source domain). The statement "his father is a dinosaur" would be interpreted as an assertion that the father in question can be classified as part of the "dinosaur" category. Within the categorisation view class inclusion statements like these trigger an in-

ferencing 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 "his 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. However, the question whether metaphor is a conceptual or a language phenomenon could not have been answered without deciding where to draw the distinction between the literal and figurative.

1.2.2. A closer look at the literal vs. figurative language 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. 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; do

they require different kinds of mental processing; is there a distinction between cognitive processes behind literal and figurative language production and understanding. And indeed most of them have already been asked and have been receiving progressively complex answers.

Ancient philosophers and rhetoricians saw metaphor as a linguistic device which could be 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 not limited to the scope of a single work, speech, or conversation. What is more, according to this view the aim of metaphor was to transfer a familiar term from its usual location in conceptual space into an uncommon setting in order to produce a surprising and poignant rhetorical effect. Importantly, 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. Viewing metaphor as an ornamental phenomenon, a bonus feature to the obligatory faculty of literal language, continued to be a dominant trend in metaphor study from Aristotelian times and cumulated in the creation of the standard pragmatic model (cf. Searle 1979), and the comparison view of metaphor described in section 1.2.1. Considered merely a departure from literal language, metaphoric meaning was thought to be secondary to literal interpretation and, consequently, its interpretation was deemed 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 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 took advantage of a common measure of the semantic accessibility of a given word, namely the 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). If the target word and the prime word are semantically related then decisions on a lexical choice task 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 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. Faster responses to literal targets than metaphorical ones would indicate that literal meanings are activated more quickly, and the other way round. 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 of 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 understand 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. When they were asked to name the colour of ink in which colour names were printed they found it difficult to tune out linguistic information. For instance, the correct answer for the word "red" printed in blue ink would be blue. Participants in Stroop-type 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. In response to criticism regarding choice of stimuli for this experiment Glucksberg and colleagues repeated the study, this time using metaphors rated for aptness, and got the same results. They concluded that it is impossible to consciouslt 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 language 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 language 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 is based on the premise that all subject matter can be comprehended literally, only literal state-

ments 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 eds. 2008: 16). Consequently, cognitive linguistics makes this distinction 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 unnecessary, as Turner claims that both are merely extremes on a continuum of language processes (Turner 2005: 1).

1.3. Conceptual Metaphor Theory

From early metaphor theories to current hypotheses about metaphoric structure of thought, views on the nature of metaphor have radically evolved both in terms of definition and influence. Paradigm shift is particularly prominent when it comes 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 language and cognition.

1.3.1. Metaphoric thought and metaphorical language

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 (Hills 2011). 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 the problem of a breakdown in communication, we are defining the problem by viewing communication as transfer of meaning, and words as containers into which that meaning should be packed (Reddy 1979: 286). By this logic, if the communication is unsuccessful it 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 type of insight that came from “The conduit metaphor” makes it not only a brilliant exploration of previously undetected issue, but also a turning point for cognitive science.

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” (Lakoff and Johnson 1980) appeared shortly after, spurring the development of Conceptual Metaphor Theory. 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 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 a variety fields of broadly understood empirical cognitive science.

Published in the 1980's Lakoff and Johnson's book "Metaphors we live by" (1980) lay the foundations of the conceptual theory of metaphor. The theory of conceptual metaphor 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 interesting 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.

1.4. Main assumptions of Conceptual Metaphor Theory

In their works on CMT Lakoff and colleagues (Lakoff 1987; Lakoff and Johnson 1980; Lakoff and Turner 1989; Gibbs 1994; Gibbs et al. 1997; Kövecses 2011) argued that metaphor is not primarily a language phenomenon but rather a cognitive mechanism. In other words, 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 two important observations regarding mappings can be made. First, clearly not all features of the source domain are mapped onto the target; we do not necessarily mean

that the software is valuable in monetary terms, or imagine it has decorative potential. Second, many researchers pointed out that in general source domains tend to be more concrete than target domains (Ungerer and Schmid 1996: 121; Gibbs 1996: 310; after Szwedek 2009). As a consequence, 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 address 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).

1.4.1. Invariance hypothesis

As mentioned in the previous sections, conceptual metaphors involve mappings of features between conceptual domains. Although it is possible to draw an infinite number of similarities between any two concepts making the number of potential mappings unlimited, only some of those mappings are used. 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 mappings with one-to-one feature correspondence, and certain mappings are favoured over others. 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.

Lakoff introduced the Invariance Hypothesis as a general principle meant to account for this seeming gap in mapping patterns in the cognitive and linguistic systems. To this effect, he proposed that "metaphorical mappings preserve the cognitive topology

(the image-schematic structure) of the source domain" (Lakoff 1990: 54). Image schemata were originally defined as meaningful experiential pre-conceptual structures grounded in recurrent bodily movements through space, perceptual interactions, and ways of manipulating objects (Hampe 2005: 1). Therefore, what Lakoff postulates is that the structure of experience imposes constraints on non-experientially based conceptual representations, because source domain structure must be preserved in the target domain mappings. However, this explanation ran into two problems. First, the invariance hypothesis is based on the assumption that domains are equipped with pre-metaphoric structure grounded in embodied experience and able to influence mapping. Yet, it is unclear how source domain structure can be preserved in an abstract target domain which, due to its non experiential nature, by definition cannot have this type of preexisting structure (Brugman 1990). Second, if the process of metaphorical mapping is constrained only by source domain structure, then it is difficult to explain why certain expressions within the theories are buildings mapping are deemed acceptable and others are not. After all, the source domain technically permits all building-related mappings, incuding those that rarely, if ever, occur in language. Furthermore, the invariance principle (Lakoff 1990; Brugman 1990) does not predict which mappings are more likely to occur in language. Clearly, while it solved some problems, the invariance hypothesis brought to light other issues. Assuming invariance of structure between source and target domains, is it possible to identify one source domain from which all structure is ultimately 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.

1.4.2. Concreteness and embodied realism.

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 understood as a set of mappings between different domains,

then data from developmental studies show evidence of metaphorical thinking very early in development. Infants as young as 29 days have exhibited the capacity to make cross-modal inferences (Meltzoff and Borton 1979). Meltzoff and Borton 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 cross-domain 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 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 between sensory domains appears at a very early stage in development. It is worth considering whether this, or a similar mechanism can be used for inferencing about abstract concepts by recycling existing motor representations to support abstract thought. Casasanto (2010: 453) suggests that cross-modal inferencing may have been the foundation of abstract thought. Implications of these findings will be the subject of further chapters. Patterns in language certainly suggest that physical experience and abstract mental representations are related. Cognitive linguists point out that speakers who talk about abstract phenomena recruit metaphors from more concrete domains (Lakoff 1993; Gibbs 1996; Casasanto 2010; Johnson 1993). However, the assertion that some domains are more conceptually rich, concrete and embodied than others poses a problem in itself.

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 uncom-

plicated. 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 most conceptual metaphors are considered implicit. Second, it remains unclear whether it is helpful to distinguish between abstract and concrete concepts, rather than explore the possibility of a continuum on which abstract and concrete are opposites or consider this distinction is entirely unnecessary (Turner 2005).

Conceptual metaphor theory makes a number of assumptions about abstract concepts. For instance, 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 premetaphoric conceptual structure (Vervaeke and Kennedy 1996), connection between the sensorimotor and conceptual systems (Pinker 1997), and reductionism (Vervaeke and Kennedy 1996, 2004). These sources of criticism will be discussed in detail in the next chapter. Nevertheless, embodiment has become the leading paradigm in cognitive linguistics, receiving support from most major linguists. Krzeszowski even goes 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).

Views in opposition to embodiment theory include Pinker (1997: 355) who hypothesised that mental representations of abstract concepts were copies of “ancestral circuits” for reasoning constructed on the basis of experience. His claim that these representations lost their connection to the sensorimotor neural circuits has been since disproved, with studies showing that participants listening to sentences show activation in brain areas responsible for an action even if the verb is used in a metaphorical 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 2006a). Studies testing mirror neuron involvement in language comprehension provide further backing to the embodiment theory.

1.4.3. Metaphor typology. Primary and complex metaphors.

Lakoff and Johnson (1980, revised in 2003) proposed a typology of metaphors in which they distinguish three types of metaphor: structural, orientational and ontological. These types are treated as independent and equal. As Szwedek (2011) points out, the criteria for this choice seem rather arbitrary: structure, orientation and existence of things. Orientational metaphors are based on the orientation of objects in space, for instance when we understand "over the moon" as happy because of the HAPPY IS UP 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 type of mapping is visible in such linguistic expressions as "the foundations of this hypothesis". Finally, in ontological metaphors one concept is represented in terms of another, usually more concrete concept. The conduit metaphor can be considered an example of an ontological metaphor since the abstract idea of communication is represented using the concrete notion of a container. The notion of ontological, structural and orientational metaphors being 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. A solution to this dilemma was proposed in the form of Objectification Theory that establishes a hierarchical typology of metaphor based on the object concept. Contribution of Objectification to CMT is discussed in detail in chapter 2 and chapter 3.

Another solution regarding the origin of source domain structure in Lakoff and Johnson's theory was postulating that conceptual metaphors do not form a unified layer of metaphorical mappings, but rather there are different levels of metaphoric complexity. Grady proposed that conceptual metaphors could be divided into primary metaphors stemming from everyday embodied experience, complex metaphors composed of primary metaphors, and compound metaphors involving both primary and complex metaphorical mappings (Grady et al. 1996; Grady 1997, 1999). Gibbs clarified that "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" (2011: 357). This approach does, however, raise a number of questions regarding the embodied or experiential nature of some 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 in the population. It is unclear whether a concept should be considered embodied merely because of an existing possibility of being experienced, and if so would such a concept be classified differently for persons who have first hand experience as opposed to theoretical knowledge. Thus, the primary metaphor theory has been found a useful, but not exhaustive way of constraining metaphorical mappings. 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). However, as mentioned above, primary metaphor theory does not account for constraints apparent in metaphorical mappings. It has been argued that a successful model of metaphor comprehension should not only be able to predict all possible mappings, but also reject mappings that are not permitted. It seems reasonable to postulate that there is a basic level of embodied experience which may be coded in the form of (metaphorical) mappings. Also, it has been shown that metaphors can be combined to form increasingly complex structures. I would like to argue further in this paper that establishing a new metaphor typology as a foundation for a clear model producing reliable results and able to handle mappings that are to some degree recursive is preferable to adding a vaguely defined layer of "non-embodied" mapping to an existing classification. What is more, any attempt to modify metaphor typologies existing in the CMT should be conducted with view of the limitations of this theory.

1.5. Limitations of CMT

“Metaphors We Live By” was in many ways a game changer. This 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 “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). However, conceptual metaphor theory has traditionally been concerned with relations and structures at the mental representation level, focusing on the role of the 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, which implies that the problem may lay more in Gibbs' answer to criticism than with 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 from introspective, 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 eds. 2004; Lakoff and Johnson 1980; Kövecses 2002). Researchers would chose 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. There exists a plethora of studies demonstrating the influence of embodied experience on the understanding of abstract concepts including 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 the aspiration to provide an account of language that is consistent with what other cognitive science disciplines (neuroscience, cognitive psychology, developmental psychology, psycholinguistics, etc) have revealed about cognition and the brain (Lakoff 1990) it needs to apply methods used by the more empirically focused sciences. In addition, certain methodological problems need to be addressed.

1.5.1. 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). Gibbs 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, according to the invariance principle metaphors should 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). Yet 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, and in what sense 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.

1.5.2. Falsifiability and predictive power.

Any two concepts are infinitely similar. Humans are able to draw parallels between things practically ad infinitum but, in fact, we rarely do. As mentioned in section 1.4.1. 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 prin-

ciple (Lakoff 1990) was an attempt to account for overgeneration, the issue is still far from solved. 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 invariance principle 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, the predictive power of a theory of cognition is valuable for three reasons. 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 conceptual metaphor theory might mean 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.

1.5.3. 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 in my view" (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 criticism that has so far prevented CMT from enjoying the status of a serious contender among mental representation theories pertains to its clarity.

1.5.4. Clarity.

It is important for theoretical models to undergo criticism in order to identify their shortcomings and, if possible, solve emerging problems. 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 hard to disprove. Theories with well-defined scope and finely tuned hypotheses are easier to test and, therefore, falsify. If a theory makes specific predictions these predictions can be tested and the results yield credence to, or weaken the theoretical claims made by that theory. In contrast, the more vague the assumptions and general the claims of a model, the more difficult it is 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 assumptions 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 approach does not lend scientific credibility to the theory. Clarity is vital to falsifiability, an issue discussed in the previous section, as “empirical evidence can only support a model that is well specified enough to make clear predictions” (Murphy 1997: 102).

The lack of clarity is a problem that can only be addressed at a theoretical level. It can be seen from the previous sections in this chapter that CMT has a number of is-

sues to resolve, including the lack of clear criteria for distinguishing between abstract and concrete concepts, metaphor typology, and circularity of argumentation. Furthermore, proponents and sceptics of CMT alike are posing important questions regarding the nature of embodied representations. For example, Rakova inquires about the nature of distinction between nominal concepts (designating things) as opposed to verbal concepts (designating processes) and their corresponding dynamic neural activation patterns (Rakova 2002; after Krzeszowski 2002: 267).

1.6. Alternative solutions and theories

Opposite the many proponents of conceptual metaphor, 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 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 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 been conclusively shown to be better than their literal counterparts. In order to be able to compare metaphoric and literal views on conceptualisation theories need to be articulated precisely enough to allow that comparison, something which in Murphy's view conceptual metaphor theory was missing. Even if the empirical data from an experiment support the claims of 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) which tested both metaphoric and non-metaphoric solutions to understand priming of expressions that stemmed from similar conceptual

metaphors. As mentioned above, this oversight may be an indirect effect of the apparent difficulty with 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).

In contrast to literal theories of meaning, cognitive linguistics developed a number of theories in line with conceptual metaphor. The limited scope of this thesis permits focus only on those paradigms that are relevant for the study. For a more detailed coverage the reader is advised to consult Kövecses (2011), who published an excellent overview of contemporary theories of metaphor.

1.6.1. Lexical concepts and cognitive models (LCCM)

LCCM (Evans 2010) theory is a usage-based theory of lexical representation and meaning construction. It is concerned with language understanding and, as such, classifies as a front stage cognition theory (in contrast to CMT and blending, which are backstage cognition theories, but with which LCCM remains compatible). LCCM aims to produce a psychologically accurate model of meaning construction based on the assumption that words individually bear no meaning but rather provide avenues of access to cognitive models available to language users. Within this framework, meaning is a property associated with a complete utterance. Meaning construction is a dynamic interpretation process where parts of a word's semantic potential get activated based on the data contained in a linguistic utterance and extra-linguistic context. In a vein similar to other cognitive linguistic theories (Lakoff 1993), Evans proposes that figurative language arises from regular meaning-construction processes no different from those that give rise to non-figurative language. The notion of concept and cognitive model will be elaborated upon further in this paper.

1.6.2. Objectification

Objectification theory proposed by Szwedek (2000a, 2002, 2004, 2005, 2008) is an improvement over Lakoff and Johnson's metaphor typology (1980, revised 2003). This approach is contrasted to what they propose in the latest edition of their book, namely that 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 are not independent properties in themselves, but 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). Proposing that objectification constitutes a fundamental type of metaphorization, he argues, allows structure and orientation to be assigned in agreement with the inheritance of properties hypothesis (De Beaugrande and Dressler 1981; after Szwedek 2004). Objectification as an alternative theory of metaphorization is the subject of the second chapter.

1.7. Conclusions: CMT and cognitive science research

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, according to Krzeszowski, it is increasingly clear that cognitive linguistics should not be considered autonomous, but rather an integral part of cognitive science. Linguistics is an indispensable part without which the latter could not exist, but it should not be regarded as separate. Conceptual metaphor and other theories of embodied cognition brought new understanding of language and communication into linguistics at the same time requiring researchers to become involved in research that is increasingly interdisciplinary. Deconstructing the conduit metaphor (Reddy 1979) changed our understanding of meaning and communication, bringing cognitive linguistics closer to

other natural sciences and further from the notion that language can be studied as an autonomous phenomenon outside of meaning, environment, and context. Nevertheless, there are still visible remnants of the period when linguistics was a self-proclaimed autonomous science. Many debates on the field hinge on terminological misunderstandings. Cognitive linguistics inherited a number of questions from structuralist linguistics, but they are often deemed invalid or ill conceived in the embodiment framework. On the other hand, methodological frameworks functioning in other branches of cognitive science are not always compatible with traditional methods of conducting cognitive linguistic inquiry. Taking into account the sources of above mentioned criticism levelled at CMT, this thesis aims to propose a coherent model of metaphor that will be geared towards empirical testability and based on interdisciplinary research findings, but also focused on improving the accessibility of the findings of CMT and related theories to the general scientific community.

Chapter 2: Objectification Theory. Basic terms and principles.

2.1. Introduction

In the previous chapter I introduced the notions of conceptual metaphor and tried to establish the background in which the theory operates, its main tenets, and goals for further development. Research has convincingly shown that much of conceptual structure depends on physical experience. Although the claim has been considered controversial (cf. Gibbs 2011), CMT asserts the structure of mental representation can be studied through language. In the previous chapter I have shown that language data alone is no longer considered sufficient to support CMT, and that the theory needs more sources of evidence to substantiate its claims regarding conceptualisation processes. However, for this to be possible, conceptual metaphor theory needs to provide a framework compatible with modern psychological and neurological research. This chapter will seek to establish the role of conceptual metaphor in modern cognitive science, focusing on the creation of abstract and concrete concepts. I will discuss recent developments in theory of mental representation, and describe classical models (Markman 1999) as well as newer or less established approaches (Barsalou 1999; Semin and Smith 2007) to representation. Finally, I will assess the applicability of CMT to empirical conceptualisation research, both with and without the amendments introduced in Objectification Theory (Szwedek 2002).

Due to the interdisciplinary nature of this thesis I will strive to justify the methodological and theoretical choices made in the development of the proposed conceptualisation model. What may be a natural choice of framework for a linguist need not necessarily feel justified for someone outside the field. I am aware that the approach taken in this and the following theoretical chapters of this thesis may feel too detailed or redundant to some, while not explicit enough to others. However, if the aim is to produce a model that is potentially useful to researchers from a variety of fields within cognitive sciences, including psychology, linguistics, computational modelling, and AI compromises need to be made. I hope that this chapter is informative without dwelling too much on details, and useful without sounding authoritative. Both methodological and theoret-

ical frameworks of cognitive linguistics are in constant development, which makes it impossible to proclaim one approach as correct. Nevertheless, I hope that the methodological choices made for this model will to some degree hold up to the pressure of time.

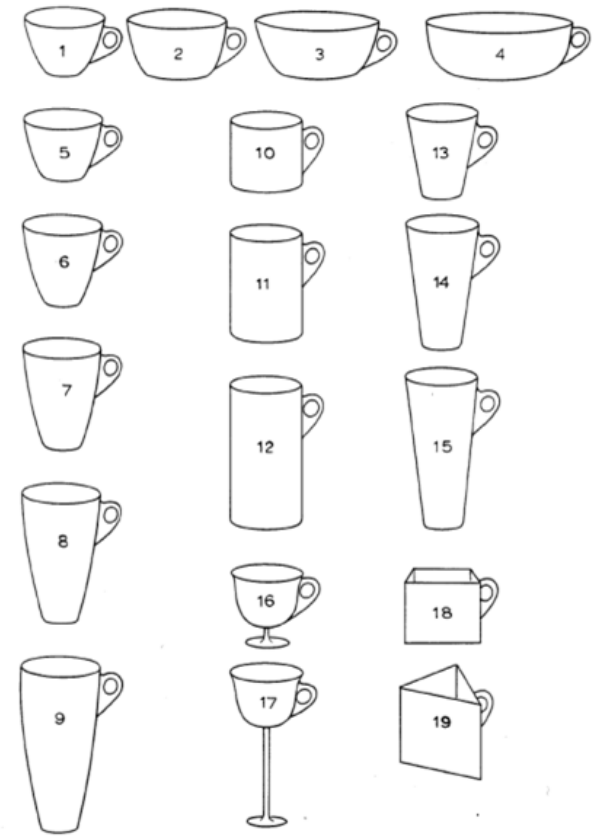
2.2. Mental representation

"Thinking can best be understood in terms of representational structures in the mind and computational procedures that operate on those structures" (Thagard 2005: 12). Accounting for knowledge representation is an important 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 of the chosen theory of representation, but also its compatibility with the increasingly empirically-focused domain of cognitive science.

The debate whether conceptual structure is embodied or symbolic has a long history, and it is not for the first time that perception has been identified as a source of representation. Prior to the twentieth century theories of cognition relied on perception to a great extent (Barsalou 1999). The subsequent developments in logic, statistics and computational modelling inspired theories that divorced perception and meaning. Stemming from these developments was the classical representation theory, which postulates that mental representations take the form of amodal symbols (Fodor 1975, 1983). According to 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 amodal symbols (Markman 1999; Markman and Dietrich 2000a). More recently, theories of mental representation have undergone a paradigm shift again from the classical to a more embodied approach to conceptualisation. This change may be helpful in reconciling the psychological and cognitive linguistic research on mental representation and semantic storage or the so-called mental lexicon. The classical theory of representation assumes that 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). This belief has been challenged by research demonstrating that the sensorimotor cortex is involved in semantic processing (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). In other words, when we are asked to imagine playing tennis, not only does this activate the brain areas responsible for language comprehension and memory, but also the motor cortex areas normally involved in playing. In fact, this discovery has already been used to detect consciousness of patients in vegetative state (Cruse et al. 2011; Owen et al. 2006). 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 increasingly corroborated by evidence from empirical studies. Amodal representation is among many principles of the classical theory of representation that have been questioned by research in the vein of 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 of importance not only to researchers 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 mortar that connects all the heretofore separate bricks within cognitive science including prototype theory, image schemata, cognitive linguistics and conceptual metaphor.

2.3. Classical vs embodied accounts. Toward a comprehensive approach to mental representation.



Although the classical and embodied approaches take different stances with regard to origin, structure and form of mental representation, they both allow for a similar working definition. Mental representations are mediating states of intelligent systems that carry information (Markman and Dietrich 2000a: 471). It needs to be noted that representations must be interpretable, or "something is a representation only if a process can be used to interpret that representation" (Markman 1999: 8). In search for a unified mental representation framework that allows for an inherently perceptual mental representation system we need to consider two possible solutions. First, introducing changes into the classical view so that it accounts for recent findings regarding conceptual struc-

ture (Markman and Dietrich 2000a). Second, adopting one of the existing alternatives to the classical view, namely theories based the on embodied grounding hypothesis including perceptual symbol systems (Barsalou 1999), situated cognition (Robbins and Aydede 2009), embodiment (Semin and Smith 2007; Fogassi and Ferrari 2007), dynamical systems (Beer 2000) or a variation thereof. Let us now examine these possibilities in more detail.

Most 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 internal structure of the amodal symbol does not reflect the underlying perceptual activation pattern. For instance, within this approach symbols for colours of objects 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 perceptual activation patterns are conceivably more similar for the first pair than the second.

Although some of the beliefs postulated in classical theories of representation are debatable, they have many 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, perhaps most importantly for this thesis, the ability to account for both abstract and concrete concepts (Markman 1999; Markman and Dietrich 2000a). It is clear that any theory that posits 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

[2]For an overview of classical theories of representations see (Markman 1999).
[3] Percept is a term used for perceptual representations within the classical account (Fodor 1975, 1983)

added quality that would make it better or more plausible as an account of representation. Having established this set of benchmarking qualities, let us look at how different models of representations compare with the classical view in terms of phenomena particularly relevant in the context of this thesis: conceptualisation mechanism, abstract vs concrete distinction, and language.

2.3.1. Language, memory and representation structure

Traditional theories of representations are grounded in language (Collins and Loftus 1975; Fodor 1975). Although they treat language and symbols as different, the adopted approach to knowledge representation mirrors linguistic structure (Barsalou et al. 2008). For example, predicates for objects, events, and properties often correspond to the words that denote them. For instance, 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 assumption that the word is close to what constitutes the content of the symbol. Furthermore, symbolic thought is assumed to be analogous to language in many ways. Understanding language is based on sequential processing of words in a sentence, just as conceptual processing is assumed to be sequential, with symbols processed as lists or in sentence-like structures (Fodor and Pylyshyn 1988). Although the classical account of representation seems compatible with structural linguistics, researchers in the field of cognitive linguistics tend to adopt non classical assumptions 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). Cognitive linguistics is far from rejecting any kind of connection between words and concepts. Quite on the opposite, concepts and words 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). This assumption is reflected not only in the theoretical framework of the discipline, but also in study design as many cognitive lin-

guistic 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 classical assumption is that all representations need to be enduring and, therefore, stored in long-term semantic memory (Markman and Dietrich 2000a). However, grounded cognition approaches including situated cognition and dynamic systems views present possible alternatives. The former states that many aspects of the world remain stable so that we do not need to remember them, or code in an enduring form. The phenomenon of change blindness, when we do not notice changes in these elements of a scene that are out of our conscious focus, could be seen as evidence in support of this hypothesis. 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 sensorimotor 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 grounded cognition 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 brain language systems and situated simulations in the brain modal systems are related (cf. Barsalou et al. 2008). 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. It has been mentioned in the previous section that a felicitous account of mental representation needs to account for both abstract and concrete concepts.

2.3.2. Concreteness and the symbol grounding problem

It has been stated already that amodal representations are by definition not directly grounded in experience. While the classical account allows for 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 need to account for what is called the symbol grounding problem, or the nature of the relationship between the symbol and its reference to its specific instances (Harnad 1990). In contrast, this issue does not arise in embodiment- and simulation-based accounts of representation used by cognitive linguistics. The hypothesis of grounded cognition states that representations are grounded in sensory modalities. This assumption forms the basis of a substantial amount of research within cognitive linguistics in general and CMT in particular. Often studies do not focus on searching for the origin of representation, but rather on showing that conceptual structure is grounded in experience. Concrete concepts are assumed to be directly or indirectly embodied, or based on bodily experience and sensory data.

There are many contrasting accounts of abstract conceptualisation. It is the intention of the author of the present thesis to show how concept creation processes can be modelled through conceptual metaphorization. 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 flexible, and that both concrete and abstract concepts can be accounted for in this manner (Barsalou 1999; Goldstone and Barsalou 1998). Because of the close relation between the two processes, research on the nature of concepts is important for categorisation studies.

2.3.3. Categorisation

Categorisation is one of the most basic cognitive and indispensable functions of living organisms. Even amoebas distinguish between two categories of things they encounter: “food” and “not food” (Lakoff 1987). For the purpose of this study we will follow the definition of category as a class of objects in the world (Murphy 2004). Categories are useful cognitive devices. Once established, they serve to reduce the mental load. In fact, Rosch (1999: 252) identifies providing maximum information with minimum cognitive

effort as one of the principles of categorisation. Newly encountered entities can be classified as category members rather than analysed separately. For instance, if we have two categories for animals, domestic (friendly) and wild (potentially hostile) sorting unfamiliar animals we encounter into one of those groups relieves us from having to decide whether we should expect any animal we encounter to be friendly or not on an individual basis. Furthermore, categories permit generalisation and inferencing. Once we decide that the goat we met is a domesticated animal we may also determine that all goats are domesticated and, as a result, infer that goats are non-hostile. 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 racist, 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.

2.3.4. Conceptualisation

Concepts and categories are two terms that usually appear together in psychological research. Therefore it seems important to introduce a basic distinction between these two terms. While categories denote classes of objects, concepts constitute the mental representation of a class of objects (Murphy 2004)[4]. In line with the paradigm preferred before the cognitive revolution described in chapter 1, classical theories of representation assumed that concepts consist of rule-based definitions. Concept x is comprised of properties separately necessary and jointly sufficient for the concept to be an x (Machery 2011: 16). According to this definition, if someone holds the classical concept of bach-

[4]I will further refine this definition later in the thesis.

elor they believe that in order to be a bachelor it is necessary and sufficient to be an unmarried adult male. The traditional account of concepts is associated with a simple categorisation model. In order to categorise an object as x one needs to determine if the object has features that are thought necessary and sufficient for x. For instance, the concept of bachelor would consist of the following features: 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. In contrast, 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 useful sources of knowledge about basics of category learning, for the most part rule based accounts of conceptualisation have been replaced by prototype and exemplar based theories.

There were three main reasons for rejecting the classical view of concepts: category boundaries, concept complexity and accounting for typicality and exemplar effects found in experimental studies. Classical accounts of categorisation are able to accurately predict categorisation decisions when categories are clearly delineated. However, in case of categories with vague boundaries, the basis for classifying an object into one category and not the other is no longer obvious. 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”. However, 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 states that this problem may be overcome by assuming that it is not the category boundaries that need to be vague, but rather the predicates used as classifying features should be vague themselves (2007). Another illustration of this problem is Labov's famous cup/bowl experiment (1973) in which he showed the participants a set of drawings of cup-like objects (see Figure 1) and asked them to decide whether an object was a cup or a bowl. The results showed that 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. This can be taken taken to suggest that category judgements are context dependent in a way that cannot be accounted for with predicate vagueness.

The second reason behind the waning popularity of the classical view was accounting for complexity of representations. If concepts are sets of necessary and sufficient features 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 conceivably be more difficult to interpret than simple notions, a fact that would be reflected in longer processing time in case of complex notions. However, studies show that complex concepts such as murder are no more difficult to process than the concepts they are composed of. In contrast to the classical account, most grounded cognition approaches to representation are based on a version of the prototype theory. 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) demonstrating that categories are not the bounded, clearly delineated sets of features required by classical logic. 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 within 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, conceptual representations seem to be rather concrete. 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 plethora of categories (Rosch 1999, 1973; Smith and Medin 1981; Rosch and Mervis 1975).

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, 2006b). Cognitive linguistics was among the first branches of science to champion grounded cognition theories in modern times. Most cognitive linguistic research rejects the notion that concepts are sets of necessary and sufficient features in favour of the view that that categories have a prototype structure. This approach is called the prototype theory.

Prototypes are composed of features that can be considered typical, that is likely to describe an object in the category, or diagnostic, that is indicative of category membership, or a combination of both (Machery 2007). For instance, the 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 most representative or typical example is the closest to the prototype. Prototype theories received support form a wide range of empirical studies. Posner and Keele (1970) 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 an unfamiliar 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, 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 matches the prototype closer 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 were they as members of a specific category. For example, the category of birds included robins, swallows, penguins, os-

triches and chickens. The participants demonstrate 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. In contrast to the classical representation theories, prototype theories were able to account for a wide variety of cognitive phenomena including categorization, 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. Nevertheless, the classical account of concepts as composed of sets of necessary and sufficient features (Aitchison 2012) does not seem adequate for the purpose of an empirically grounded interdisciplinary, conceptual metaphor based model. Empirical research demonstrated the explanatory and predictive power of grounded cognition models of conceptualisation. Therefore, it appears that any model of conceptualisation aspiring to reconcile theoretical and empirical findings needs to take into account the prototype theory of representation. For the purpose of the present thesis 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 theoretical model will be discussed and explained later in this paper.

2.4. 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 in nature, are objectively only as valid as the evidence that supports them. At the same time, 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. 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 are a number of reasons why developing new models and improving existing theories is beneficial for both the theoretical and empirical sides of cognitive science. First, models help empiricists 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 understanding of concepts should translate to study design. Change in theoretical approach should translate to change in 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. A good example here is conceptual metaphor theory which, 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. Second, 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 that can be reconciled with what we know about the brain lead to 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 neural theories in order to increase dialogue opportunities these discip-

lines. Finally, while many models are meant to be interpreted as analogies or simulations, 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 consider 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 od cognitive disciplines.

Because organisms need cognitive systems that deal with the world as a whole rather than separate situations (Edelman 2003) 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 currently a 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) but, although fascinating, it lies beyond the scope of this thesis[5]. For now let us agree that an adequate model of mental representation should be compatible with empirical findings, follow a coherent theoretical framework, and be scalable so that inference goes beyond any specific cognitive function. Therefore, if

[5]For details see (Edelman 2003; Markman and Dietrich 2000a)

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.

2.5. Neurolinguistic evidence for cognitive phenomena – review of methodological constraints

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 results 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 potential (ERP) is a variant of EEG often used in neurolinguistic research because it measures changes in 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 (less than 1 msec) changes in activa-

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

tion, it has limited spatial resolution because this technique 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 challenges of EEG and ERP data analysis (Savoy 2001). Indirect methods such as MRI, fMRI and PET are also called hemodynamic 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 brain areas 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 metabolic changes and influence the blood flow is not clear. However, the empirical relationship between brain activity and such changes is very reliable. Positron emission tomography (PET) is one of the methods that applies this principle to measure 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 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 studies in the domain of neurolinguistics have largely been replaced with functional magnetic resonance (fMRI). The fMRI technique refers to the detection of 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 (fMRI) 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 popu-

[7]for a detailed description of these methods see (Savoy 2001; Ganis and Kosslyn 2002)

lar method in neurolinguistic research, fMRI is not ideal. 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. In other words, even small movements of the head introduce artefacts into the data, which may make the collected information effectively useless. Assuming that the experiment produced valid results, another question is whether they comparable to the results of other studies, and to what extent it is possible to make cross-disciplinary inferences.

It is often the case, particularly in popular scientific reporting, that results of neurolinguistic studies are sensationalised. This is not surprising: the colourful 3D activation maps produced by neuroimaging software easily yield to enthusiastic misinterpretation. It is important to remember that 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 relative differences in neural activity between 2 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 a 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 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. In conclusion, it is clear that neuroimaging research contributed greatly to the development of the field of cognitive science. Nevertheless, one should bear in mind both the advantages and limitations of such studies when constructing theoretical models with interdisciplinary scope (Poeppel and Embick 2005).

2.6. Conceptual structure and the brain

"Concepts are the glue that holds our mental world together" (Murphy 2004: 1). Concepts are the elementary units of reason and linguistic meaning and have long been at the centre of cognitive science research. 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 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 shown in section 2.4, 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 categorize, 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.

2.6.1. Neurolinguistics of semantic processing

Semantic processing, or access to knowledge about concepts is a central feature of human behaviour. It is not only important to 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 who suffered from brain disorders, including Alzheimer's, dementia, aphasia and schizophrenia. Semantic processing has also been the subject of a plethora of neuroimaging studies conducted on healthy volunteers with the use of such methods as positron emission tomography (PET), functional magnetic resonance imaging (fMRI) and event related potential (ERP) research. 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 it 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.

2.6.2. Are some concepts amodal?

In the beginning of this paper 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). Within this approach the sensorimotor system provides structure to both types of conceptual representations, and constrains their semantic content. Some neurological studies refer to the so-called amodal areas of the cortex as being associated with semantic processes in the brain, but this terminology is misleading. While indeed 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). More recent studies show that even cortical regions formerly considered ‘‘unimodal’’ receive inputs from multiple sensory modalities (Schroeder and Foxe 2005). Binder et al. propose to draw the distinction between the ‘‘modal’’ cortex where processing reflects a dominant sensory or motor modality, and the ‘‘amodal’’ cortex where input from multiple modalities is more nearly 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 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 namely that imagining and doing evoke similar activation patterns seems to corroborate Lakoff's theory. This phenomenon is called motor resonance (Zwaan and Taylor 2006), referring to the observation that some words “resonate” in the sensorimotor systems as if they were actions. For example, "when people close their eyes and visualize a simple object such as the letter "a", the primary 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 in primates, neural cells located in the motor cortex firing 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 a relationship between language, gesture, and the mirror neuron system (Arbib 2006b; Rizzolatti and Craighero 2004). The mirror neuron theory of language development (MNT) is discussed in more detail further in this paper. At this point, the hypothesis that conceptual representations of physical objects are grounded in experience stands relatively uncontested. Nevertheless, “how people mentally represent these 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.

2.6.3. Abstract and concrete concepts in the brain. The concreteness effect.

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 more resilient to brain damage (Katz and Goodglass 1990) than words representing abstract concepts. This phenomenon is known as the concreteness effect, and has become the subject of extensive research in 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 which makes comprehension easier and faster. The dual-coding theory, on the other hand, assumes that all verbal stimuli initially activate representations in the mental lexicon. In addition, concrete words activate information in a nonverbal imagistic system to which they are connected. This part of the comprehension process is difficult, if not impossible for abstract concepts. This model argues that there is a difference 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, "does the word "bird" contain the letter Y?") which 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. In other words, 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, and one used also in the experimental part of the present thesis, is conducting a questionnaire among a set of subjects who will not be involved in subsequent studies based on the stimuli tested for concreteness[8]. Participants are asked to rate a set of concepts on a scale, and the data is used to compute

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

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 its 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. Concrete words are associated with other traits such as being easy to imagine, whereas abstract words are not (Feng et al. 2011; see also: Paivio 1971), but this can hardly be considered objective criterion to distinguish between the two. Furthermore, the concreteness (and imagibility) of a concept is calculated on the basis of subjective judgements of a group of people. The key question here is whether popular judgement can (and should) replace selection based on objective criteria. The problem may be illustrated simply. While many people say that dolphin is a fish, that does not necessarily mean it is true; many people claiming that mountain is a concrete concept does not constitute proof that it is. Naturally, seeing that concepts are cognitive phenomena rather than physical entities relying on introspection may seem an intuitive methodological choice. Nevertheless, I would like to argue in this chapter that introducing a set of objective criteria as a 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]. The second 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 important, which effectively means their rank on the concreteness

[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 chapter 3 of this thesis.

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.

2.7. 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. When we look into studies within cognitive sciences, it is clear that the concrete versus abstract divide cannot 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. 1997). This definition is problematic for a variety of reasons (Szwedek 2010). First, because it introduces a very subjective element into concreteness judgement. For instance, the concept of war can be considered abstract and concrete at the same time for two different persons with different backgrounds. It is concrete if that person experienced it directly, abstract if they were 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 of the conceptual metaphor LOVE is A JOURNEY (Lakoff and Johnson 2003)? 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 former 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 to an extent 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. Despite measurable differences between concepts on the opposite sides of the concreteness spectrum it is still unclear what exactly is 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 mean that abstract concepts are rooted in sensory modalities. However, Pinker (1997) 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. Both of these theories agree on one point: abstract concepts derive from the brain's capacity to acquire concrete concepts. What they disagree on is their current relationship. It is possible that abstract concepts are simply a case of an evolutionary mechanism called exaptation, or recruiting existing structures for new uses (Gould and Vrba 1982; after Casasanto 2010). Have they evolved on the basis of a mechanism meant for something different and taken 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 feathered limbs were used for flying (Gould 1991). Recent findings suggest that abstract concepts may have also been a result of exaptation. Research on the concreteness effect shows that abstract concept comprehension activates mainly 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). These results seem to go in line with the embodiment theory, which states that concrete concepts are grounded in sens-

ory 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. The question is, how did minds that have developed 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 metaphorization.

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 categorisation and understanding of the world (Lakoff 1993; Gibbs 1996). Can metaphorical processes account for the distinction between abstract and concrete concepts? The answer is: perhaps, 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.

2.8. Objectification

It has been shown in the previous chapter that the abstract/concrete distinction is both an important and neglected issue within the framework of conceptual metaphor. 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.

The development of metaphor and the development of abstract thinking have been compared before (Casasanto 2010; McGlone 2001). If we consider metaphor a type of categorisation during which some phenomenon is categorised in terms of an-

other, more concrete concept it is easy to draw parallels between metaphorical and abstract thinking. In both cases the more 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 abstract thinking is based on concrete physical experience (Fogassi and Ferrari 2007; Semin and Smith 2007), a view that is supported by mirror-neuron accounts of language and cognition (Arbib 2006b; 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 resembling 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 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 "directly experiencec" criterion posed by Gibbs (1996) because without a very specific definition it is difficult to claim that we experience a journey more directly than any emotion. We also cannot intuitively claim that a journey is "more readily imagined" (Fliessbach et al. 2006) than love. All in all, journey as a concept seems rather abstract in itself. Perhaps this metaphor could be described as a 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 concreteness of the source domain is greater than that of the target. In light of the evidence for the advantages of concreteness reviewed in section 2.6.3. 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? In this sense the most useful reference in terms of concreteness is a physical object. 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. Nevertheless, in his Objectification Theory Szwedek (2011) makes a compelling argument that the X IS AN OBJECT metaphor is the most basic and widespread conceptual mapping.

2.8.1. Definition of objectification

In his work on Objectification Theory Szwedek insists that the term 'objectification' is applied in consonance with its meaning as defined by the Oxford English Dictionary, that is "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 eds. 1989). However, it becomes apparent that throughout his papers the term is applied specifically with reference to the ontological metaphorization from concrete to abstract domains as a fundamental type of cognitive operation. In other words, he proposes that before any other metaphorical operations can be performed, concepts are coded as belonging to the domain of physical objects, and only as a consequence can be further described in terms of ontology, orientation, and structure. 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[10] 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 in themselves. Structure and orientation are properties of objects. Therefore, "before any entity can be assigned structure or orientation, it must be objectified first" (Szwedek 2004: 121).

As mentioned above, CMT identifies three types of metaphor: ontological, structural and orientational and puts them in a relation of equality rather than hierarchy. Objectification Theory arranges these metaphor types on a continuum because, as Szwedek

[10]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 will exclude it from the present analysis.

points out, structure is a property that only physical objects can have, and orientation can only be identified in relation to objects that have certain structure. This model identifies objectification as fundamental type of metaphorization, allowing structure and orientation to be assigned in agreement with the inheritance of properties hypothesis (De Beaugrande and Dressler 1981). By proposing this solution Szwedek implicitly answers a common question regarding the status of metaphor as a cognitive phenomenon, namely whether metaphor is an online process in language understanding or rather an ontogenetic process related to concept creation (Gibbs et al. 1997). Objectification Theory clearly sways towards the latter view, although I would suggest that the way concepts are initially created must have an online influence on general comprehension, particularly in view of the dynamic representation system hypothesis (Beer 2000).

2.8.2. Explanatory value of Objectification Theory

It could be claimed that proposing an additional basic step in the conceptualisation process of abstract concepts 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). In other words, we already suspect that abstract concepts are understood in concrete terms, therefore an additional explanation mechanism is redundant. However, as I will try to show in this and the following chapters, Objectification Theory constitutes a valuable addition to CMT because it increases its falsifiability, introduces constraints on possible metaphorical events and helps generate testable hypotheses rather than post-hoc justifications.

Arguments against the Conceptual Metaphor Theory have been reviewed in detail in the first chapter of this thesis. Critics of CMT have long taken issue with the apparent lack of constraints on metaphorical mappings between source and target domains. This lack of rules 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 map-

pings 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. It is also unable to explain those felicity judgements. By introducing Objectification Theory, which only allows certain mappings, and assumes that inheritance of features follows a hierarchical structure (i.e. 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). In experiments based on the Objectification-CMT paradigm it is possible to predict certain aspects of feature mapping, and test the accuracy of these predictions empirically. 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 wanting in CMT.

The first chapter of this thesis reports that 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 mapping preserves 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). Invariance Principle significantly increased the explanatory power of CMT with regard to felicitous and infelicitous mappings. It also left the theory with some issues that Objectification Theory proposes to resolve.

Invariance Principle relies on the assumption that structure is a property of both target and source domains. However, if we assume that 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 overwhelming amount of evid-

ence that the structure of target domains constrains possible mappings (1993) we are left with the first choice. Objectification applies before other metaphorical processes (although, given the assumption that it is a type of metaphoric operation, retaining the original term "pre-metaphoric level" seems problematic). 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 processing, objectification as a process can be considered the source of abstract target domain structure before metaphorization.

Another set of difficulties outlined in the first chapter of this thesis is associated with CMT as an empirical research framework. To summarise briefly: conceptual metaphors are incomplete mappings of features between the target and the source domain (Ruiz de Mendoza Ibáñez and Pérez Hernández 2011). They are considered incomplete because not every feature of the target domain can be mapped onto the source domain. Also, it is not assumed that abstract concepts are understood via one prevailing mapping, but rather constitute a part of a variety of conceptual metaphors. 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, yet it is equally acceptable to use the LOVE IS A JOURNEY metaphor and say "we encountered some obstacles on our way to happiness". Outside of the assertion that the structure of the target and source domains must be preserved CMT does not offer tools to predict which conceptual metaphors are useful, and which mappings within these metaphors are plausible, or considered "correct". For 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 acceptable while LOVE IS A POTATO ("ex. "I peeled my way into his heart") is doubtful at best. 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 ac-

ceptability, it can be used to design testable hypotheses regarding mapping felicity in a way that CMT cannot.

It is relatively easy for CMT to generate post hoc explanations of novel metaphoric expressions. Discovering a phrase that does not adhere to any known conceptual metaphor does not disprove CMT. Anomalous or novel metaphoric language can be explained away as a discovery of a new conceptual metaphor underlying the expression. This makes it effectively impossible to produce linguistic evidence against CMT. 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 hierarchical structure of metaphor which may be used as a step-by-step verification procedure for assessing mapping validity.

2.8.3. Objectification and the concreteness effect

In the previous sections I have shown examples of real differences between concepts identified as abstract and concrete in terms of memory, speed of recognition, ease of comprehension, and brain regions involved. The concreteness effect shown in a number of neurolinguistic studies (ex. Della Rosa et al. 2010; Kounios and Holcomb 1994; Casasanto et al. 2001) prompted me to ask whether a questionnaire was the best method for gauging concept concreteness. It is clear that cognitive linguistics does not offer a better alternative for measuring this feature. Researchers in the field 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. In other words, the first step in conceptualisation is the mapping of features between the newly acquired concept and the source domain of physical objects. Structure and orientation are mappings of features inherited from the source domain. Objectification Theory introduces an amended conceptual metaphor typology based on the notion of concreteness as experienced by touch.

2.9. Conceptual metaphor – an Objectification based typology

It has been shown that internal inconsistencies in CMT can be resolved by postulating the existence of pre-metaphorical structure of abstract concepts. Objectification Theory proposes that the domain of physical objects is the source of this structure. Concepts would acquire structure through being objectified, a basic conceptual process where an abstract target domain is mapped onto the broadly defined domain of physical objects. Szwedek suggests that other types of metaphorical processes depend on objectification and are hierarchically related to it. Consequently, he puts forward a three level metaphor typology that includes metonymy-based, concrete-to-abstract and abstract-to-abstract metaphors (Szwedek 2011). These levels represent directionality of mappings.

2.9.1. 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 metaphorical one because 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 the OBJECT IS ANOTHER OBJECT statement. 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. In the broader framework, metonymy-based metaphors are more complex than metonymies, which are the easiest to comprehend type of figurative language (Van Herwegen et al. 2013).

2.9.2. 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 metaphors 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 should be sought in evolution. Objectification answered the human need to account for increasingly abstract phenomena. In other words, when humans needed to conceptualise concepts more complex and less tangible than "apple" and "branch" they used the existing mental representation system to do so. Because the system was not developed for entertaining abstract thoughts these new types of concepts were processed in the object framework. "The new abstract entities were identified, con-

ceptualized, and verbalized in terms of the only world that had been known to our ancestors, the world of physical objects" (Szwedek 2011: 345). Interestingly, in this respect 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 ed. 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 at in more detail in the following chapters on conceptual metaphor in gesture.

2.9.3. Abstract-to-abstract metaphors

Metaphorical mappings from an abstract source to an abstract target are the most frequently discussed 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 type. In CMT research 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, 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 war 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 target and source domains need to be objectified first.

Szwedek also classifies orientational metaphors in the abstract-to-abstract category. Orientational metaphors are mappings between concepts that stand in some spa-

tial 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.

2.10. 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 as a cognitive process. In order to play a non-trivial role in developing an account of mental representation objectification needs to be shown as a process that is not only possible, but also plausible. It is also important to demonstrate whether Objectification provides a more complete account of categorisation than existing 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 features of the phenomena they encounter. Using those features we are able to compare newly encountered objects and assign them to one (or more) categories. Any time a certain phenomenon is encountered and 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 mod-

els (Chandler 1991). Prototype theory has two consequences for conceptual metaphor. First, it reinforces the connection between concept creation and categorisation processes. Second, the model is feature-based and concepts are composed of feature sets. As we know, metaphorical mappings are parallels drawn between features of two (or more) concepts. One of the arguments against the classical representation theory was that it was impossible to construct sets of necessary and sufficient conditions (features) for any given category because concepts can be characterised by an infinite number of features. 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 concepts (Casasanto et al. 2001; Fliessbach et al. 2006; Kounios and Holcomb 1994). In the embodied cognition framework understanding 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. Thus, they are represented primarily in the supramodal cortex.

I believe that the gradual metaphorization of abstract concepts reflected in Szwedek's metaphor typology resembles the notion of chained metonymies, or metonymies that require multiple conceptual shifts (Hilpert 2007: 77). In Objectification

Theory an abstract concept acquires the properties of a physical object including structure and orientation. The objectified concept may then undergo further abstract-to-abstract metaphorization. As a result, any abstract concept has physical properties like orientation and structure that permit further metaphorization. Beyond that abstract concepts may be described in terms of other concepts (both abstract and concrete), and temporarily acquire features as a result. These processes constitute additional steps in metaphorical chaining.

Objectification Theory provides an interesting perspective on the development of abstract concept understanding. Rather than postulating metaphorization as a separate conceptual process, it fits in with evolutionary models (Casasanto 2010) that propose a common mechanism for conceptualisation. 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.

2.11. Questions for Objectification Theory

The previous sections served to show how implementing Objectification Theory into the CMT framework ameliorates 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.

2.11.1. The ultimate source domain

Identifying the concrete domain in which abstract thinking is ultimately grounded has been the subject of a number of papers (Szwedek 2011, 2000b). In summary, there are three major contenders for the position of ultimate source domain: structure (Grady et al. 1996), space (Radden et al. eds. 2007; Vervaeke and Kennedy 2004) and object (Szwedek 2000a). Structure is not a viable candidate for a pervasive source domain 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). Phenomena such as fictive motion and spatial reference systems for time have been presented as evidence that space provides structure to more 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). It is impossible to understand space without understanding physical objects. In this sense, objects play a more primary role in conceptualisation than space. Furthermore, it is not uncommon for blind children to conceptualise the notion of space in terms of time (Marek 1997), which would be impossible if space were the basis of conceptualisation. Blind children consider the time necessary for a movement between two destinations a more basic experience than space, presumably because space is experienced visually. It could be argued that this is the result of experiencing space and developing spatial orientation in familiar surroundings. It needs to be noted that spatial orientation in blind children is developed primarily through touch[11], both directly and with the aid of the white cane. Both blind and seeing speakers relate time and space to tangible objects. Objectification Theory proposes that the source of target domain structure should be sought in the domain of physical objects. Among other arguments Szwedek points out that touch is the first sense to develop in the human foetus (Szwedek 2000b) so potentially a good point of reference for subsequent sensory-based processing. Although touch and tangibility constitute a useful

[11]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).

tertium comparationis for gauging concreteness, the objective importance of touch for conceptualisation needs to be proven. 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 perhaps tangibility is a useful device for assessing concept concreteness with little neurological validity beyond that.

2.11.2. Internal consistency

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 metaphorization. After objectification is applied to abstract concepts 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)? Also, the status of objectification needs further analysis with regard to its permanence and effect on processing. The philosophical discussion regarding the status of metaphor as an ontogenetic vs phylogenetic process provides a valid point of reference. “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). Objectification needs to be established in a broader context of cognitive processes.

2.11.3. Objectification: property vs process

Another issue that needs to be addressed in Objectification Theory is its cognitive status. Its definition 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.

2.12. Advantages of Objectification over CMT

Occam's razor is a methodological principle that states the simplest explanation that accounts for all the data is preferable (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 like to argue that the 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 empirical interdisciplinary research.

As demonstrated in the first chapter, CMT has been accused of circularity of argumentation and lack of predictive power (Murphy 1997) that resulted from lack of constraints. After the addition of Objectification Theory metaphorical mappings follow a set of constraints introduced gradually in a chain of metaphorical processes. Objectification can be tested by comparing the mappings it predicts and excludes at any given stage with 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. On the other hand, the status of objectification as an unconscious cognitive process makes it more elusive and difficult to study. This does not take away from the theory's capacity for making testable predictions.

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 perceptu-

ally 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 mentioned that structural metaphors are both the most frequent and the most frequently analysed type of conceptual metaphor. In contrast to Objectification Theory, CMT does not explain the prevalence of metaphors belonging to this type. According to OT metaphor typology structural metaphors are classified under abstract-to-abstract metaphors (the remaining two categories being metonymical metaphors and objectification metaphors). Metonymic mappings focus on a salient feature of a particular concepts and are, as a result, quite constrained with regard to feature mapping which limits their usefulness and expressive power. Objectification, being a basic conceptual operation is largely unconscious, and often remains unidentified as a metaphoric mapping. 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, whereas CMT remains descriptive.

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. Chapter three of this thesis focuses on showing how CMT-OT reconciles computational and non-computational frameworks without being reductionist.

2.13. Applications of Objectification Theory

Having reviewed both the advantages and issues pertaining to Objectification Theory, one could carefully admit 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 may improve the relation between neurolinguistics and linguistics in a manner postulated by Poeppel and Embick (2005) and make experimental designs less subjective.

Studies based on a set of stimuli that is classified as concrete or abstract based on a relatively stable criterion (as opposed to judged as concrete) may also be 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 solve.

2.14. Conclusions

Objectification Theory opens up a new avenue 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 cognitive semantics and brain studies. One could hope that this will become a stepping stone between different 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 as an interdisciplinary principle. These issues, including its status as a process or feature, falsifiability, and general usefulness are the subject of chapter three.

Chapter 3: Objectification as an emergent feature of conceptual metaphorization

3.1. Introduction

The purpose of the first two theoretical chapters of this thesis was to demonstrate that existing accounts of mental representation have left many unanswered questions regarding abstract concept understanding. I have shown 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 grounds for this distinction. Following Szwedek's Objectification Theory (Szwedek 2000a, 2002, 2008, 2011) tangibility was identified as a potentially valid abstract/concrete distinction criterion. We have also considered the plausibility of OT as a conceptualisation model and research framework. Objectification Theory as an improvement over Conceptual Metaphor Theory appears to be consistent with both 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. The present chapter focuses on assessing 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.

3.2. Connectionist models in cognitive theorizing

The idea that neural networks can be used to further the understanding of the mind dates back to cognitive connectionism[12], a computational modelling approach to cognition.

[12]Connectionist modelling research has a lengthy tradition the description of which lies beyond the scope of this thesis. New Connectionism is the name of the approach continued after the cognitive revolution, because studies in the tradition espouse connectionist assumptions while not being contradictory to cognitive semantics or conceptual metaphor (Regier 1996).

Network models of cognitive functions reoriented the study of natural semantics and conceptualisation, becoming a major step in rethinking the nature of concepts. The notion of concept learning in humans 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. eds. 1998), and that simple networks (perceptrons) learning to categorise patterns arrange them into "concepts" with prototypical structure resembling that hypothesised 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 classical theory of mental representation (Markman and Dietrich 2000a). Although neural network models do not claim to reflect actual brain architecture, they try to emulate its computational properties and structural constraints, often serving as adequate analogies of the cognitive processes they perform (Westermann et al. 2006). Taking into account the relationship between neural architecture and brain function, connectionism attempts to shed light on the mind. For instance, Regier's model of spatial language learning (1996) based on the principles of cognitive semantics (Brugman 1990; Lakoff 1987; Talmy 1983) learned spatial terms from a variety of natural languages through a set of videos that show objects in different spatial relations, and display the names of those arrangement. For instance, one object hovering over another would be accompanied by the word "above". The network learned those spatial relations and their descriptors, and demonstrated its knowledge by naming relations shown in an unfamiliar set of videos. 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 abstract 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. CMT suggests that those representations

are employed for abstract reasoning, effectively dismantling Markman and Dietrich's (2000b) argument that amodal concepts are prerequisites of abstract thinking. Clearly, there are circumstances that make CMT and connectionist modelling great allies in the quest for understanding abstract conceptualisation.

Although constrained neural networks are usually motivated by 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 (Duch 2009) of brain states rather than attempts to replicate brain structure. In computational cognitive modelling insight is gathered from instances where the model performs successfully and, more importantly, when it makes errors. 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 the task of predicting 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 further predictions. In the course of the experiment the network learned to accurately predict sounds. In addition, it began to identify word boundaries. Perhaps the most interesting "side effect" of the experiment was that in identifying boundaries between words the model made erroneous guesses remarkably similar to those made by young children learning to speak. The model separated sequences of sounds into non-words and articles, making mistakes commonly seen in children's language, for instance "a nelephant" or "a dult". Such experiments further the understanding of human conceptual processes in a way that is not reductionist. Word boundary identification in the Elman (1990) experiment highlights another important aspect of connectionist models: 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 learn-

ing and adjustment processes in the network. The observation that some complex systems manifest higher level properties that are not attributable to the components is called emergence (Sawyer 2002).

3.3. Emergence of meaning

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 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, so simplicity is an important advantage of this approach. All connectionist models can be deconstructed into on four elements: units, connections, activations, and connection weights (Mareschal et al. 2007). Units of a connectionist model are basic information processing structures similar to neurons in biological networks. The units of a connectionist network can represent the function of one neuron, or a group of neurons (Thagard 2005: 116). As an analogy to biological networks, connectionist models are typically composed of many units arranged into layers. In most models units are organized in three layers: the input units, hidden units and the output units. The input units supply the information, which is computed by the hidden units layer and the solution is supplied by the output units. Because of this structure three layer 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).

3.3.1. Concept representation and prototypes

There are two ways to represent concepts in a connectionist network. Older connectionist models were localist (Elman et al. eds. 1998: 90) meaning that is each concept was represented by a single node. In contrast, most current network models rely on distributed representations (Rumelhart and McClelland 1987). In such networks propositions and concepts are dynamically represented as patterns of activation. Distributed representations have important advantages over localist networks for modelling conceptualisation. Similar to the brain, one set of units may represent a variety of concepts through different activation patterns. Distributed representations are also 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 is spread over many units that may represent features, so concepts that are similar will cause similar patterns of activity (Elman et al. eds. 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 an emergent property in conceptualisation.

3.3.2. Emergence of features: language studies vs. mind models

Although they may make the most straightforward examples, emergence of meaning is not limited to conceptualisation models in connectionist networks. Feature emergence is also a linguistic phenomenon. In metaphor comprehension feature emergence occurs when a non-salient feature (one that is not commonly elicited as a feature of the source or target domains) (Becker 1997) becomes salient in metaphor comprehension (Utsumi 2005; Terai and Goldstone 2011). It could be argued that this type of emergence, and emergence in a connectionist sense are associated merely because of the name. However, if we assume that metaphor is a categorisation process (Thomas and Mareschal 2001) both definitions of feature emergence are applicable. For example, if objectifica-

tion is an emergent feature of conceptual metaphorisation in the connectionist sense it needs to be shown as a property of the conceptual system. In the context of metaphor studies objectification can be considered an emergent property if it is demonstrated to be more salient in metaphor than without a metaphoric context. It appears that both of these approaches may be used provide convergent evidence for the status of objectification. In the connectionist paradigm objectification may be both a process and a feature, while in the metaphor comprehension paradigm it can only be interpreted as a feature. For the sake of clarity these approaches are presented in the form of a table (see Table 1) below. A quick comparison of the two approaches shows that neural network models are more focused on the process by which mental representations are created, whereas metaphor studies focus on comprehension and retrieval of features. It would be interesting to see how these contrasting accounts could be used to study the status of objectification.

Table 1. Feature emergence.

neural network models	**metaphor studies**
an emergent process (something that the model does without being programmed to)	an emergent feature is a non-salient property that becomes highlighted in the metaphor
an emergent property is a property acquired as a result of the emergent process emergence is a function of network structure important in concept creation	important in comprehension and appreciation

For this reason I will show how the methodological paradigm used for finding emergent features in metaphors can be applied to investigate objectification.

3.3.3. There is no object. Objectification as an emergent feature.

Chapter two reviewed some of the arguments for introducing objectification as an additional conceptual process, facilitating the comprehension of abstract concepts and enabling their further metaphorization. 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 it as ontological metaphorization 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 comprehension of abstract topics there is no need for a separate process, as object-features emerge from the very act of categorisation (Jelec 2009). Furthermore, defining objectification in terms of features rather than processes helps integrate it into a more general cognitive science framework. Shifting the perspective on objectification from process- to feature-focused makes it more relevant to research on conceptualisation because, rather than add an additional process that needs to be proven we are proposing a property common for the whole conceptual system. "To understand categorization it is necessary to further understand processes of perceptual feature creation" (Markman and Dietrich 2000a: 472).

I propose that from a neurological perspective there is no need for an object concept. In its original version, Objectification Theory points out that 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 indicates that information about 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, it could be argued 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).

3.4. Objectification as effect of feature emergence: an empirical study

In many ways language reflects our psychological experience (Radden et al. eds. 2007). CMT states that through language researchers gain access to information about conceptual structure. 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 whole network of relations between the brain, the mind, language, and experience. Thus, successful accounts of conceptualisation should 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 the course of earlier studies (Jelec 2009; Jelec and Jaworska 2011) Objectification Theory is easily implemented into a network-based paradigm.

If the mechanism for concept formation resembles a network it is reasonable to assume that evidence for this is to be sought in language. Exploration of the nature of language processes brings researchers closer to understanding conceptual processes (Gibbs 2011, 1996, 1994). Neural networks operating on natural language data are designed to be models of human performance. Such models become a valuable source of insight about the nature of human cognition (Mareschal and Thomas 2006). Let us then postulate that the mechanism for categorization and concept formation initially developed to cope with concepts directly accessible to the early humans (concrete objects). Such a network would convert external sensory inputs into an internal, multi modal network representation of the object in the brain. The sheer amount of sensorimotor stimuli accessible for any perceived natural object must be overwhelming[13], 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. What is more, the compression of data facilitates recog-

[13]Studies involving children diagnosed with ASD (Autistic Spectrum Disorder) show that a disruption in stimuli filtering mechanisms may lead 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).

nition of prototypical examples and inhibits the recognition of peripheral representations. The question is what happens if a system developed for object understanding is required to cope with increasingly abstract concepts? We proposed that when an abstract notion is computed by a neural network designed to cope with tangible concepts the data compression mechanism would require the notion to be conceptualized as an object to permit further processing. In short, the concept would become objectified. Objectification is in this sense both a process (of abstract concept categorisation) and an emergent property of the neural mechanism for categorisation. Abstract language phenomena including conceptual metaphors are a consequence of this system rather than evidence for inherently metaphoric reasoning. The study presented in the following chapter investigates whether objectification is indeed an emergent property of conceptualisation.

3.4.1. Aim:

In the previous sections I presented two interpretations of feature emergence: connectionist and linguistic. The connectionist implementation 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. Language comprehension is more straightforward to study than implicit conceptualisation processes. Therefore, I propose to use the linguistic view as a means to study the validity of the connectionist model.

For this experiment we hypothesised that if objectification as understood by Szwedek (2002) is an emergent feature of metaphorical mapping at the conceptual level abstract concepts would be judged as more tangible 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 modelled our research on other emergent feature paradigms (Utsumi 2005; Becker 1997).

3.4.2. Methodological considerations

Because of its implicit nature, conceptual metaphor is notoriously difficult to study. One disadvantage of CMT is that conceptual metaphors underlying metaphoric expressions are elusive because of the lack of constraints on mappings. 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 would influence the psychological validity of the study.

Testing objectification, a process that we assume is unconscious and pre-metaphoric (in the sense that it is applied before abstract-to-abstract metaphors), meets 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 one of the first steps in metaphoric chaining then it is necessary to ensure that the method allows us to study that level, rather than further metaphorical mappings. With these considerations in mind we decided to base the study on metaphor comprehension and appreciation models (Terai and Goldstone 2011; Utsumi 2005) but use a Likert scale rating rather than an elicitation paradigm.

3.4.3. Participants

We asked 79 participants, 12 male and 67 female, 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 a higher level education, and most participated in an introductory course to linguist-

ics. 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.

3.4.4. Stimuli

For experimental material we chose 21 conceptual metaphors of abstract concepts from the Master Metaphor List (Lakoff et al. 1991). Each conceptual metaphor was used to generate two sentences containing conventional metaphoric expressions. The complete list of metaphors and sentences used in this experiment is provided in Table 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) discussed in the second chapter of this thesis. In order to control for any effects of particular sentence structure two sentences were generated for every conceptual metaphor. For instance, BEAUTY IS A FLOWER was the underlying conceptual metaphor for two sentences: “Even the most expensive facial cream will not return her wilting beauty”(Nawet najdroższe kremy nie będą w stanie przywrócić jej przywiędłej urody) and “I do not trust him: he is overly invested in cultivating his beauty” (Nie ufam mu, on nadmiernie pielęgnuje swoją urodę) (Jelec and Jaworska 2011). Sentences containing conventional metaphoric expressions were pretested and modified for psychological validity as well as assessed for understandability and conventionality.

3.4.5. Procedure

The participants were divided into two groups. There were two tasks. In the single-concept task the stimuli were topics or vehicles extracted from metaphors and presented alone, interspersed with some distractor words. In the single concept task participants were asked to rate words on four 7 point Likert scales with regard to: familiarity (zna-

jomość), formality (formalność), valuation (wartość) and tangibility (materialność). The values used in the analysis were tangibility and familiarity, the rest was used as filler scales in order to avoid participants' 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, the metaphor-concept task, was similar except the stimuli were conventional metaphorical expressions instead of topics or vehicles alone. Participants were shown sentences with one word underlined and asked to rate the expression containing the underlined word on a different set of four 7 point Likert scales. These scales measured: familiarity (znajomość), understandability (zrozumiałość), metaphoricity (dosłowność) and tangibility (materialność). The underlined word always represented the target domain of the underlying conceptual metaphor. Again, there was no set time limit for participant response. The second task was designed in a way that each group received 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 with different contexts).

3.4.6. Results

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 mean tangibility ratings for primed and unprimed instances of use, 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 2.

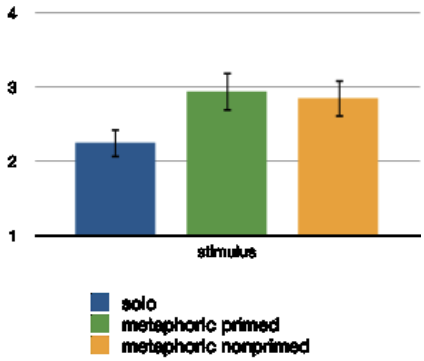


Fig. 2: Graph showing a statistically significant increase in perceived concreteness, and no relevant differences across the primed and non-primed group

These results suggest that context influences the perception of abstract concepts. Specifically, our results suggest that abstract concepts in conceptual metaphors are judged to be more tangible (concrete) than abstract concepts alone. These results support the hypothesis that objectification in the sense of acquiring or highlighting object properties is an emergent feature of conceptual metaphorisation.

3.4.7. Discussion

Although there is a difference in tangibility judgements that seems to support our Objectification Theory hypothesis, this effect may also be due to the influence of sentence context on tangibility judgements. We have tried to control this factor by using two different contexts for each underlying conceptual mapping, but it is reasonable to assume a residual effect. 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 answered accordingly. These data points were excluded from the analysis. The issue, however, is a source of valuable insight for future studies.

3.5. Discussion: Objectification Theory in conceptualisation research

Previous research demonstrates objectification effects in language comprehension. Objectification Theory is an amendment to Conceptual Metaphor Theory that not only increases its empirical usefulness, but also is compatible with a variety of cognitive paradigms including connectionist modelling and neurolinguistics. Its introduction into the CMT framework may prove beneficial. 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 can influence cognitive research methodology remains to be seen. Nevertheless, if it is to be introduced as a vital part of conceptualisation, predictions made within Objectification Theory 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.

3.6. Conclusions:

I propose that objectification is a process through which concepts become eligible to be treated as physical objects; including but not limited to acquisition of structure, orientation in space, movement in space, manipulation, and resizing to the human-scale. This is not a separate cognitive process, but rather a set of emergent properties that result from conceptualising abstract phenomena via neural pathways that developed for the comprehension of concrete objects (exaptation). Objectification should not, therefore, be

viewed as type of metaphor but rather a fundamental cognitive and computational principle underlying the development of theoretical models.

Due to the limitations of experiments based solely on linguistic data it is difficult to convincingly demonstrate the existence and properties of unconscious cognitive processes (Murphy 1997). Linguistic evidence for objectification as an emergent feature presented in this chapter could 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 data (Cienki and Müller eds. 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 4: Conceptual metaphor, objectification and gesture

4.1. Introduction

Despite a plethora of research on the subject, the human capacity for abstract thought remains a mystery. We may know brain activation patterns evoked by the word love, but we are far from understanding how it is conceptualized. It has been shown in the previous chapters of this thesis that both Conceptual Metaphor Theory and Objectification-Theory support the view that understanding abstract concepts is based on physical experience. Research demonstrates that a vast majority of abstract concepts in language and gesture is represented in concrete terms (Lakens 2010; Lakoff 1987), and many relatively abstract subjects such as communication are commonly described as sensorimotor experiences. We speak about hurtful words and force of argumentation as if speech had a physical effect; communication is defined as exchange of information as if meaning was an object handed over to an interlocutor. In general, everyday metaphorical language suggests that abstract concepts are understood in terms of concrete experience. Indeed, Conceptual Metaphor Theory postulates that abstract concepts are metaphorical, a statement that is still a source of controversy. Cognitive science often relies on linguistic studies to provide information regarding cognition. Many point out that language is no longer sufficient as the sole source of support for a metaphoric model of concepts (Murphy 1997: 101). As explained in previous chapters, this is largely due to the methodological limitations of CMT. Lexical and syntactical priming, omitting information that is difficult to verbalise (Ericsson and Simon 1993), vocabulary and memory limitations are all factors that may influence linguistic performance in a cognitive task. One of the most important problems is that it is virtually impossible to prove the existence of one conceptual metaphor over another using a set of expressions where the source domain is implicit, even though these expressions are supposed to be at the centre of interest within CMT (Gibbs 2011: 531). On the other hand, spontaneous co-speech gesture is not constrained by the same factors as speech. Gestures do not replicate the syntax of the question or the text of the problem. They convey visuospatial information in a way that is nearly impossible for speech. Spontaneous speech of most language users is

accompanied by gesture (Goldin-Meadow 2003). Therefore, gesture is a valuable source of information about cognitive processes, particularly those that are not readily expressed in speech like objectification. “Speech and gesture together provide a more complete picture of mental representations than does speech alone” (Alibali et al. 1999: 327).

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 theoretically consistent both internally with CMT, and externally with methodological approaches from outside cognitive linguistics. Objectification has been analysed as a process and an emergent feature. Research results demonstrated an objectification effect in conceptual metaphorisation. However, due to the elusive nature of underlying mappings these results need to be approached cautiously. Before recommending the introduction of Objectification Theory into the CMT paradigm further support for the theory is required. To seek this support we turn to studies in metaphorical gesture.

4.2. The importance of gesture studies for cognitive science

It is almost impossible for people to talk without gesturing (Goldin-Meadow 2005). When gesture is produced spontaneously alongside speech it forms an integrated system with that speech. In this way, both speech and gesture are manifestations of the same set of cognitive processes. Because they are not constrained like language, gestures provide a window onto the thought processes of the speaker/gesturer. Alongside language data, gesture provides the most important source of evidence for metaphorical thinking (Cienki 2008; Müller 2008; Langacker 2008).

One of the main assumptions of CMT is that metaphors are sets of mappings between conceptual domains. These mappings are studied on the basis of linguistic expressions in which they appear. However, if metaphors indeed have their basis in the conceptual system then language should be just one of their possible manifestations. In other words, conceptual metaphors should be visible in various forms of human beha-

viour. Research on the topic demonstrates the existence of metaphorical mappings in a wide variety of fields, including visual media, music, and dance (Cienki 2008). Increasingly gesture studies show that spontaneous gestures produced alongside speech, particularly gestures of the hands and forearms, can also constitute metaphoric expressions. Gesture studies not only provide CMT with deeper support by showing the ubiquity of metaphorical mappings in human behaviour, but also pose important questions regarding the theory itself. In this chapter I will introduce basic notions regarding metaphorical gesture studies, focusing on the conceptual aspect of gesture. We will analyse Objectification Theory in the context of gesture studies looking for evidence of the process in a multimodal context.

4.3. What is gesture

It is impossible to define gesture without referring to language, and difficult to do so without referring to deeper cognitive processes. The first chapter of the present thesis discusses embodiment as a theory of mental representation. Embodiment theory aims to explain the basis of mental representation by postulating that conceptual structures developed from perceptual processes, and are influenced by this fact (Goldstone and Barsalou 1998: 234). In simpler 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 thought is reflected in everyday language which is demonstrably embodied. Another important way in which embodiment manifests itself in language is spontaneous gesture accompanying speech (Barsalou 2008: 628). It is important to note that the relationship between language and gesture depends upon how these words are defined.

4.3.1. Definitions

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 thesis, however, we will focus on gestures of the hands and arms. Because it is difficult to conclusively identify the purpose of any given gestural movement we will disregard the second part of the definition.

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)[14]. The preparation phase occurs when the gesturer moves their hands from the rest position to the position where the gesture will be enacted. The space in which gesture is enacted can broadly be called the gesture space. The preparation phase may end in a prestroke hold (Kita 1990) during which the hand briefly hovers in the air in anticipation of gesture stroke. The stroke phase is the meaningful phase of gesture. It is considered to minimally constitute a gesture, so that a movement without a stroke phase is not defined 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 may be complimentary to that in language. For instance, when we say "she 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 as a way to indicate the upper floor of a building. If the gesture contains a stroke, the stroke phase

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

may end in a poststroke hold. The hand freezes before a retraction maintaining the stroke's final position and posture. 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 a rest position, which is not necessarily the same location from which the preparation phase began. The retraction phase is optional because in some cases gesturers begin a new stroke immediately after the previous one. These distinctions are applied in the empirical study on objectification in gesture described further in this thesis.

4.4. Types of gesture: Kendon's continuum

Originally, distinctions between different types of gestures have been introduced by Adam Kendon (1988). These types were arranged on a scale by McNeill (1992) who introduced them under the term "Kendon's continuum". Gesture types located along Kendon's continuum differ in two respects: similarity to spoken language and optionality. The degree to which speech is an obligatory support for gesture decreases from gesturing to signs. At the same time the degree to which gesture has language-like properties increases. Although for the purpose of this thesis I will be focusing primarily on gesture co-ocurring with speech, it seems appropriate to discuss all of the gesture types introduced by Kendon to set a context for further discussion and analysis.

4.4.1. Signs

At one extreme of Kendon's continuum are signs, or units of meaning in a sign language (McNeill 1992). From 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, unlike that of the spoken languages used in a given area. For instance, ASL (Amer-

ican Sign Language) and American English differ in terms of the grammatical patterns they use, vocabulary, morphology etc. 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).

4.4.2. Pantomime

Pantomime is a sequence of gestures performed in the absence of speech and conveying a certain story. It is not directly dependent on language. However, Arbib (2006b, 2006a) cites pantomime as evidence for a common evolutionary background of gesture and language and their joint dependence on the mirror neuron system. He claims that the brain mechanisms supporting human language are not specialized for speech, but rather for broadly understood multimodal communication (Arbib 2006a: 25). The mirror-neuron system for grasping served as a neural basis for both language and gesture. Mirror neurons allow mammals such as apes to recognise and learn the actions of others. Generally speaking, the same neurons that are activated in the sensorimotor cortex when the ape performs an action are activated when it witnesses another ape (or a human) make a movement that resembles that action. In this way embodied simulations constitute a part of the knowledge about an action. Because human interaction is based on shared knowledge pantomime was not only a means to teach a certain set of movements, but also to convey a meaning beyond that. As meanings became increasingly conventionalised (that is they could denote an object in the absence of this object), pantomime began to include vocal gestures which eventually became speech. Although so far unsubstantiated with much empirical evidence, Arbib's Mirror Neuron Hypothesis of language evolution (MNH) does explain the close synchrony between gesture and speech.

4.4.3. 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 highly culture dependent (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 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.

4.4.4. Speech-linked gestures

Speech-linked gestures 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 the sentence structure in an almost word-like manner. These gestures are often called nonredundant, supplementary, or mismatching gestures because the information they convey is not present in the accompanying speech (Hostetter 2011: 298).

4.4.5. Gesticulations (gesturing)

Gesticulation or gesturing is a motion that conveys a meaning related to co-ocurring 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). Such co-linguistic gesture presumes the primacy of 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 this type of 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 a palm with 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 in a simulation gesture. 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 those terms through which the topic is characterized (Kendon 2000). This hypothesis seems to go in line with CMT amended by Objectification Theory because both types of concepts are viewed as embodied and distinguished only be the type of reference.

4.5. Other relevant typologies

Outside of the distinctions introduced in Kendon's continuum gestures are categorised according to a number of criteria. For the purpose of investigating a conceptual process such as objectification it is important to be aware of the many, oftentimes subtle distinctions between gesture types.

4.5.1. Spontaneous vs deliberate gesture

As mentioned in the previous section, gesticulations are spontaneously and unconsciously produced during speech. Thus, their analysis may lead to deeper insight regarding underlying cognitive processes, particularly metaphor (Cienki 2008). However, in the age of body language seminars it is increasingly difficult to find speakers who have not been subjected to some kind of gesture instruction and, therefore, display spontaneous as well as acquired gesture. Acquired gesture is not a reliable source of information about conceptual processes, particularly if taught with explicit focus on co-speech gestures. However, even experienced researchers find it difficult to tell apart gesticulation that occurs spontaneously and gestures that are the result of training. In the present study we sought to ameliorate this issue by inviting blind and severely visually impaired informants to participate in the experiment. The implications of this, as well as some methodological consequences are discussed in the following chapter.

4.5.2. Gestural viewpoint

In general, gesticulation represents the world from two perspectives: that of an observer (observer viewpoint O-VPT), and of a character (C-VPT) (Cassell and McNeill 1991). Observer viewpoint gestures are usually representative or iconic gestures that denote something from a third-person perspective. For instance, moving a hand quickly along a path when describing the route of a car ride presents the situation from the point of view

located outside the car. Similarly, character point of view 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 often sometimes called simulation gestures.

4.5.3. Conventionality

The issue of conventionality and cultural dependence of gesture has already been introduced in section 4.4. 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 is highly dependent on the context (McNeill 1992). For the purpose of the present analysis the usefulness of highly conventionalised gestures is rather limited because they would be indicative of the broader culture rather than mental processes of informants.

4.5.4. Discourse function

Müller (1998) introduced another classification which presents metaphorical gesture from a different perspective. It 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 a concrete or abstract concepts. Because the present thesis focuses largely on abstract and concrete concepts and their conceptual correlates, the analysis of experimental data will revolve around referential gestures.

4.6. Comparison of language and gesture

As mentioned earlier, language and gesture are intertwined to an extent that bred hypotheses about their common origin (Arbib 2006b, 2006a). Therefore, to enrich our understanding of conceptual processes 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, Sweetser (2008) points out a number of contrasts between language and gesture with regard to conventionality of symbols, monitoring of performance, and concreteness. It is clear that there are contrasts between gesture and speech, just as there are contrasts between gesture and sign language. However, to what extent these differences can be accounted for by different modalities (hearing/sight), and to what extent they result from the contrast between language and non-language remains a subject of debate.

4.6.1. Conventionality

Language is conventional in that most words have fixed meanings unrelated to their form. On the other hand, spontaneous co-speech gesture is non-conventional and flexible. A spontaneous gesture for “ball” may take many different forms. Likewise, a gesture used to denote a ball may mean something else in a different context. Much like spoken languages, sign languages typically have fixed signs for particular words or concepts. With the exception of culturally transferred quotable gestures (emblems) (Kendon 2004) such as “thumbs up”, co-speech gestures denoting particular concepts are not fixed and may even change in the course of one conversation. For instance, when describing a situation involving tree one might make a co-speech gesture of tracing the trunk as if one was grabbing it with the insides of both palms, 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. In neither language the other gesture for tree is considered 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.

4.6.2. Conscious monitoring

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 (auditory or visual) or rather 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).

4.6.3. Concreteness

Language is commonly seen as the "abstract" mode of communication, 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. However, gesture analysts are not always clear what it means that gestures are more concrete than language. 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. Sign language is a set of muscularly performed routines that are visible, whereas spoken language affects hearing (Sweetser 2008: 359). The issue of concreteness might, therefore, be related to the medium of communication. The visual modality in which gestures are meaningful is iconic in nature. It relies heavily on representing concrete objects and relation between them, while abstract meanings are conveyed metonymically or metaphorically. It remains to be seen whether this distinction can be operationalised in empirical studies of conceptual metaphor and objectification.

4.6.4. Complementary modalities or separate systems?

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 2006b, 2006a). 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 et al. 1993).

The further a gesture type is classified along Kendon's Continuum, the bigger its similarities to language. Sign languages can be classified as languages rather than movements if we follow Saussure's definition of language, that is as long as we can prove that signs form arbitrary form-meaning pairs organised syntagmatically and paradigmatically (Kendon 2000: 47). Sign languages also tend to be independent of spoken languages, in that speakers usually cannot use the two simultaneously. At the other end of the spectrum is gesticulation, which usually occurs with spoken language communication. 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. Gestures used in partnership with speech participate in the construction of meaning (Kendon 2000). They serve different but complementary roles. In contrast, 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.

4.7. Gesture and conceptual metaphors

The earlier chapters of this thesis summarised problems in conceptual metaphor research. In general, cognitive structures (specifically conceptual structures) are inferred 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 of 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 the results of psycholinguistic studies. Clearly, language alone is not enough to draw inferences about thought.

On the other hand, many limitations of 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 to 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 et al. 1993).

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. Thus, metaphoric gesture is 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 commu-

nication and embodied (Chui 2011; Müller 2008; Cienki 2008). Gestures may serve as indicators of metaphorical mappings activated in speech, for instance, when the gestures of a speaker 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).

There are many ways in which gesture is a relevant 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 et al. 1993, 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.

4.7.1. Highlighting

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 hear 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,

having proclaimed the likeness of life and bananas we might add the expression "so to speak" in order to ensure that our interlocutors' attention is drawn to the metaphoricity of the statement (Cameron and Deignan 2003). The same process of highlighting metaphoricity is 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 eye gaze at the gesture, and marking one part of the utterance with gesture and sound (such as pitch changes, but also beats[15]) 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.

4.7.2. 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 an important 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 proposed that iconic and metaphorical gestures differ only with regard to the concreteness of referent (1998), but others argue that abstract concepts can be depicted by iconic (non-metaphoric) gesture (Fricke 2004; after Cienki 2008). If true, this observation would go against both CMT and Objectification Theory, both of which rely on the assumption that abstract concepts are understood metaphorically. Therefore, let us analyse the argument in detail. Fricke (2004) claims that a non-metaphoric gesture depicting an abstract concept occurs, for instance, when a teacher arranges her fingers in

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

the shape of a triangle to evoke the abstract concept of a triangle. However, it could be argued that 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 their physical representation (the drawing or model) of a triangle. 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.

4.8. Objectification and gesture

In the beginning of this chapter I have reviewed a number of gesture classification systems some of which focused on gesture referents. For instance, the commonly used iconic/metaphoric gesture distinction is based on 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 mapping (Müller 2008). As the previous section shows, this definition can be problematic. Earlier in this paper I have shown that the definition of concreteness in cognitive research is not adequate and proposed, following Szwedek's work on Objectification Theory (2002, 2011), an object-based criterion for assessing concreteness. That criterion is established as tangibility, experienced by touch. I tried to show that introducing this amendment ameliorates many issues in CMT including the concreteness problem. It is my opinion that Objectification Theory would make a valuable contribution to conceptual metaphor study not only in language, but in gesture as well.

4.9. Gestures and Szwedek's metaphor typology

The metaphor typology introduced by Szwedek (2011) and reviewed in the second chapter of this thesis consists 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. 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, therefore gestures used to depict them must be metaphorical rather than referential. The first example, that of the triangle gesture analysed in section 4.7.1. has been shown to be metonymic. The second example resembles in its form Szwedek's Captain Thelwal metaphor in that a metaphorical meaning is expressed 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, and due to the fact that they are at the beginning of the metaphor chain, and likely to be overshadowed by the more saliently metaphoric type 3 metaphors. The situation in gesture is quite the reverse, and 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, these types of mappings are much more visible in gesture than in speech. In fact, gestures reveal people's understanding of non-physical events in terms of 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. Indeed, gestures are 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 es-

sentially 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.

4.10. Conclusions

Iconic manifestations of thought in gesture prove that metaphoric thought is not lexicalized, 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 answers the criticism regarding circular logic applied in CMT, a criticism voiced often (Murphy 1997; Vervaeke and Kennedy 1996) and reviewed extensively in this thesis. While it is no longer sufficient to make claims based on language data alone, 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). Gesture analysis demonstrates that many, if not all, metaphors are embodied. Not only spontaneous co-speech metaphoric gestures are grounded in physical experience, but signed languages have long been known to depict metaphoric source domain 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 is an ontological metaphor, showing an abstract concept in concrete 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.

4.10.1. Objectification in gesture – questions for further research

In order to explore the validity of Szwedek's assertion that touch is vital for assessing concept concreteness I propose a study that does not rely entirely on language data, but rather on embodied representations in gesture. Additionally, because it is often difficult to separate learned (culturally transmitted) gesture from spontaneous gesticulation indicative of conceptual processes, the study compares the performance of persons for whom sight is not a primary source of information to that of their sighted peers. By doing so we control for the influence of the cultural context on co-speech gestures.

Chapter 5: Objectification effects in the gesture of blind and visually impaired children and young adults

5.1. Introduction

“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, and they continue to do so in conversations with an interlocutor whom they know to be blind . It seems that gestures play a role beyond communication. A phenomenon called the speech-gesture mismatch can tell a teacher if the student understands a problem even if they are not yet able to explain it in words (Alibali et al. 1993). Quite literally, there is more to gesture than meets the eye.

In the course of this chapter I will review a number of studies on gesture, metaphor and blindness in order to demonstrate their usefulness as sources of evidence for mental representation. I will argue that gesture of blind and severely visually impaired persons can bring important insight into the nature of spontaneous gesture because of the minimal influence of cultural transfer on their gesticulation. Then I will present a two part empirical study that I have conducted together with colleagues: Dorota Jaworska and Zuzanna Fleischer. The purpose of the study was to analyse instances of spontaneous gesture of blind and severely visually impaired children and young adults who were asked to describe abstract and concrete concepts. Over the course of 13 months we worked in close cooperation with the Owińska Boarding School for the Blind and Visually Impaired in order to gather experience, teach, and interview students. The data we

collected has already been presented during talks and conferences; some preliminary findings have already been published (Jelec et al. 2012).

5.2. Why study gestural behaviour of blind and visually impaired persons

We have seen that gesture is a source of insight into cognition. Focusing on gesture analysis to draw inferences about the mental representation system forces constraints on the type of gesture analysed. 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 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 conveyed in gesture (Iverson and Goldin-Meadow 1997, 2001; Iverson et al. 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 true also in case of people who had reduced opportunities to acquire gesture in a social context, such as the blind and severely visually impaired. Although language, learning, and mental representations of blind adults and children 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 young research topic. By studying 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, the authors of this study assume that spontaneous gestures in blindness will be indicative of cognitive processing and dynamic mental representations because they are less dependent on visually transferred cultural tendencies than gestures of their sighted peers.

5.3. Language and gesture in typical and atypical development.

Children's gestures and language to a large extent develop from their interactions with objects (Bruce et al. 2007). Both deaf and blind children receive fewer information about language than their sighted peers, but they exhibit different learning strategies. Whereas deaf two-year olds perform class consistent behaviours such as sorting toys into categories based on their perceptual qualities, no such tendencies were observed in their blind peers (Dunlea 1989: 61). Class consistent behaviour is a prerequisite for constructing basic categories, and influences language development. This means that blind children are more likely to learn language later. As a result, blind children are more likely to develop mental representations of abstract concepts that are primarily acquired through language, and to develop them later than their sighted peers. Such concepts include two subjects particularly interesting for gesture research: objects and space. Both have been suggested as candidates for the ultimate source domain. However, as I have tried to show in the second and third chapter of the present thesis, objects are preferable for this role because conceptualisation of space is object-dependent. Studies in the language and behaviour of blind children appear to corroborate this view.

5.3.1. Conceptual representations of space

There are two opposing theoretical positions regarding the conceptualisation of space in blindness. The Inefficiency Theory posits that congenitally blind people develop concepts and representations of space, but those concepts are inferior to those of the sighted

and late blind in that space is conceptualised as a series of paths rather than an overall plane, whereas the Difference Theory proposes that spatial relations in blind persons are functionally equivalent to those of the sighted, 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, with 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 equally useful and complex as those of their sighted peers (Piskorska et al. 2008; Jaworska-Biskup 2009). Generally, blind youth acquire spatial competence equivalent to that of the sighted by mid-adolescence (Juurmaa 1973). A number of studies show that the visually impaired perform poorly on spatial competence tests relative to blindfolded sighted participants. However, these results may have been influenced by the choice of experimental stimuli which are highly familiar to the sighted, but less so for the visually impaired participants (Juurmaa 1973).

One aspect of space that is important for gestures studies is viewpoint (discussed in section 4.5.2 of the present thesis). The two types of viewpoint: observer viewpoint (OVT) and character viewpoint (CVT) are distinguished by the point of reference in space assumed by the speaker/gesturer, which is related to spatial coding strategies. Observer viewpoint is used when gestures show a third person's perspective. Character viewpoint is demonstrated in gestures that are made from the perspective of the agent. 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 (Heller and Kennedy 1990), or using self as the main point of reference. 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 interrelationships between locations), which influences viewpoint. Both for sighted blindfolded children and late blinded children display a greater tendency to assume observer viewpoint than their

blind peers. Congenitally blind children tend to neglect external cues, and thus adopt different strategies. Findings from mental imagery tasks provide further support for the argument that visually impaired children can acquire spatial representations which are functionally equivalent to those of sighted people.

What is important from the point of view of Objectification Theory, egocentrism is another argument against space in the debate about the ultimate source domain. The difference in understanding space between persons who rely primarily on sight, and those who do not, illustrates that space is not a basic domain in any sense, but rather a function of objects. When congenitally blind persons default to the egocentric perspective they use the self as a reference point for space which extends around it. Although neurotypical persons are able to understand space in relation to any object, it remains a fact that, as Szwedek (2011) pointed out, space is object dependent.

5.3.2. Gesture and the object concept

Adopting the view that the concept of space fundamentally depends on objects requires 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 they usually imply the existence of an object. These findings seem to be consistent with Objectification Theory which puts objects, or acquisition of object-like features, at the centre of mental representation development.

5.4. 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 who need to rely on vision rather than other communicative media. However, as I attempted to show in the previous chapter, the role of gesture extends far beyond visual communication. Speakers without access to visual information, who have never seen distance, space, or shape coded in gesture do not refrain from spontaneously using gesture in conversation. Congenitally blind speakers gesture 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 sighted interlocutors (Iverson and Goldin-Meadow 2001, 1997; Iverson et al. 1998). The types of gesture used by blind speakers are usually limited to those that are spontaneous rather than culturally transmitted, making them ideal informants for cognitive processing studies. However, if one decides to analyse gestural behaviour of blind and severely visually impaired persons there are some considerations that need to be taken into account.

While blind persons have been found to gesture at a similar rate to sighted people, their gestures do not always look the same as their sighted peers. 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 gestures of others, reinforce socially acceptable gestures, and monitor their own behaviours (Eichel 1977: 128). Congenitally blind persons rarely produce conventional gestures because these gestures are culturally transferred, and this type of learning is largely based on 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, as well as produce adaptor gestures (Magnusson and Karlsson 2008). In view of these considerations it seems that studying co-speech gesture of blind speakers should be a relatively straightforward way to learn about conceptual structure. Nevertheless, gestures of blind

persons display a number of characteristics whose nature must be taken into account before drawing premature conclusions.

5.4.1. Mannerisms and revalidation training

Existing studies on the gestures of blind children, adolescents and adults are mainly quantitative in nature and focus on the comparison between the blind and sighted groups of respondents (Iverson and Goldin-Meadow 1997; Iverson et al. 1998; Sharkey and Stafford 1990; Sharkey et al. 2000). In most cases gestures are divided into two categories: 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 1977). Like self-adaptors, blindisms can be classified into two categories: self touching and finger manipulation (Blass et al. 1974). A preference of the latter movement over the former is sometimes considered indicative of cognitive development (Blass et al. 1974). This type of mannerisms are thought to have roots in infancy. Cutsforth (1951) theorized that because of the lack of visual stimulation, a child who is blind or has severe low vision will turn inward with acts of "automatic self-stimulation" (self-adaptors). Stereotypical behaviours in blind babies include: eye pressing, gazing into the light, pointing out body parts, offering objects to others (Dunlea 1989**).** A sighted 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 does

not have this advantage, making the body the source and the object of stimulation (Cutsforth 1951; after: Sharkey et al. 2000).

Because blind persons cannot monitor their own movements through visual feedback, and because blindisms appear to resemble the uncoordinated movements of patients with brain damage they have a stigmatising effect (Blass et al. 1974). 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 gesture 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 possible effects of revalidation on spontaneous gesture are an important factor to bear in mind during the analysis of gestures performed by blind individuals. Although blindisms have traditionally been interpreted as bearing no meaning outside of possibly stimulating cognitive function (Blass et al. 1974; Eichel 1977) Kendon (2012) suggested to include them in the gesture analysis for blind participants.

5.4.2. Gesture and posture

For the purpose of the present study we have defined gesture as a movement of the hands or arms. The methodological considerations for this choice were not fully explained in the first chapter of the present thesis because they needed to be presented in a broader context of studies on gesture, in particular gesture of blind persons. Similarly to hand gestures, posture is a communicative medium (Ekman and Friesen 1974), and can govern turn-taking, attention, and focus in conversation (McClave 2000). In blindness, however, children do not have access to the type of visual feedback that allows sighted children to adjust posture. 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, or request and deny actions. For instance, the rejection gesture in which the child turns his or her face away from an entity and pushes the entity 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 sighted individuals, but different non-vocal strategies with less focus on gestures and posture shifts (Sharkey and Stafford 1990). This differences in body language prompted the author to narrow down the definition of gesture in the present thesis as movement of the hands and arms. The intent was to avoid confounding the data with body movements the function of which has not yet been adequately analysed.

5.5. Cognitive role of gesture in blind and severely visually impaired students[16].

The previous chapters of this thesis 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 conceptual representation. As a result we have turned to the analysis of spontaneous co-speech gesture to seek further support for objectification. 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 in order to record gestures that exhibit little cultural influence. Together with colleagues we have gathered and analysed data from blind and severely visually impaired children and young adults, as well as a control group of sighted young adults.

[16]The following sections describe an empirical study of the relation between gesture, language and cognition that has been conducted in the course of thirteen months 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 boarding 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" The author of this thesis is thankful to the Centre, and school authorities, parents and students for the received guidance and help.

The following sections of this chapters focus on the methodological considerations, experiment design and analysis of this study.

5.5.1. Introduction: ethical issues

Any research demanding participation from members of a community already at a disadvantage needs to be informed by a number of ethical principles. First and foremost, the benefit of the study must not be one-sided. In other words, merely gathering data must not be the sole benefit of the study. Therefore, prior to asking students for participation in the experiment, the researchers volunteered for a period of six months in the facility in which research was conducted. This involved both conducting English classes, and organising language focused activities for the student club. The benefit of this approach was twofold: the school community benefited in terms of the number of conducted language classes, and volunteering gave the researchers an opportunity to get acquainted with the students. The latter is a particularly important issue for the psychological validity of the study because the informants belong to a particularly vulnerable population being both persons with disabilities, and underage. At any stage of the study researchers put ethical treatment and comfort of the participants as their priority.

The focus on gesture produced spontaneously alongside speech required that the experimental part of the study be recorded in an environment familiar to the participants. Blind and seeing impaired persons are often reluctant to produce gestures in unfamiliar surroundings because they are afraid of hurting themselves or others. Also, revalidation courses can have a stifling effect on the readiness to use gesture spontaneously. By conducting the experimental part of our study in a playroom at the boarding school which was familiar territory for all the participants we hoped to control this factor.

5.5.2. Aim of the study

The present study investigates co-speech gestures produced by blind and severely visually impaired primary and secondary school students. Our intention was to see if the concreteness of the concept (measured on the basis of tangibility criterion introduced in OT) has an effect on the rate and type of produced gesture in the blind and control group. The number of gestures produced by the blind participants for abstract and concrete concepts was considered potentially indicative of objectification effects for two reasons. First, because blind persons are known not to produce culturally dependent and turn taking gestures (Sharkey and Stafford 1990) the number of gestures produced should not depend on the perceived difficulty of a concept nor on the discourse type (as it would for sighted participants). Second, if we assume the number of blindisms to be constant for a given participant then changes in the overall number of gestures should primarily reflect cognitive functions. Thus gesture performance may be considered indicative of conceptualisation processes as shown in sections 5.3 and 5.4. Previous studies show that blind and sighted participants do not differ significantly in the number of gestures they produce during piagetian tasks (Iverson and Goldin-Meadow 2001; Iverson et al. 1998; Alibali et al. 2001). Following research findings on this topic, we predicted that there would be no quantitative difference between the overall number of gestures produced by blind and sighted age-matched participants with regard to concrete concepts because they would be the easiest to convey. The potential difference between number of gestures produced during descriptions of abstract concepts was identified as a topic for exploratory analysis, as blind persons seldom produce referential metaphoric gesture which may reduce their gesticulation rates for this conditions. 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 the type of concept described.

The secondary purpose of this study was to observe whether the source domains referred to 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 sensory domains in description. I analysed solely the performance of fully congenitally blind children and young adults to limit the possibility of finding culturally acquired gestures. I focused on the verbal and gestural performance of the respondents in order to identify instances where gestures and speech were used congruently, that is they referred to the same topic. 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) they may not necessarily be present in speech. In order to find answers to these research questions we conducted an elicitation experiment described below. During the course of the analysis several interesting phenomena including the prevalence of simulation over gesture in the youngest participants, and the use of sound drew the attention of the author, and their significance for this thesis is discussed in the final sections of this chapter.

5.5.3. Method

The study was conducted in three stages: observation, elicitation and subsequent analysis. The observation stage included a volunteering period, the aim of which is described in section 5.5.1. Researchers participated in school events, taught a number of language classes under the supervision of school staff, and organised extracurricular activities. During this stage insight was gained regarding the communicative preferences and gestural behaviours of the students. This information was subsequently used to develop an appropriate study design.

The goal of the second stage of the study was to determine whether the presence and types of gestures in the participants' communicative repertoire was related to the type of concept they were describing. To do so, I designed and coded a simple computer programme that conducted interviews with the participants by giving instructions, prompting with words, and asking questions[17]. The exact nature of the tasks is discussed in section 5.5.6 concerning experimental procedure. The interviews were recorded on two video cameras, which will be described in detail in the study design section. All

[17]The full script used in this experiment can be found in part three of the Appendix to this thesis.

participants gave their consent to be recorded, and parental consent was obtained for recording underage participants.

There were three important reasons for using a computer programme in place of a live interlocutor. First, the interviews were conducted in the course of a month and in different rooms of the boarding school building (in case of the blind participants) or school classrooms (for the control group). Using a set of prerecorded questions and responses reduced some of the variability introduced by the changes in conditions. Second, volunteer work with blind and visually impaired youth at the school made the author realise that technology plays a very special role in their lives. Computers were always an attractive addition to classes, and generated a lot of interest. Maintaining the interest of the youngest participants in such studies often presents a challenge so a decision was made to introduce a computer "friend" as the interlocutor. Subsequent enthusiastic feedback from study participants suggested that this was the right choice. Finally, for methodological reasons the participants could not be informed that the focus of the study was gesture, but had to be encouraged to use gesture in a way that did not betray the purpose of the experiment. Seeing how difficult it would have been to argue that the experimenters needed to see gestures to understand speech, introducing the computer "friend" served as a believable cover story. The participants were told that their task was to teach the computer the meaning of concepts by explaining them verbally and in gesture. This approach had the additional 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 the benevolent teacher.

5.5.4. Participants

We conducted interviews in Polish with 12 blind and seeing impaired children and young adults divided into two age groups: seven children (7-11 years old) and six young adults (16-19 years old). This group consisted of four male and eight female respondents. All of our participants in these groups were congenitally blind or lost sight at an early age; all were either fully or functionally blind, most had some residual vision in

the form of perceiving movement or light. None of them had any cognitive deficits. In addition, we recorded a control group consisting of seven sighted young adults who were age and gender matched to our young adult group.

5.5.5. Stimuli

The empirical part of this study we used recordings of words that designated concrete and abstract concepts. These words were pre-tested for understandability, frequency and tangibility in the course of the study described in chapter three of this thesis (Jelec and Jaworska 2011). Two lists of 21 abstract and 21 concrete concepts were compiled, one per each of the two experimental conditions; in both conditions the program randomly chose 10 words from the list and played them to the participant in random order.

5.5.6. Procedure

The study consisted of a two part free speech elicitation experiment. The decision behind using a human-computer interaction paradigm was explained earlier in this chapter. 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. In addition, gestural and verbal responses of the participants were recorded on two video cameras. The experiment did not use any visual stimuli in order to avoid confounding data due to the varying visual sensitivity of the subjects (who had visual impairments of varying degrees: light perception, full blindness, contrast perception etc.) and controls.

Participants began the experiment seated at a table with palms resting on its surface. They were informed that the computer had trouble learning new words and concepts, and that the purpose of the study was to teach some words to the computer by us-

ing words and gestures. Participants were informed that the study was recorded (if necessary the meaning of that was explained in detail), asked for permission to be recorded, and informed that they would remain anonymous. The empirical part of the study began after receiving confirmation that the participant knew and accepted the nature of the experiment.

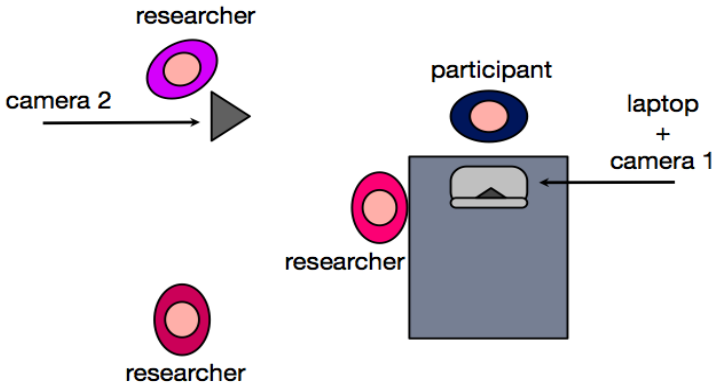


Fig. 3: schematic drawing of the experimental setup

The experiment consisted of one task executed in two conditions. In the monologue condition the participant heard a word which they then explained to the computer using words and gestures. In the dialogue condition a similar procedure was employed. The participant heard a word and was immediately asked a clarifying question by the computer. When they respond the computer asks an additional question and waits for a response. There were four clarification requests per concept. They included: “Pokaż mi co to jest” (Show me what it is), “Pokaż mi jakie to jest” (Show me what it ’s like), “Pokaż mi gdzie mogę to spotkać” (Show me where to find it) and “Pokaż mi co o tym sądzisz” (Show me what you think of it). If the participant did not know the answer or was unfamiliar with the concept they were able to skip it by placing their palms on the table. The researcher then forwarded the programme manually to the next concept or question.

5.5.7. Experimental setup and design

In order to be able to analyse gestures in three dimensions the participants were recor-

Fig. 4: still image from the first-person view camera

ded from two separate cameras.

The experimental setup was similar for all recordings, and is schematically represented

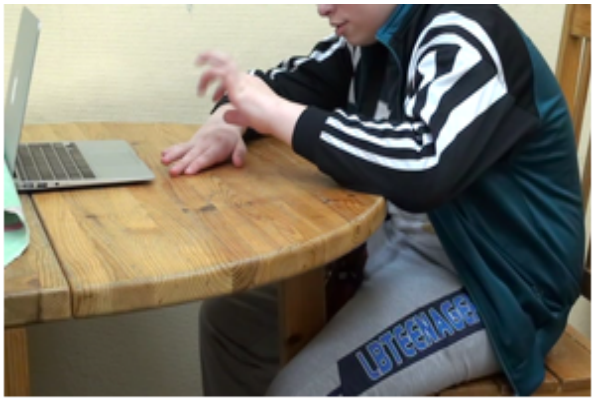


Fig. 5: still image from the third-person view camera

in Figure 3. One of the cameras used was directly facing the participant, recording the movements of their palms and hands. The other was located on a tripod standing to the right of the participant and recording their hand, arm and body movement. Both cameras were adjusted to ensure the anonymity of participants. The frames of the resulting films do not contain faces of the respondents. Figures 4 and 5 show sample recordings from the first-person and third-person perspective cameras respectively. This experimental setup ensured data redundancy, safeguarded against data loss and facilitated reliable analysis.

5.5.8. Annotation and data analysis

The analysis is based on the methodology put forward in the appendix to David McNeill's book “Hand and Mind” (1992) with subsequent revisions by the author. The speech of all the participants was transcribed orthographically, and the occurrence of gestures was marked in relevant spaces. The annotation stage was done by three researchers who were trained on the criteria for annotation, and whose agreement regarding gesture identification was randomly checked. Most recordings were annotated by two independent researchers.

For the purpose of this study the following definitions have been adopted. Gesture unit is a complete semantic unit, or response to one concept or question. It begins and ends in the rest phase. In this study we assumed that a response to one concept was equal to one gesture unit, because participants began and ended their responses with palms placed on the table surface. In other words, each gesture unit began and ended in this rest position. Gesture is defined as a movement that begins in the preparation phase and ends with the retraction phase, unless it ends at the beginning of the preparation stage for another gesture, nested or otherwise. Strokes were annotated only if the gesture was repetitive but did not involve a retraction between repetitions. These repetitions were counted as strokes within one gesture. In case of the blind participants, adaptors (including those that were identified as blindisms) have been included in the annotation.

5.6. Representation of abstract and concrete concepts in gesture: quantitative analysis of responses.

Quantitative analysis was focused on the number of gestures performed per response for concrete and abstract concepts. Before performing further analysis, a histogram of the data was created in order to investigate data distribution. As a result, one control participant's data had to be excluded from the analysis as an outlier.

5.6.1. Blind vs. control group analysis

Simple analysis of means showed a slight difference in the performance of blind and sighted participants for both abstract and concrete concepts. Blind adults performed more gestures per response in both conditions. The mean for abstract concepts was 4.968 (std dev: 3.942) when compared to sighted controls' mean of 4.212 (std dev: 4.349). For concrete concepts the mean result of blind participants was 5.138 gestures per response (std dev: 3.354), compared to the sighted controls' result of 3.625 (std dev: 3.700). However, the statistical analysis using a T-test for Significance for Two Unknown Means and Unknown Standard Deviations (assuming normal distribution) showed that this difference is significant only for concrete concepts[18]. This result can perhaps be accounted for by the inclusion of adaptor gestures in the analysis, which are much more common in blind than in sighted interactants (Eichel 1977; Blass et al. 1974).

5.6.2. Blind group analysis: abstract and concrete concepts in gesture

To the best of the author's knowledge there are no studies that compare quantitatively the gesticulation of adults and children who are blind. One study by Blass and colleagues (1974) suggests, however that gestures of blind persons are correlated with their cognitive and lexical development. It was not surprising, therefore, that the statistical analysis of the data showed a difference between the two groups of blind participants. Children have been found to gesture less than adults in both conditions. What is more, they gestured significantly less when describing abstract concepts.

Qualitative analysis shows that there are differences both between the blind and control adult group, and within the whole blind group with regard to the number of gestures per abstract concepts (but not for blind adults alone). With regard to children, these results can be interpreted to mean that the occurrence of gesture is related to the understanding of abstract concepts. If objectification influences the number of gestures

[18]A detailed table listing the statistical results is found in table E of the Appendix

produced in both types of concepts, then it follows that for children, whose knowledge of abstract concepts is limited, the number of gesture would be lower than in adults. However, this result could be also be accounted for by the kind of developmental differences described by Blass (1974).

A follow up analysis was performed separately for the blind children group, revealing that the mean number of gestures was greater for concrete concepts than for abstract phenomena (ABSTRACT: mean: 1.702, std dev: 1.768; CONCRETE: mean: 1.959, std dev: 1.947). Although the small number of participants in this age group does not permit to claim these findings are generalisable (they are not statistically significant), the distinctively smaller number of gestures in the abstract condition is interesting with regard to Objectification Theory. Developmental studies show that the acquisition of abstract concepts occurs gradually, and follows concrete concept acquisition (Mandler and McDonough 1993; Mandler 1999). On the other hand, any objectification effects in gesture would be limited to concepts that were acquired into the mental lexicon. If abstract concepts at this age are not fully understood, or acquired only partly the effects of objectification may not be prominent in gesture nor language. This may be visible particularly in blind children's performance, because of the well-documented phenomenon of verbalism. Verbalism is a stage in language learning in which blind children are reported as able to verbalise a definition of a concept without understanding it (Marek 1999; Jaworska-Biskup 2009). If this was the case with the youngest participants in the study, their gestures could not have reflected any objectification features simply because they are emergent in concept acquisition, which in their case did not occur.

5.7. Representation of abstract and concrete concepts in blindness. Qualitative analysis of responses.

Mental representations of blind and seeing adults appear to be equally complex. Theories regarding conceptual and language development in blindness reviewed earlier in this chapter suggest that persons with a specific sensory impairment manage to develop rep-

resentations that are similar to those of neurotypical adults, although this development may take a longer time and be achieved via alternative sensory means of perception (Ungar et al. 1996; Iverson et al. 1998). This partly explains the differences in the numbers of gestures produced by blind children and adults found in quantitative analysis. A detailed analysis of the gesticulation of congenitally blind participants reveals several interesting phenomena in the data. It is important for the reader to understand why this section does not include quantitative data. Because some of the blind participants, particularly those in the younger age group, were not indicative of the gestural behaviour of the group due to overall cognitive development, and their tendency to use limit their gesticulation to adaptors their performances were not analysed separately. What s more, comparing the numbers of referential gestures of any given type to the overall number of movements that were classified as gestures would be misleading because the results are not generalisable across the group due to individual differences. In other words, stating that a particularly talkative child performed X gestures of this type from the overall number of Y gestures performed by her age group does not provide reliable information about other group members. In fact, it may be quite misleading to say that her performance accounted for a certain percentage of referential gestures as most young participants were quite reluctant to gesticulate.

The qualitative analysis of the data is divided according to gesture type, and is a summary of the performance of four fully congenitally blind participants: one adult (female) and two children (one boy and one girl). After their verbal and gestural performance was transcribed, instances where gestures and speech were used congruently were identified. Gestures were analysed in terms of visible object traits, although (consistent with the predictions of Objectification Theory) those traits might not have been found in speech.

5.7.1. Pointing gestures

Studies found that blind children rarely execute pointing gestures (Iverson and Goldin-Meadow 2001), and tend to use an open palm rater than extended finger in order to in-

dicate focus on a particular object or area (Iverson et al. 2000). Our data are in line with these findings, with only one instance of pointing gesture, performed by the congenitally blind Boy 12[19], who used an extended palm to indicate a place in the room where puzzles were kept when describing the word puzzle. Pointing (deictic) gestures do not necessarily reveal any object traits as they are commonly used to establish shared attention (McNeill 1992). Interestingly, pointing seems to depend on the presence of vision also in sighted speakers, as blindfolded persons have also been found to rarely use deictic gestures (Iverson and Goldin-Meadow 2001).

5.7.2. Adaptors

As mentioned earlier in this chapter, we found blind persons to use adaptors very frequently. Blass and colleagues found that blind persons engaged in body-focused movements much more frequently than object-focused movements (1974). Qualitative analysis of gesture reveals this to be true of all our congenitally blind participants with adaptors making up for 29% of gestures performed by Girl 1, and 36% and 6% of Girl 10 and Boy 12 respectively. Blass et. al. also 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. On this ground they proposed to introduce a distinction between disorganizing and integrative aspects of behaviour. Although of small consequence to Objectification Theory, the observation that despite revalidation training all our blind participants engaged in adaptors seems to confirm Kendon's (2012) intuition that these gestures have a heretofore unexplored cognitive function.

[19]In order to preserve anonymity of participants I will refer to them by codes rather than their first names.

5.7.3. Simulations

Although they are not traditionally classified as a separate gesture category, this analysis will be treating simulation gestures as a discrete category of referential gestures because they were clearly employed as such by our participants. To clarify, by simulation gesture I understand gestures that are part of a reenaCMTent of a scene performed from a character viewpoint. Gestural viewpoint, or the perspective represented in gesture has been described in the previous chapter. Generally, a speaker/gesturer can assume two viewpoints: the third-person point of view, or the first-person point of view. In some gestures the two viewpoints are combined (McNeill 1992). Blind children and young adults in the present study exhibited a strong viewpoint preference in their response, in that their answers were often self-centred, and gestures performed from a character viewpoint (CVP). Instances of simulation gestures mainly occurred in the descriptions of abstract concepts, which may suggest that these concepts have not been fully acquired in that they were available as part of a context rather than a separate entry. For instance, Girl 10 explained the concept of life ("życie") by reenacting the moment her parents told her she was going to have a sibling, and assuming the roles of herself, her mother and her father in voice and in gesture. Another example is that of Boy 12 who described the concept of success as "success is when we have achievement, when we get a five in class and jump for joy" while simulating jumping by raising both hands and lifting himself slightly from the chair. Participants frequently explained concepts by recreating events, acting them out vocally and physically. Girl 10 was particularly fond of this technique, and almost all of her responses had a simulation component. For instance, when asked to explain the word "koperta" (envelope) she tucked her hand over her collar and pretended to write on her chest, at the same time loudly chanting what she wrote - "(Girl 10) is naughty". Boy 12 used this technique a number of times, for instance when explaining the word "kryzys" (crisis) he peeked into an imaginary wallet that he pretended to hold in his hands and exclaimed "uh-oh" - a remarkably complex simulation that involved visual, tactile, and audio components. A strong tactile component was a common feature of such gestures. In fact, the medium of sound and touch in simulation gestures seemed interdependent, with some participants incorporating touch into

an auditory description, some using touch and sound together, and some rejecting spoken language entirely in favour of producing a fully gestural description.

A similar tendency for assuming character viewpoint was noted in studies that involved blind Polish learners of English. Results of these studies show that visually impaired respondents (particularly young children) tend to include in their descriptions objects that are close or familiar (Jaworska-Biskup 2009, 2011), or substitute pronouns referring to other people with “me” or “my” (Jaworska-Biskup 2010a). Just as one one of our youngest participants, Girl 10, described the notion of an envelope by turning herself into one, blind children in other studies used themselves in describing concepts. For instance, “black is the colour of the screen of my computer when it breaks”, “green is the food I give to my hamster” (Jaworska-Biskup 2009: 28). This phenomenon, known as egocentrism, has already been shown to occur in the language of blind children (Gleitman and Landau 1985) but, to the best of the author's knowledge, this is the first time it has been demonstrated in gesture. One interpretation of these findings is that the poverty of sensory stimulation encourages children to use themselves as the main point of reference rather than encourage external viewpoint in both communicative modalities. For Objectification Theory, viewpoint in gesture confirms that the conceptualisation of space requires a concrete reference in the form of external object (as is the case in sighted children and adults) or self.

5.7.4. Referential gesture. Metaphor and analogy in descriptions and gestures.

Studies show that blind students exhibit a broad knowledge of non-literal associations with concrete concepts (Jaworska-Biskup 2009, 2010b). For instance, when asked for definitions of certain visually-based concepts children produced a whole range of non-literal of associations, for instance death and sadness as descriptors for the colour black. Although there were some indications that blind persons are unable to acquire metaphorical gestures, data gathered in the course of this study suggests otherwise. Iverson and Goldin-Meadow (1997) observed that, while sighted children produced a very small number of metaphoric gestures, congenitally blind children did not produce any meta-

phoric gestures at all. They speculated that blind individuals may be unable to produce metaphoric gestures (Iverson and Goldin-Meadow 1997, 2001) 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 Girl 3, a young adult, described marriages as "when one person gives their love to another person" and illustrated this (metaphorical) expression with a metaphoric gesture: both palms curled into fists slowly being drawn together across the table. What is interesting in this example is the apparent discrepancy between the mappings presented in language and gesture. While gesture presents love as "two objects getting together", in language love is described as a transfer of an object. Another instance is Boy 12 describing the concept of knowledge ("wiedza") by saying "knowledge is gathered in the head" and simultaneously tapping his forehead with an open palm. Although instances of metaphorical gestures were few and far between, surprisingly some concrete concepts were described metaphorically. Girl 10 described a weight "ciężar" to the computer "if you have some games in you (…) or if you have some music" while stroking the computer in front of her, clearly indicating her concreteness judgement about computer files in what seems to be a clear 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 is 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 sighted peers (2009). A similar strategy was visible in the performance of several participants, most notably Boy 10 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, sighted in her experiment 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.

5.7.5. Referential gesture: sensory source domains

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 sighted peers (Jaworska-Biskup 2009). However, blind children are expected to incorporate descriptors from multiple sensory domains more often than sighted children. We predicted that the descriptions produced by blind students would show a variety of 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 "kwiat" (flower), or "wino" (wine). One possible explanation is that 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 so this explanation has limited feasibility.

Sound and touch, perhaps predictably, were the sensory domains most frequently represented in language. Interestingly, in many instances they occurred together in language, gesture or across domains. Sounds were present in verbal descriptions in declarative form, for instance Girl 10, described the word success as "when someone says I think I cannot sing and then they sing anyway". Another child, Boy 12 described a career 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 these children, which is most

likely partly a result of the education system. The presence of sound in descriptions went beyond language, with participants enriching their responses by adding onomatopoeias and gestures that simulated playing a musical instrument and gestures that involved both touch and sound at once. Clearly, declarative, sound-based descriptions are not the only possible applications of this sensory domain.

Interestingly, sound and touch seem to have acquired a discourse function. A number of blind young adult respondents used sounds to add rhythm to speech or stress parts of sentences. Girl 1 in particular often marked ends of sentences and phrases with a knock on the table, but others have produced similar sounds to accentuate questions, or list a number of items. 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, for them it is possible to replace this type of visual data with perfectly timed knocks.

Touch alone was mostly present in gesture that accompanied language describing shapes and sizes. 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, young adult Girl 1 described a flower by tracing the outline of a stalk vertically upwards from the table and, having reached the top of the stalk, drew 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 appear to be 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 findings of other studies, namely that seeing children use visual descriptions, while blind children are more modality independent using a variety of descriptors for mould: slimy, wet, smooth or sticky; or the wind: blowing, whispering (Jaworska-Biskup 2009).

5.7.6. Qualitative analysis: conclusions

In summary, findings from this experiment do not go in line with studies showing blind persons inability to employ metaphoric gesture. Participants in the present experiment reliably used both metaphoric language and gesture as well as analogy. These results suggest that metaphoric gesture does not depend on sight but rather on the intrinsic structure of concepts, which supports Objectification Theory. Finding no instances of object features in metaphoric concepts would effectively disprove OT, as according to the theory their understanding and objectification are co-dependent. Thus we may infer that the null hypothesis of Objectification Theory being untrue is rejected. Naturally, this does not necessarily confirm the reverse and more research is needed to support OT beyond this preliminary study.

5.8. Further discussion. Comparison with relevant English and Polish studies.

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. From research on visually impaired people's use of gestures in monologues (Blass et al. 1974; Iverson and Goldin-Meadow 2001), in conversations with experimenters (McGinnis 1981) to studies on the use gestures in social conversation with one another (Sharkey et al. 2000). Blind children's language and conceptual development was tested in longitudinal studies (Dunlea 1989) as well as case studies (Jaworska-Biskup 2009). Language learning is another topic of particular interest with Polish researcher Bogusław Marek paving the way for both research and innovative teaching practice (Marek 1999, 2000).

Perhaps the most interesting from the point of view of Objectification Theory is a series of studies conducted 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). She investigated blind children's understanding of concepts from the following groups: colours, textures, materials, natural objects, visual traits, and living organisms by asking the participants to perform three types of tasks: listing associations with a concept, defining concepts, and finding similarities and differences between concepts (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 language. What is more, studies show that blind children who are native speakers of Polish or English differ greatly in terms of language competence, and may display surprising gaps in conceptual knowledge (Marek 2000, 1997). The results of the present study are 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 may have had an influence on the performance of the younger group of participants, who gestured significantly less for abstract concepts most likely because they failed to understand them.

5.8.1. Individual variation

As was the case in our study, most research involving blind and visually impaired participants finds a great individual variation between the respondents both in terms of knowledge and behaviour. Clearly, 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 sighted 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 parental behaviour as the reason for delays in concep-

tual 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). A summary table of these results can be found in the Appendix.

5.8.2. Importance of gesture and language for conceptual development of blind children

The relation between conceptual development, language and gesture has been a recurring topic throughout this thesis. This notion is a particularly important one in the education of blind and seeing impaired children because for them language performs an additional compensatory function. Language learning prevents blind persons from being deprived of social, economic and learning opportunities (Krzeszowski 1993). As shown in neurolinguistic studies, 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, on intangible phenomena such as dust. Blind children constantly as questions that test and adjust their understanding of such concepts, for instance, "what is rust", "what is the difference between wrinkles and spots", "what do I look like" etc. Research on concept acquisition and its consequences for language learning is particularly important for this group because second language learning is an opportunity to broaden the blind student's knowledge.

Studies show that gestures can be indicative of language competence. Children who are first to combine a single word and a single gesture (for instance saying "mommy" and pointing at a hat) to make sentences are likely to be the first of their peers to use two word combinations such as "mommy hat" produced 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 on this topic before drawing any conclusions.

5.9. Conclusions. Cognitive role of gesture in blindness. Implications for Objectification Theory.

The present study focused on exploring 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 ultimate source domain hypothesis (2011). Furthermore, both the presence of metaphorical gesture and the fact that it frequently possessed a tactile component does not permit to reject the hypothesis posed by Objectification Theory, namely that abstract concepts are understood through a basic ontological metaphorisation process 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 the object concept is established on a complex multi-sensory basis rather than on tangibility alone.

Furthermore, blind children reliably used simulations in their descriptions, confirming the egocentrism view of language and extending it to gesture. Together with the prevalence of self-adaptors in gesture, this observation may lead us to believe that blind children's reference point in space is indeed an object – in the form of their own body. The 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 interpersonal differences.

Conclusion. Are abstract concepts like dinosaur feathers? Objectification as a conceptual model.

One of the key points in the discussion on Lakoff and Johnson's Contemporary Theory of Metaphor (Lakoff 1993) later amended to Neural Theory of Metaphor (Lakoff 2008) was whether or not metaphoric thought postulated within its framework requires pre-metaphoric conceptual structure. In fact, two types of questions are commonly asked within cognitive linguistics studies: is there intra-conceptual structure shared by all abstract and concrete concepts, and whether there exists an inter-conceptual structure that governs inferencing. 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 to bridging the gap between concrete and abstract concepts. Objectification Theory promises to do precisely that by making it possible to incorporate findings from a variety of empirically minded into one coherent framework.

Theories of cognition, including those that originated in cognitive linguistics require empirical backing. 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 such a theory. 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). There are several requirements that need to be fulfilled in order for an account to qualify as good enough. Fulfilling most of the conditions identified by Gibbs (2000) would certainly yield credibility to Objectification Theory as a relatively new account of meaning. Let us, therefore, review these 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 thesis, Szwedek's objectification-based metaphor typology accounts for most, if not all metaphors and puts them in a coherent framework with metonymy through the process of chaining (Hilpert 2007).

Second, a theory should pay explicit attention to meaning construction, not just meaning processing (or meaning ``selection''). Objectification Theory is applied at the concept creation level, thus accounting for the generation of meaning. Third, Gibbs re-

quires a good theory to be dynamic and place emphasis on emergent properties of meaning and cognition (2000: 348) and, as shown in chapters two and three of the present thesis, Objectification Theory produces a model of conceptualisation that fulfils both these requirements excellently. Finally, in order to present Objectification Theory as a potentially useful it needs to be shown as empirically valid by producing testable hypotheses, supported by empirical research. Although these are very early stages of research on the topic, both studies presented in the present thesis yield support to hypotheses produced by Objectification Theory. Nevertheless, further research is needed, most notably a comparison of predictions made by Conceptual Metaphor Theory alone and in conjunction with Objectification. These preliminary findings allow the author to state 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 of fields; multimodal framework offered by allowing for multiple types of evidence; as well as internal and external coherence with previous research findings. If abstract concepts are indeed, as Objectification Theory predicts, like dinosaur feathers then the author of the present study hopes it is analogous to discovering and describing an interesting dinosaur feather fossil. For a researcher it suggests an answer to the dinosaur feather dilemma while evoking his or her curiosity to do more digging.

Appendix

TABLE A—topics of conceptual metaphors (with translations)

topic	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	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 SAMOCHÓD	love is a car
KARIERA TO WINO	career is wine
BIEDA TO DZIURA	poverty is a hole

TABLE C—scripts used in the gesture experiment (author: Anna Jelec)

```
-- PsyScript script format 1.0


proc main


  log $experiment

  log $subject


  log $return

  log $timeStamp

  log $dateStamp

  log $return

  wait for 10 seconds or a key



  play sound intro.mp3

  pause for 1 seconds
```

```
play sound lista1.mp3
pause for 1 second

play sound proba.mp3
pause for 2 seconds

play sound koperta.mp3
wait for 60 seconds or a key
play sound beep.wav
pause for 1 second

play sound przejdziemy.mp3
wait for 10 seconds or a key


repeat using $varP from 10 rows of listapierwsza
  play sound $varP
  log $varP
  wait for a key
  play sound beep.wav
end repeat

play sound koniecl1.mp3

play sound lista2.mp3
pause for 1 seconds

repeat using $varQ from 10 rows of listadruga

  play sound $varQ
```

```
    log $varQ

    play sound co.mp3
    wait for a key
    play sound jakie.mp3
    wait for a key
    play sound gdzie.mp3
    wait for a key
    play sound sadzisz.mp3
    wait for a key

  end repeat

  play sound koniecl2.mp3
  wait for 1 second


  play sound koniece.mp3

end proc

-------------------------------- tables ---------------------------------

table listapierwsza in random order
  zlosc.mp3
  uroda.mp3
  nadzieja.mp3
  klopot.mp3
  stres.mp3
  stabilizacja.mp3
  kryzys.mp3
```

```
  kariera.mp3
  choroba.mp3
  usmiech.mp3
  bieda.mp3
  dziura.mp3
  przesylka.mp3
  kwiat.mp3
  samochod.mp3
  drapieznik.mp3
  plaskowyz.mp3
  robak.mp3
  pojemnik.mp3
  przeciwnik.mp3
  ciezar.mp3
end table

table listadruga in random order
  ptak.mp3
  tort.mp3
  bagaz.mp3
  wino.mp3
  ksiazka.mp3
  ukladanka.mp3
  zwierze.mp3
  prezent.mp3
  czlowiek.mp3
  przysmak.mp3
  studnia.mp3
  mysl.mp3
  milosc.mp3
  pomysl.mp3
```

```
  malzenstwo.mp3
  sukces.mp3
  wiedza.mp3
  wladza.mp3
  zycie.mp3
  zyczliwosc.mp3
  internet.mp3
end table

-- PsyScript script format 1.0

proc main

  log $experiment
  log $subject

  log $return
  log $timeStamp
  log $dateStamp
  log $return
  wait for 10 seconds or a key


  play sound intro.mp3
  pause for 1 seconds

  play sound lista1.mp3
  pause for 1 second

  play sound proba.mp3
  pause for 2 seconds
```

```
play sound koperta.mp3
wait for 60 seconds or a key
play sound beep.wav
pause for 1 second

play sound przejdziemy.mp3
wait for 10 seconds or a key



repeat using $varP from 10 rows of listadruga
  play sound $varP
  log $varP
  wait for a key
  play sound beep.wav
end repeat

play sound koniecl1.mp3

play sound lista2.mp3
pause for 1 seconds

repeat using $varQ from 10 rows of listapierwsza

  play sound $varQ
  log $varQ

  play sound co.mp3
  wait for a key
  play sound jakie.mp3
  wait for a key
```

```
    play sound gdzie.mp3
    wait for a key
    play sound sadzisz.mp3
    wait for a key

  end repeat

  play sound koniecl2.mp3
  wait for 1 second


  play sound koniece.mp3

end proc

-------------------------------- tables ---------------------------------

table listapierwsza in random order
  zlosc.mp3
  uroda.mp3
  nadzieja.mp3
  klopot.mp3
  stres.mp3
  stabilizacja.mp3
  kryzys.mp3
  kariera.mp3
  choroba.mp3
  usmiech.mp3
  bieda.mp3
  dziura.mp3
  przesylka.mp3
```

```
  kwiat.mp3
  samochod.mp3
  drapieznik.mp3
  plaskowyz.mp3
  robak.mp3
  pojemnik.mp3
  przeciwnik.mp3
  ciezar.mp3
end table

table listadruga in random order
  ptak.mp3
  tort.mp3
  bagaz.mp3
  wino.mp3
  ksiazka.mp3
  ukladanka.mp3
  zwierze.mp3
  prezent.mp3
  czlowiek.mp3
  przysmak.mp3
  studnia.mp3
  mysl.mp3
  milosc.mp3
  pomysl.mp3
  malzenstwo.mp3
  sukces.mp3
  wiedza.mp3
  wladza.mp3
  zycie.mp3
  zyczliwosc.mp3
```

```
  internet.mp3
end table
```

TABLE D—Results of gesture analysis

subject/ word	grupa	mean G/AC mono	mean G/CC mono	mean G/AC dialo	mean G/CC dialo	word count mono	answers mono	gestures mono	word count dialo	answers dialo	gestures dialo	MONO G/Q ratio	MONO G/W ratio	DIALO G/Q ratio	DIALO G/W ratio
1	blind	6,4	4,44	5,70	5,82	762	19	104	1388	42	121	5,47	0,14	2,88	0,09
2	blind	0,6	0,40	9,40	9,20	308	9	5	425	35	93	0,56	0,02	2,66	0,22
3	blind	2,25	3,40	8,83	7,80	762	10	26	793	40	92	2,60	0,03	2,30	0,12
4	blind	1,5	1,25	5,75	5,50	23	9	8	181	33	56	0,89	0,35	1,70	0,31
5	blind	1,83	2	5,60	10	74	9	13	167	31	58	1,44	0,18	1,87	0,35
6	blind	4	3,50	6,40	7	226	10	33	46	39	67	3,30	0,15	1,72	1,46
7	blind	0,5	0,75	0,5	1,20	64	6	4	88	15	17	0,67	0,06	1,13	0,19
8	blind	0	0	1	2	23	8	0	174	34	15	0,00	0,00	0,44	0,09
9	blind	1	0	1,67	1	71	7	1	73	22	9	0,14	0,01	0,41	0,12
10	blind	1	2,25	3,83	2,33	391	9	14	966	36	30	1,56	0,04	0,83	0,03
11	blind	3	0	1,67	3,17	92	3	9	224	26	24	3,00	0,10	0,92	0,11
12	blind	2,4	2,60	2,50	4,40	850	10	25	827	40	32	2,50	0,03	0,80	0,04
13	control	4,17	3	8,86	10	590	10	37	1040	40	92	3,70	0,06	2,30	0,09
14	control	0,2	0,4	2	2,60	400	10	3	391	27	17	0,30	0,01	0,63	0,04
15	control	2,6	2,6	6,83	6,25	164	10	26	40	38	66	2,60	0,16	1,74	1,65
17	control	2,20	2,20	5,50	6,50	401	10	22	919	32	248	2,20	0,05	7,75	0,27
18	control	5	5	7,50	5,50	166	6	30	302	40	63	5,00	0,18	1,58	0,21
19	control	0	0	0,75	1,25	166	9	0	124	23	8	0,00	0,00	0,35	0,06

TABLE E-results of the statistical analysis (Significance for Two Unknown Means and Unknown Standard Deviations)

Problem	Data	Hypothesis	Test value	Critical area	Conclusion
Average number of gestures per abstract concept. Blind adults vs control group.	Blind adults: $\bar{x}_1 = 4.968$ $s_1 = 3.942$ $n_1 = 62$ Control group: $\bar{x}_2 = 4.212$ $s_2 = 4.349$ $n_2 = 52$	$H_0: \mu_1 = \mu_2$ $H_1: \mu_1 > \mu_2$	$u = 0.96452$	$\lambda = \langle 1.65, \infty)$	Test value is outside the critical area, thus cannot reject H_0 for p-value 0.05.
Average number of gestures per concrete concept. Blind adults vs control group.	Blind adults: $\bar{x}_1 = 5.138$ $s_1 = 3.354$ $n_1 = 65$ Control group: $\bar{x}_2 = 3.625$ $s_2 = 3.700$ $n_2 = 56$	$H_0: \mu_1 = \mu_2$ $H_1: \mu_1 > \mu_2$	$u = 2.3415$	$\lambda = \langle 1.65, \infty)$	Test value is in the critical area, thus we reject H_0 for p-value 0.05 and accept H_1.
Average number of gestures per abstract concept. Blind children vs blind adults.	Blind children: $\bar{x}_1 = 1.702$ $s_1 = 1.768$ $n_1 = 47$ Blind adults: $\bar{x}_2 = 4.968$ $s_2 = 3.942$	$H_0: \mu_1 = \mu_2$ $H_1: \mu_1 < \mu_2$	$u = -5.7995$	$\lambda = (-\infty, -1.65\rangle$	Test value is in the critical area, thus we reject H_0 for p-value 0.05 and accept H_1

	$n_2=62$				
Average number of gestures per concrete concept. Blind children vs blind adults.	Blind children: $\bar{x}_1=1.959$ $s_1=1.947$ $n_1=50$ Blind adults: $\bar{x}_2=5.138$ $s_2=3.354$ $n_2=65$	$H_0: \mu_1=\mu_2$ $H_1: \mu_1<\mu_2$	$u=-4.8838$	$\lambda=(-\infty,-1.65\rangle$	Test value is in the critical area, thus we reject H_0 for p-value 0.05 and accept H_1
Average number of gestures per concept in case of blind adults, abstract vs concrete concepts	Abstract: $\bar{x}_1=4.968$ $s_1=3.942$ $n_1=62$ Concrete: $\bar{x}_2=5.138$ $s_2=3.354$ $n_2=65$	$H_0: \mu_1=\mu_2$ $H_1: \mu_1\neq\mu_2$	$u=-0.26117$	$\lambda=(-\infty,-1.96\rangle \cup\langle 1.96,\infty)$	Test value is outside the critical area, thus cannot reject H_0 for p-value 0.05
Average number of gestures per concept in case of blind children, abstract vs concrete concepts	Abstract: $\bar{x}_1=1.702$ $s_1=1.768$ $n_1=47$ Concrete: $\bar{x}_2=1.959$ $s_2=1.947$ $n_2=50$	$H_0: \mu_1=\mu_2$ $H_1: \mu_1\neq\mu_2$	$u=-0.68123$	$\lambda=(-\infty,-1.96\rangle \cup\langle 1.96,\infty)$	Test value is outside the critical area, thus cannot reject H_0 for p-value 0.05

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