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Master thesis  
August 2019

**Are you faster on a  
bridge or a volcano?  
The effects of  
linguistic concreteness  
on Construal Level  
Theory**

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## **Abstract**

The present research aimed to get a better understanding of the relation between linguistic concreteness and Construal Level Theory. Two studies were conducted to determine whether linguistic concreteness affects the association between psychological distance and construal level. Study 1 used a rating task and demonstrated that linguistic concreteness does not depend on psychological distance, and that the dimensions of psychological distance are not similar. Study 2 used an Implicit Association Test to provide evidence for the claim that concrete language can speed up response times in low construal level and proximity pairings, and that abstract language can speed up response times in high-construal level and distance pairings. Abstract language did influence the pairings as expected, whereas concrete language did not. These findings suggest that linguistic concreteness can facilitate the association between psychological distance and construal level, but only under certain – yet undiscovered – circumstances.

## **Chapter I: Theoretical framework**

## Introduction

As a student, I regularly get caught up in the hustle of an upcoming deadline for a paper. I suppose the thought I have most often is ‘Why did I not start earlier?’ after which I proceed to justify my actions of procrastination by claiming that this ‘very good idea’ for a research topic had not come to mind until now. Back when we got the assignment, I tell myself, it was all still very abstract and I could not think of concrete steps to undertake in preparation for writing my paper. Unbeknownst to me, I might have actually been right. It is actually more difficult to construe concrete representations of an event if that event is distal. Thus, the fact that my deadline was still weeks away actually obstructed my brain from having concrete thoughts about the paper. And of course, since the professor did not provide me with concrete examples, that did not help either. Simply put, I was unable to work on this paper more concretely up until now, two days before the deadline, because now the event is not distal anymore. It is near. Very near, actually.

The abovementioned anecdote actually briefly touches upon the topics that will be discussed. The present thesis contributes to the efforts of identifying the cognitive heuristics that guide the representation of events in the human mind. By adopting Construal Level Theory as the main framework (CLT; Trope & Liberman, 2003; Trope & Liberman, 2010), I propose that CLT’s central concepts - psychological distance and construal level – can be used to identify and understand novel heuristics that people may rely on to assess events of everyday life. Specifically, I examine whether linguistic concreteness can influence the association between psychological distance and construal level. Thus far this assumption has not been tested, although there is reason to assume that linguistic concreteness plays a role, which I will elaborate on in the Literature review.

In the following sections of this chapter, I will provide the reasoning behind CLT, summarize the literature on the influence of psychological distance on cognitive processing, and explain the rationale for incorporating linguistic concreteness in CLT.

## Literature review

### *Construal Level Theory*

Construal Level Theory (CLT; Trope & Liberman, 2003; Trope & Liberman, 2010) is a psychological theory that explains the relationship between construal level and psychological distance. Construal level refers to the way events and objects are represented in people's mind. High construal level refers to representations that are abstract, simple, decontextualized, and superordinate. Low construal level is more concrete, complex, contextual, and subordinate. For the remainder of this thesis, I will use the terms *high/low construal level* and *high-/low-level construal* to refer to the abovementioned representations.

Typically, changing the features of a high-level construal results in major changes in the meaning of the event. Changing the features of a low-level construal results in only minor changes in the meaning of the event. For example, in the low-level event of *children playing basketball outside*, replacing the basketball with a football would only cause a small adjustment in the event to *children playing football outside*. The superordinate event of *children playing outside* would still be maintained. However, for a high-level event such as *greeting somebody*, a change such as replacing *greeting* with *ignoring* or *somebody* with *nobody* would change the meaning of the event entirely. This can be explained by the fact that low-level construals are richer and more detailed. Therefore, changing an aspect of an event will only change a detail. High-level construals, on the other hand, are more general and less detailed.

CLT explains the level of mental construal with processes that allow people to transcend from their subjective experience, or 'zero distance point' (Liberman, Trope, & Stephan, 2007, p. 353). These processes involve abstractness. A person's immediate experience only refers to themselves, to the *here* and the *now*, in *reality*. Psychological distance helps imagine events or objects outside of their immediate experience, such as a faraway place (*there*), another time (*not now*), another person (*not self*), or a hypothetical situation (*not reality*) by construing more abstract representations about these events (Liberman & Trope, 2008; Trope & Liberman, 2010).

According to CLT, psychological distance influences the abstractness of mental representations. The more distal an event or object is, the more abstract its representation will be in the human mind. For the remainder of this thesis, I will use the term *psychological distance* to refer to the general concept. However, I will also mention the dichotomy between *psychological proximity* (i.e., when an object or event is psychologically proximal) and

*psychological distance* (i.e., when an object or event is psychologically distal). To distinguish between the two types of psychological distance, I will refer to the former as *psychological distance* and the latter as solely *distance*.

Psychological distance cues convey information about four different dimensions: information can be about location (proximal or distal location), time (the present or other times), people (in-group or out-group), and hypotheticality (real or imaginary). These four dimensions are commonly indicated as respectively the spatial dimensions, the temporal dimension, the social dimensions and the hypothetical dimension. It is suggested that more distance between a perceiver and a target results in vagueness or loss of details. Therefore, people must instead rely on general knowledge or categorical information about the target to construct a mental representation. The abstractness of distal events is thus the result of a 'lack of knowledge' (Liberman, Trope & Stephan, 2007, p. 353).

Evidence for the relationship between psychological distance and construal level has been provided in many CLT-related studies. To provide some examples, Liberman and Trope (1998) let participants imagine themselves engaged in activities either tomorrow (proximal psychological distance) or next year (distal psychological distance), and describe these activities (Study 1). Results showed that participants described distant future activities in high-level, abstract terms and near future activities in low-level, concrete terms. Other studies have shown that psychological distance affects object categorization (e.g., Liberman, Sagristano & Trope, 2002, Study 1; Wakslak, Trope, Liberman & Alony, 2006, Study 1). Participants in spatially distal conditions tended to group objects into fewer - thus more general and abstract - categories than in spatially proximal conditions. Likewise, Fujita, Henderson, Eng, Trope and Liberman (2006, Study 2) hypothesized that distance should increase the abstractness of language. The results showed that participants recall events with more abstract language if the event is more distal. Likewise, Semin and Fiedler (1988) demonstrated that participants used more abstract language to describe an event that takes place in a spatially distant location than an event that takes place in a spatially near location. Participants thus formed more abstract mental construals about the more distal event than about the more proximal event. Similar conclusions can be found in the study by Eyal, Liberman, Sagristano and Trope (2005) where it was also found that temporally distant events are represented more abstractly than temporally proximal events.

The association between construal level and psychological distance is bidirectional. Not only will psychological distance affect the level of construal, but the level of construal also affects perceived psychological distance (Liberman, Trope & Stephan, 2007). Liberman,

Trope, McCrea and Sherman (2007) demonstrated in four studies that priming participants into a high-level construal will increase the perceived distance from the event in comparison to low-level construal.

In CLT, the four dimensions of psychological distance are cognitively associated with construal level (Bar-Anan, Liberman, & Trope, 2006). It is claimed that this association is so strong that it exists on an implicit level of thought. People will associate proximal targets with low-level construals and concrete representation, and distal targets with high-level construals and abstract representation. Even in the absence of any information about the target event, people will attend to an overgeneralized association.

Bar-Anan et al. (2006) demonstrated this using an Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998) to test if words that imply distal targets are automatically associated with words that imply high-level construals. In the IAT, participants were prompted to categorize target words into one of two categories. Words belonged either to the category of psychological distance (*proximal* or *distal*) or the category of construal level (*low-level* or *high-level*). The hypothesis was that participants would respond faster if proximal words and low-level words were arranged on the same side of the screen (congruent condition) than when proximal words and high-level words were arranged on the same side of the screen (incongruent condition). The results confirmed this idea. In all eight studies, response time was significantly faster in the congruent condition than in the incongruent condition. The difference in reaction times between the congruent and incongruent condition was not the same in every study. Whereas in a study on the social dimension a difference of 66 milliseconds was reported, another study on the spatial dimension had a difference of 241 milliseconds.

Bar-Anan, Liberman, Trope & Algom (2007) further confirmed the idea of an overgeneralized association by adjusting a Stroop task to test the ‘automatic activation’ (p. 615) of psychological distance. In nine studies, words related to the temporal, social or hypothetical dimension were placed in the picture that showed a road and represented the spatial dimension. The words were placed either at the beginning of the road (spatially proximal) or at the end of the road (spatially distal). The hypothesis was that participants would perform better in the Stroop task when the psychological distance of the word and the spatial location matched than when they did not match. Results showed that this was indeed the case. Participants were unable to ignore the psychological distance, even when it was not their goal to assess the psychological distance.

Two important observations can be made about potential origins for the differences in reaction times across the studies reported by Bar-Anan et al. (2006). It is striking that so much variation was found because all eight studies were identical apart from 1) the dimension of psychological distance and 2) the presented stimuli.

Pertaining to the dimensions of psychological distance, Trope and Liberman (2010) have suggested that some dimensions of psychological distance are ‘more basic or influential’ (p. 444) than other dimensions. The spatial dimension might be the dimension that is learned at a young age and is easily detectable. The temporal dimension could be understood merely in reference to the spatial dimension, as time is uncontrollable and unchangeable. The social dimension is suggested to play a central role in psychological distance, since distance on any dimension has the *self* of the perceiver as the starting point. The hypothetical dimension could be the more difficult dimension to understand because hypotheticality is learned at an older age. It is therefore possible that the differences between the studies from Bar-Anan et al. (2006) can be explained by the differences between dimensions as described by Trope and Liberman (2010).

Another possible suggestion, however, is that the differences are due to differences in concreteness of the used target stimuli. Specifically, I propose in this thesis that some target words used in these studies were more concrete, and therefore caused an advantage over abstract words. Thus far this possibility has not been tested empirically. In the next section, this concreteness explanation will be talked about in more detail.

### *Concreteness*

Concreteness, paradoxically, is an abstract term. The common layman is in the dark when trying to explain what concreteness actually involves. The idea that language has different levels of concreteness roots in the Linguistic Category Model (LCM; Semin & Fiedler, 1988), which is a model that explains how language represents psychological processes. The model does so by categorizing different types of words based on how concrete they are. In total, 5 categories are identified from most concrete to most abstract: descriptive action verbs (e.g., *punch*), interpretative action verbs (e.g., *hurt*), state action verbs (e.g., *surprise*), state verbs (e.g., *hate*), and adjectives (e.g., *aggressive*). The more concrete the language is, the more concrete the process in the mind is, and vice versa.

In CLT research, concreteness has been operationalized in different ways. For example, Fujita et al. (2006, Study 1) operationalized concreteness as more or less detailed or categorical (e.g., *getting something to eat* versus *pulling an apple off a branch*). Liberman et al. (2007) operationalized concreteness in a similar way (e.g., *proofread the paper* versus *check the paper*

for spelling and typing errors). Other CLT-related studies have used LCM (Semin & Fiedler, 1988) to analyse concreteness (Fujita et al., 2006), analysed concreteness in terms of specificity (Wakslak, Trope, Liberman & Alony, 2006), or used trait terms (abstract) versus verbs depicting interpersonal events (concrete) to control for concreteness (Semin & Smith, 1999). This type of concreteness operationalization is in line with both LCM and early concreteness research that claims that concreteness is related to specification (Pettus & Diener, 1977; Reyes et al., 1986).

However, linguistic research has shown that concreteness can be identified in terms of imageability (i.e., whether something can be imagined easily; Paivio, 1986), or is related to sensory perceptions (i.e., how well something can be perceived by the senses; Douma, 1994). Furthermore, Vossen and Spooren (2012) have shown that concreteness is dependent of perceptual features. How easily something can be drawn or depicted defines its concreteness. Recent research (Spooren, Hustinx, Aben & Turkenburg, 2015) has shown that the determinants of concreteness differ per word category. Sensory perception is significant for adjectives, verbs and nouns, but specificity marks concreteness for nouns as well, and the ability to draw or film the target adds to concreteness for verbs<sup>1</sup>. These linguistic operationalizations of concreteness have thus far not/hardly been used on CLT research.

However, returning to the discussion about the studies by Bar-Anan et al. (2006), it is plausible that linguistic concreteness (which I shall henceforth call such to discriminate between *linguistic concreteness* and *low construal concreteness*) caused the difference in effects between studies. The different studies did, for example, not control for the word categories of stimuli. Some studies included only nouns whereas in others the stimuli consisted of pronouns or adjectives. In this thesis I therefore propose that controlling for linguistic concreteness will influence the association between psychological distance and construal level that Bar-Anan et al. (2006) found. Below I will elaborate on this proposition, based on previous linguistics research.

Linguistic theories have for a long time attempted to explain concreteness effects or the behavioural advantages that concrete concepts have over abstract concepts. Several different explanations for the concreteness advantage have been forwarded. Dual Coding Theory (Paivio, 1986) claims that the advantage of concreteness stems from the fact that both concrete and abstract concepts have a verbal code representation, but only concrete concepts have a nonverbal, perceptual code as well. Therefore, concrete words can be processed faster because they can be accessed via more routes than abstract words.

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<sup>1</sup> The aim of the present study is not to give an extensive review of concreteness research, although I acknowledge that there is a lot more to say about concreteness.

Context Availability Theory (Schwanenflugel & Schoben, 1983) states that concreteness advantages cannot be explained because concrete concepts have more representations than abstract ones. Rather, concrete concepts have fewer, yet stronger contextual links in memory, whereas abstract concepts have more, weaker contextual links. Specifically, concrete information tends to be stored better and is thus more accessible, thus more available than abstract information. This also explains the availability heuristic (Tversky & Kahneman, 1973): concreteness effects are due to the fact that judgment about events is based on relevant information that is available in memory.

Situations simulation views of conceptual representation (Barsalou & Wiemer-Hastings, 2005) hold that it is more difficult to access abstract words in memory. This is because abstract information is represented in a wide range of situation that focus on social, introspective and affective information. Concreteness information, however, is represented in a narrow range of situations that focus on perceptual and motor information, which is easier to access.

In sum, linguistic research proposes different theories to explain concreteness effects but agrees on the fact that concrete language has its advantages over abstract language due to accessibility. Therefore, it might be interesting to explore the effects on linguistic concreteness in CLT-related context and to discover whether the differences in response time in the studies by Bar-Anan et al. (2006) can be explained with the help of linguistic concreteness. I suspect that linguistic concreteness facilitates response time within the context of an IAT as well.

To summarize, CLT claims that there is a relation between psychological distance and construal level. The more distal an event on any of the four dimensions (spatial, temporal, social and hypothetical), the more abstract its mental representation will be. This association is bi-directional in that it can also be turned around: the more abstract a representation is, the more distance from that event is perceived. The association between psychological distance and construal level is not only bi-directional, but also overgeneralized. People will automatically associate proximal targets with low-level construals and concrete representation, and distal targets with high-level construals and abstract representation. Bar-Anan et al. (2006) have shown this in a collection of studies using the IAT.

However, differences in results between the Bar-Anan et al. (2006) studies have led to the suspicion that another factor has influenced the results. I propose that previous CLT research has erroneously disregarded the effects of linguistic concreteness. Presumably, linguistic concreteness affects the association between psychological distance and construal level. Specifically, in the context of CLT, it can be argued that there is an interaction between

linguistic concreteness, psychological distance and construal level. Concrete language should facilitate the association between low-level construal and psychological proximity, whereas abstract language might do the same for high-level construal and psychological distance.

In the next section, I will elaborate on the aim and hypotheses of this thesis. Furthermore, I will provide an overview of the chapters II through IV.

## Research goals and hypotheses

The aim of this thesis was to gain a better understanding of the relation between psychological distance, construal level and linguistic concreteness. As the previous sections discussed, the association between psychological distance and construal level is so strong that it can be interpreted as an overgeneralized association. The present study uses this association in order to investigate how linguistic concreteness affects CLT. One way to test this is by measuring response times in an IAT. In the IAT participants will be asked to categorize stimuli related to either construal level (i.e., whether a word relates to *concrete* or *abstract*) or psychological distance (i.e., whether a word relates to *proximal* or *distal*). As these categories will be mapped on either the left or right side of the screen, it is expected – as previous research has already shown – that participants will be faster to respond if *proximal* and *concrete* are mapped on the same side (i.e., creating a congruent pairing) than when *proximal* is mapped on the same side as *abstract* (i.e., creating an incongruent pairing). In the present research linguistic concreteness is incorporated into this test by selecting stimuli for psychological distance which are either linguistically concrete or abstract (e.g., *bridge* versus *peace*). This will be done in Study 2. The IAT is chosen because it can measure the implicit association people have about concepts, without explicit thought. Because low construal and proximity collocate with concrete representation, the prediction is that concrete language will facilitate the association. On the other hand, high construal and distance lead to abstract representation in the mind, and so abstract language will facilitate in this setting. The hypothesis is that linguistically concrete stimuli are predicted to speed up the response time in the IAT for congruent pairings of low construal and psychological proximity as opposed to abstract stimuli. For high construal and psychological distance, the hypothesis is that abstract language speeds up the response time, whereas the response time will be slower when exposed to concrete stimuli.

To rule out the possibility that linguistic concreteness has an intrinsic relation with psychological distance, a first study will be conducted prior to the IAT. In this study, participants will be asked to rate stimuli on both psychological distance and concreteness. If any interdependence exists between linguistic concreteness and psychological distance, there should be a demonstrable relation between the two concepts: proximal items should then be rated either more concrete or more abstract than distal items. If no correlation is found, it is

safe to assume that linguistic concreteness can act as an independent factor and influence construal level processing apart from psychological distance (H1).

A second assumption that was taken into consideration in the present research is that not all dimensions of psychological dimension are similar (H2). Research suggests that some are more basic than other (Trope & Liberman, 2010). It is desirable to explore the influence of linguistic concreteness across the different dimensions of psychological distance. Therefore, in Study 1 participants were asked to rate stimuli across the different dimensions of psychological distance.

A third CLT assumption that was be tested in Study 2 was that the association between psychological distance and construal level is so strong and overgeneralized that manipulating linguistic concreteness cannot nullify the association. It would make no difference whether the IAT was filled with concrete or abstract target stimuli. Participants would prefer the CLT congruent pairing over the CLT incongruent pairing either way (H3).

In short, the hypotheses were formulated as follows:

H1. Linguistic concreteness is independent from psychological distance (tested in Study 1).

H2. The dimensions of psychological distance differ from each other (tested in Study 1).

H3. Participants respond faster in the CLT congruent condition than in the CLT incongruent condition (tested in Study 2).

H4a. In the CLT congruent condition, participants respond faster in the concreteness congruent condition than in the concreteness incongruent condition (tested in Study 2).

H4b. In the CLT congruent condition, participants respond faster in the abstractness congruent condition than in the abstractness incongruent condition (tested in Study 2).

### *Chapter overview*

In the next chapter, Study 1 – the rating task – is discussed to address hypotheses 1 and 2. In chapter III, the effect of linguistic concreteness on CLT was investigated. Using an IAT, hypotheses 3, 4a, and 4B were tested. In the final chapter of this thesis, a general discussion of both studies is offered alongside an address of the implications of the studies, their feedback to former research and an evaluation of the studies. To conclude, suggestions will be made for future research.

## **Chapter II: Study 1**

## Methodology

In the present study, hypotheses 1 and 2 were tested using the results from a rating task. First of all, I predicted that linguistic concreteness is independent from psychological distance (H1). Secondly, I predicted that the dimensions of psychological distance differ from each other (H2).

For the rating task, items were pre-selected based on both their linguistic concreteness and their depiction of psychological distance. For linguistic concreteness, a wordlist by Brysbaert, Stevens, De Deyne, Voorspoels and Storms (2014) was used. Brysbaert et al. (2014) collected concreteness scores for 30.000 Dutch words from 75 student participants, who rated each item on a scale from 1 (very abstract) to 5 (very concrete). From this list, items were selected that were either abstract or concrete. For psychological distance, items were selected that denoted either proximity or distance. Furthermore, items were rated across all four dimensions of psychological distance. All in all, the following conditions were created<sup>2</sup>:

### Survey 1: Spatial dimension

1. Concrete items that connoted spatial proximity
2. Abstract items that connoted spatial proximity
3. Concrete items that connoted spatial distance
4. Abstract items that connoted spatial distance

### Survey 2: Temporal dimension

1. Concrete items that connoted temporal proximity
2. Abstract items that connoted temporal proximity
3. Concrete items that connoted temporal distance
4. Abstract items that connoted temporal distance

### Survey 3: Hypothetical dimension

1. Concrete items that connoted hypothetical proximity
2. Abstract items that connoted hypothetical proximity
3. Concrete items that connoted hypothetical distance
4. Abstract items that connoted hypothetical distance

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<sup>2</sup> The observant reader will notice that there are four dimensions of psychological distance and only three surveys (thus dimensions) presented here. In the Material section, it will be further explained why the social dimension was excluded.

### *Material*

The present study tested concreteness and psychological distance in three dimensions of psychological distance. Three versions of the same survey were used. The versions differed in dimension, each one focusing on one dimension of psychological distance (temporal, spatial, or hypothetical). The target words differed per dimension.

All target words were Dutch nouns consisting of only one word. In Appendix A, the Dutch version of the word list with items from all dimensions can be found. The words could not be homonyms. Furthermore, if words were gender-specific, the male variant was used, as this is commonly used as the gender-neutral variant in Dutch. In some situations, however, the female depiction was chosen. For example, *witch* was included as there is no clear masculine counterpart for it. All dimensions of psychological distance and corresponding surveys are discussed in the rest of this section.

#### Social dimension

The social dimension was not included in this study. This was done due to the impossibility to find suitable items for three reasons.

First of all, the social dimension associates with personal relations, or in-groups versus out-groups. Since in-group and out-group characteristic are strictly personal and differ from person to person (e.g., for a religious person *atheism* would be categorized as an out-group characteristic, but for an atheist this would be considered an in-group characteristic), it is difficult – if not impossible – to find suitable items without strictly controlling the demographics of participants.

Secondly, the dimensions of psychological distance differ in their relation to valence (Trope & Liberman, 2010). In the social dimension, distance decreases positivity, because people consider in-groups more positive than out-groups. The difference can clearly be observed in item pairs such as *friends* - *enemies* (target words used in Bar-Anan et al., 2006). To avoid valence from becoming a confounding factor in this survey, it was determined that neutral items would be selected. The items would connote *familiarity* (people you know) and *unfamiliarity* (people you do not know). It soon became apparent that not enough suitable items could be found that connoted the two concepts.

In a last attempt to include the social dimension, negatively and positively connoting items (e.g., *friends* and *enemies*) were included. However, the selected items showed no

variation in concreteness and were primarily abstract. Therefore, it was decided to exclude the social dimension from the study in all.

In Table 1, a list of possible items from the social dimension can be found with corresponding concreteness scores, sorted in two columns to distinguish between proximal and distal items, and sorted from low to high concreteness. As can be seen, all items were low to moderately concrete, ranging between 2.33 and 3.20, and were therefore not suited for the goal of this study.

**Table 1:** A list of target stimuli for the social dimension and their corresponding concreteness score, divided into two columns (proximal and distal items).

Proximal items	Concreteness	Distal items	Concreteness
<i>supporter</i>	2.33	<i>stranger</i>	2.33
<i>friend</i>	2.40	<i>bully</i>	2.60
<i>acquaintance</i>	2.40	<i>arch-enemy</i>	2.67
<i>bosom friend</i>	2.47	<i>alien</i>	2.67
<i>ally</i>	2.60	<i>enemy</i>	2.73
<i>fellow student</i>	3.53	<i>opponent</i>	2.79
<i>parents</i>	3.07	<i>antagonist</i>	3.20

### Spatial dimension

For the survey on spatial dimension, 26 items were selected from Brysbaert et al. (2014). The corresponding concreteness scores were taken into account while selecting items to have an even distribution in concreteness. Also, the semantic relation to spatial nearness was considered when selecting items.

Each item was matched with an antonym that had approximately the same concreteness score (Brysbaert et al., 2014), and the whole list had a fair distribution along concreteness scores, meaning that both high and low concreteness were equally included. In total, 12 concrete words were selected (with a concreteness score higher than 3.5<sup>3</sup>) and 14 abstract words were selected (with a concreteness score lower than 3.5).

Items were selected if they denoted distance on a spatial level. Items were seen as *proximal* when they depicted something that could likely occur in the Netherlands, as opposed to items that were considered *distal* when they could unlikely occur in the Netherlands.

<sup>3</sup> Actually, 2.5 would be the median, but because nouns generally have higher scores it was decided to use 3.5 as a cut-point.

Examples of proximal items were *station* and *bicycle path*, both objects that can be typically found in the Netherlands, whereas *volcano* and *rain forest* were considered distal items, as those things typically cannot be found in the Netherlands.

In Table 2, a list of all items from the spatial dimension can be found with corresponding concreteness scores, sorted in two columns to distinguish between proximal and distal items, and sorted from low to high concreteness.

**Table 2:** A list of target stimuli for the spatial dimension and their corresponding concreteness score, divided into two columns (proximal and distal items).

Proximal items	Concreteness	Distal items	Concreteness
<i>peace</i>	1.80	<i>war</i>	2.87
<i>democracy</i>	1.67	<i>dictatorship</i>	2.27
<i>chilly country</i> <sup>4</sup>	2.50	<i>universe</i>	2.47
<i>neighbourhood</i>	2.50	<i>distance</i>	2.38
<i>royal house</i>	2.93	<i>empire</i>	2.87
<i>university</i>	2.93	<i>fortress</i>	3.57
<i>home</i>	3.13	<i>cosmos</i>	2.40
<i>city</i>	3.73	<i>jungle</i>	3.67
<i>river</i>	4.73	<i>ocean-floor</i>	4.53
<i>station</i>	4.80	<i>pyramid</i>	4.60
<i>bike path</i>	4.73	<i>submarine</i>	4.60
<i>bridge</i>	4.73	<i>rain forest</i>	4.67
<i>pasture</i>	4.53	<i>volcano</i>	4.73

### Temporal dimension

33 single word items were chosen for the survey on temporal distance. They were selected for their linguistic concreteness and semantic relation to psychological distance on a temporal level.

Concreteness was manipulated using the concreteness scores from Brysbaert et al. (2014). All items had an even distribution along concreteness, meaning that both high and low concrete items were included. Items were considered concrete when they had a concreteness score above 3.5. Items were considered abstract when they scored below 3.5 on concreteness. In total, 13 concrete items were selected and 20 abstract items.

<sup>4</sup> The word *kikkerland* literally translates to ‘frog country’. It is a nickname to depict the Netherlands as a chilly country.

To manipulate psychological distance, items were chosen when relating to proximity on a temporal scale. Items were considered *proximal* when they depicted something that could exist or occur in the present time, as opposed to items that were considered *distal* when they were highly unlikely to exist or occur in the present time. Words were selected when they depicted a certain temporal distance (e.g., *present*) or when they implied a specific time frame (e.g., *dinosaur* relates to the prehistoric age which is the distal past, whereas *exam* related to studying and therefore the present, since the target group for this study was students).

While items relating to spatial distance were easy to match with opposing items, this is not the case for the temporal dimension. The opposite of *summer* could be *winter*, but it is hard to identify the proper counterpart of the item *study* or *ice age*. Therefore, the decision was made to select items related to the present versus the ‘non-present’ rather than finding sufficient counterparts.

For non-present items, the distinction was made between items relating to one’s future (e.g., *retirement*, *old age*), items relating to one’s past (e.g., *childhood*, *crib*), items relating to the past ages outside of a person’s life (e.g., *ice age*, *big bang*) and items relating to neither the past nor future, henceforth called non-proximal items. The latter items are items that do not necessarily refer to the past or future, but rather to both (e.g., *Christmas*, *winter*).

The availability heuristic (Tversky & Kahneman, 1973) and other theories<sup>5</sup> stated that concrete information is better stored in memory. Since a person might rely more heavily on memory to recollect memories from his or her own life, it is plausible that concreteness effects are stronger in this setting in the temporal dimension<sup>6</sup>. In order to prevent effects from occurring due to difference in temporal distance between items, it was decided to only use items relating to the past ages, and non-proximal items. Instead of choosing one category of non-present items, two were chosen. The main reason for this inclusion is that it allows for an analysis of what type of temporal manipulation works best.

Furthermore, items relating to one’s own lifetime (both past and future) were excluded, because it differs from person to person how distal an item is. For example, a person who interacts with toddlers or primary schoolers in daily life would feel much closer to the item *toddler* than a person who does not, even though the item is meant to refer to one’s own childhood. Furthermore, it is difficult to pinpoint which items would be universally distal from participants. Marriage, for example, might be a proximal future event for some people, whereas other people consider this

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<sup>5</sup> See Chapter I, Theoretical framework for a discussion

<sup>6</sup> This study will not elaborate on this matter. It is merely a suggestion that needs consideration and measure, and that invites for further research.

an event which is not part of their future plans at all.

This resulted in three categories of items: proximal items, non-proximal, and distal items. In Table 3, a list of all items from the temporal dimension can be found with corresponding concreteness scores, sorted in two columns to distinguish between proximal items and distal items, and sorted from low to high concreteness.

**Table 3:** A list of target stimuli for the temporal dimension and their corresponding concreteness score, divided into two columns (proximal and distal items).

Proximal items	Concreteness	Distal items (distal)	Concreteness
<i>present</i>	1.73	<i>prehistory</i>	1.47
<i>Thursday</i>	2.13	<i>renaissance</i>	1.47
<i>study</i>	2.40	<i>primordial time</i>	1.93
<i>summer</i>	2.53	<i>big bang</i>	2.20
<i>June</i>	2.60	<i>middle ages</i>	2.29
<i>college</i>	3.07	<i>ice age</i>	2.47
<i>summer day</i>	3.20	<i>hieroglyph</i>	4.00
<i>student</i>	3.27	<i>amphitheatre</i>	4.07
<i>groceries</i>	3.87	<i>guillotine</i>	4.29
<i>lunch</i>	4.00	<i>dinosaur</i>	4.67
<i>raindrop</i>	4.93		
<i>sandwich</i>	4.93		
<i>book</i>	4.93		
		Distal items (non-proximal)	Concreteness
		<i>December</i>	1.87
		<i>new year eve</i>	2.47
		<i>autumn</i>	2.73
		<i>winter</i>	2.87
		<i>Christmas</i>	3.07
		<i>evening of packages<sup>7</sup></i>	3.31
		<i>Christmas dinner</i>	4.07
		<i>winter coat</i>	4.60
		<i>deep-fried raisin bun<sup>8</sup></i>	4.80
		<i>snow</i>	4.80

<sup>7</sup> The word *pakjesavond* literally translates to ‘evening of packages’ and can be compared to the English Christmas Eve. It is a public holiday early December during which children receive presents from Saint Nicolas.

<sup>8</sup> The word *oliebol* translates to ‘oil ball’. It is a deep-fried bun of dough which is commonly eaten in the Netherlands around New Year’s Eve.

### Hypothetical dimension

26 single word items were chosen for the survey on hypothetical distance. They were selected for their linguistic concreteness and semantic relation to psychological distance on a hypothetical level.

Concreteness was manipulated using the concreteness scores from Brysbaert et al. (2014). All items had an even distribution along concreteness, meaning that both high and low concrete items were included. The list included 13 concrete items (concreteness score above 3.5) and 13 abstract items (concreteness score below 3.5).

To manipulate psychological distance, items were chosen when relating to proximity on a hypothetical scale. Items were considered *proximal* when they depicted something that could exist in reality, as opposed to items that were considered *distal* when they were considered imaginary. Imaginary items mostly included mythical creatures. To oppose mythical creatures, proximal items were chosen that related to professions of people or to animals. Only occupations of people were used, not characteristics or personality traits. It was decided not to select solely animals or solely professions, because some of the mythical creatures could be considered ‘types of people’ (e.g., *wizard*, *witch*), whereas some could be considered ‘animal-like’ (e.g., *centaur*, *dragon*).

In Table 4, a list of all items from the hypothetical dimension can be found with corresponding concreteness scores, sorted in two columns to distinguish between proximal items and distal items, and sorted from low to high concreteness.

### *Participants*

In total, 184 people responded to the surveys. Only fully completed survey were taken into account. This resulted in the exclusion of 68 surveys. A total of 116 surveys were included in the analysis. Of the included respondents, 87 identified as female, 25 as male, 1 as neutral and 3 did not included their sex. The average age of the participants was 26.04 ( $SD = 11.79$ ) years, ranging from 18 to 83 years. All participants were Dutch native speakers and residents of the Netherlands. Most participants attended college or university (87 university, 23 college, 12 other).

The survey for the spatial dimension was completed by 39 participants (12 male, 26 female, 1 neutral). The age of the respondents ranged from 18 to 76 years ( $M = 27.08$ ,  $SD = 11.59$ ). Most participants attended higher education (28 university, 6 college, 5 other)

For the temporal dimension, 39 participants completed the survey (6 male, 30 female, 3 unknown). Their minimum age was 18 and maximum age 83 ( $M = 29.06$ ,  $SD = 16.49$ ). The participants were mostly highly educated (23 university, 8 college, 5 other).

The survey from the hypothetical dimension included 38 complete responses (7 male, 31 female). The participants ranged in age from 18 to 29 years ( $M = 22.21$ ,  $SD = 2.15$ ). The participants were mostly highly educated (27 university, 9 college, 2 other)

A Pearson chi-square test was used to compare frequencies of sex and education level between surveys. The results showed that both sex ( $\chi^2(4) = 4.767$ ,  $p = .31$ ) and education ( $\chi^2(4) = 2.51$ ,  $p = .64$ ) did not differ between the three surveys. There was, however, a statistically significant difference in age between dimensions as determined by a one-way ANOVA ( $F(2,109) = 3.44$ ,  $p = .04$ ). A Bonferroni post-hoc test revealed that participants were significantly older ( $M = 27.08$ ,  $SD = 11.59$ ) in the survey that assessed the temporal dimension than in the survey on the hypothetical dimension ( $M = 22.21$ ,  $SD = 2.14$ ;  $p = .04$ ).

**Table 4:** A list of target stimuli for the hypothetical dimension and their corresponding concreteness score, divided into two columns (proximal and distal items).

Distal items		Proximal items	
<i>centaur</i>	2.00	<i>crossing guard</i>	1.90
<i>goddess</i>	2.33	<i>genius</i>	1.93
<i>goblin</i>	2.43	<i>messenger</i>	2.43
<i>wizard</i>	2.80	<i>detective</i>	2.80
<i>griffin</i>	3.14	<i>deputy headmaster</i>	2.83
<i>fairy</i>	3.27	<i>social worker</i>	3.33
<i>centaur</i> <sup>9</sup>	3.50	<i>doctor</i>	3.60
<i>ghost</i>	3.80	<i>writer</i>	3.73
<i>witch</i>	3.87	<i>teacher</i>	3.93
<i>werewolf</i>	3.87	<i>baker</i>	4.60
<i>dragon</i>	4.07	<i>monkey</i>	4.73
<i>unicorn</i>	4.20	<i>elephant</i>	4.93
<i>giant</i>	4.27	<i>Cow</i>	5.00

<sup>9</sup> The item *centaur* appeared twice in Brysbaert et al.'s (2014) list. Once (in Dutch) as *centaur* and once as *centaurus*. Both were included, because their concreteness scores were different.

### *Design*

This study had a 2 x 2 x 3 (concreteness x psychological distance x dimension) mixed design. The variables *concreteness* and *psychological distance* were manipulated within subjects, whereas the variable *dimension* varied between subjects. Participants completed one of three surveys based on the dimensions (spatial, temporal, or hypothetical), and were exposed to both conditions of psychological distance: items were either proximal or distal. Furthermore, items within each survey differed in concreteness: both concrete and abstract items were included.

The surveys consisted of 26 to 33 items. The items were randomized to prevent sequence effects. Additionally, out of all 26-33 items per version, participants only rated 15 items to prevent boredom effects. Because of the number of participants per survey, this resulted in 20 to 26 scores for items in the survey from the spatial dimension. Temporal items were scored 14 to 21 times, whereas hypothetical items received between 19 and 25 scores.

Each survey started with a disclaimer and a page with instruction. Then, participants viewed the 15 items one by one. After reading the item, participants were asked to score the items on concreteness, perceptibility and psychological distance. After answering these questions, participants proceeded to the next item. This repeated itself for 15 items. Finally, participants were asked for their personal details. On the last page, they were asked to leave their email address and thanked for their cooperation.

### *Instrument*

#### Instructions

Before starting the survey, participants were given a short instruction. In this instruction, the terms *concreteness* and *distance* were briefly explained. For concreteness, the text was:

*Words differ in concreteness. How concrete a word is, depends on the clarity or imageability of the thing that is referred to. 'Car' for example is a very concrete word, whereas 'love' is less concrete.*

Then, distance was explained. This text differed per version. For hypotheticality, the text explained the difference between real versus imaginary items, while the text for temporality talked about items being far away or near in time. The text for spatiality was:

*Things can be near or far away. The computer or the mobile device that you are working on right now, is several centimetres away from you, whereas the starry sky is thousands of kilometres away.*

The reference to the mobile device or computer was made, because the survey could only be completed online. Therefore, the participant had to be on an electronic device.

### Rating task

For linguistic concreteness, participants were asked to score how concrete they perceived the word on a scale from 1 to 5. A 5-point semantic differential scale was used as follows:

*How concrete do you find this word on a scale from 1 to 5?*

*Absolutely not concrete      2      3      4      Very concrete*

To test for validity, imageability and perceptibility questions were also included in the rating task. Imageability was included, because studies have shown that imageability and concreteness are highly correlated (Brysbaert et al., 2014). Perceptibility was included because research has shown that concreteness effects are best prediction by sensory perception. More specifically, visual perception is the best predictor of concreteness effects (Connell & Lynott, 2012). Perceptibility was questioned by asking participants about imaginability and visual perceptibility. The first question was about imaginability, whereas the second one dealt with visual perceptibility.

*How well can you imagine this word on a scale from 1 to 5?*

*Absolutely not well      2      3      4      Very well*

*How well can you see this word (with your eyes) on a scale from 1 to 5?*

*Absolutely not well      2      3      4      Very well*

Lastly, one question was about psychological distance. The wording of the question differed per version. For hypotheticality, the question focused on reality, while the survey on temporal distance mentioned the present. In the survey on spatial distance, the focus was on physical distance:

*If you consider your own position (your location, in your town, in the Netherlands), how near do you find this word on a scale from 1 to 5?*

*Very far away                      2              3              4              Very close*

### Demographic information

Finally, participants were asked for their age, their sex, and the highest level of education they had received. At the end of the survey, the option to enter their mail address appeared. By filling out their mail address, participants entered the lottery to win a gift card.

See Appendix B for a Dutch version of the survey.

### *Procedure*

The surveys were generated using Qualtrics software, Version XM. Six participants pretested the surveys to check for possible errors. Errors were corrected in the software, before publishing the surveys online.

The surveys were distributed between June 12, 2019 and June 17, 2019 via social media and personal contacts. Posts on personal accounts on Facebook, Instagram and Snapchat urged followers and friends to begin the survey by clicking on a hyperlink or sending a private message to receive a hyperlink. Each medium contained a hyperlink for a different version of the survey. To make sure that the distribution of all three versions was even, the links alternated location with each other every day, meaning the link to the survey for the spatial dimension could be found on Facebook on the first day and on Instagram on the second day. WhatsApp was also used to contact people personally and request their participation.

People who had received a link could activate it until June 22, 2019. After that day, the links became inactive, and no new surveys could be completed. People were able to complete their survey until seven days after they had initially clicked the link. After seven days, incomplete responses were collected. A reminder was sent out three days after originally posting the surveys online, both on the social media and via personal messages.

The hyperlink took participants directly to the first page of the survey, where a short text explained that people would be asked to give 15 words to rate. For each item, the stimulus word would be at the top of the page with underneath that the corresponding questions. Participants were urged not to overthink their answers, and to follow their gut feeling. Furthermore, the text stated that participants gave permission to use their responses anonymously for academic purposes when they proceeded to the next page by clicking on the ‘Start’ button, and they could

withdraw from the study at any moment.

Stimuli were presented in black letters against a white screen background and remained on the screen until the participant clicked on the 'Proceed' button. For each stimulus word, the questions about concreteness, imageability, perceptibility, and psychological distance would appear simultaneously on the screen listwise.

Completing a survey took 5 to 7 minutes. At the end of the survey, a paragraph thanked participants for their participation. Their data would be handled confidentially. An email address was provided to address any issues regarding the survey.

To motivate people into taking the survey, two gift cards of €10 were promised to be given out to two of the participants. In order to win a gift card, participants were asked to fill out their email address. The researcher would be in touch if the person had won one of the gift cards. Winners were randomly selected from all email addresses.

### *Analysis*

Hypothesis 1 was tested by means of multiple one-way repeated measures ANOVAs to analyse concreteness between the conditions of proximal-concrete, proximal-abstract, distal-concrete, and distal-abstract items. All above-mentioned analyses were performed for each dimension.

Hypothesis 2 was tested by comparing concreteness and psychological distance between dimensions. Two one-way repeated measures ANOVA were performed. The first one compared psychological distance scores between proximal and distal items across all three dimensions. The second analysis compared concreteness scores between concrete and abstract items across all three dimensions.

For Study 1, two tests were conducted to ascertain that concreteness, imageability, and perceptibility assessed one underlying dimension of concreteness. First, to test validity, a reliability analysis was performed for the scores from concreteness, imageability, and perceptibility. Mean scores per item were used for this analysis. Second, a one-sample t-test compared the mean concreteness scores per item to the concreteness scores from Brysbaert et al. (2014).

To compare the means for psychological distance between the proximal and distal items, a paired samples t-test was used. For the temporal dimension, a one-way repeated measures ANOVA was used, because non-proximal items were also included in the analysis.

## Results

The presentation of the results in this chapter has the following structure: first the results of each survey are explored individually. For each survey, the relation between concreteness and psychological distance will be assessed, after which validity will be discussed.. Finally, a across-survey comparison of concreteness and psychological distance scores will be analysed.

### *Spatial dimension*

#### Linguistic concreteness and psychological distance

To analyse whether concreteness differed between the proximal and distal items, a one-way repeated measures ANOVA was performed. The results can be found in Figure 5. The groups of proximal and distal items were split in half based on their concreteness scores<sup>10</sup>, creating the following groups:

1. Proximal-concrete (6 items)
2. Proximal-abstract (7 items)
3. Distal-concrete (6 items)
4. Distal-abstract (7 items)

Mauchly's test indicated that the assumption of sphericity had not been violated ( $\chi^2(5) = 4.42, p = .49$ ). The results showed that concreteness differed across conditions ( $F(3,114) = 92.89, p < .001$ ).

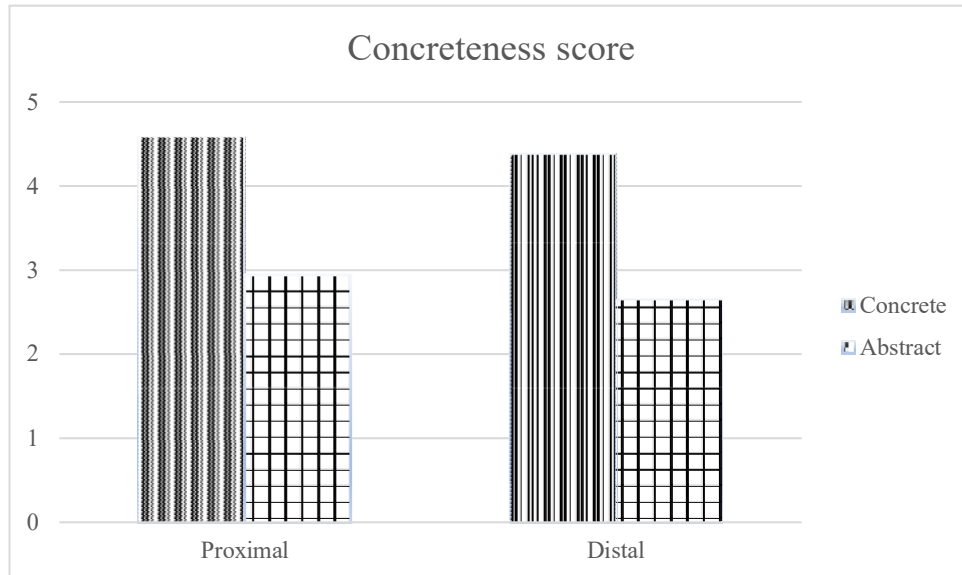
Post-hoc analyses were used to make pairwise comparisons between four conditions (proximal-concrete; proximal-abstract; distal-concrete; distal-abstract). There was a significant main effect of concreteness. Both concrete conditions (proximal-concrete:  $M = 4.58, SD = .49$ ; distal-concrete:  $M = 4.37, SD = .62$ ) were more concrete than the abstract conditions (proximal-abstract:  $M = 2.93, SD = .96$ ; distal-abstract:  $M = 2.64, SD = .89$ ), and this difference was statistically significant ( $p$ 's  $< .001$ ). Furthermore, proximal-concrete items did not significantly differ from distal-concrete items ( $p = .54$ ), and neither did proximal-abstract items significantly differ from distal-abstract items ( $p = .55$ ).

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<sup>10</sup> A score above 4.00 meant an item was considered concrete; a score below 3.00 meant an item was considered abstract. Items with a score between 3.00 and 3.99 were divided among concrete and abstract groups to make them equal in number of items (e.g., the item *jungle* had a concreteness score of 3.00, but since the division between distal-concrete and distal-abstract items was respectively 5 to 7, the item was placed in the distal-concrete category).

Therefore, it can be concluded that linguistic concreteness did not differ between proximal and distal items.

**Figure 5:** A bar chart with concreteness scores for the proximal and distal condition in the spatial dimension, divided into concrete and abstract items.



#### Validity of concreteness and comparison with Brysbaert et al.'s (2014) scores

To check the validity of the concreteness scores, first a reliability analysis was conducted that included concreteness, perceptibility and imageability scores. The analysis showed high reliability ( $\alpha = .82$ ). Second, the concreteness scores for all 26 items were compared to their concreteness scores of Brysbaert et al. (2014). The results showed that concreteness scores for 18 items did not differ significantly from the scores by Brysbaert et al. (2014) ( $p$ 's  $> .05$ ). Participants gave 6 items a higher average mean score, whereas 2 items scored lower on concreteness than Brysbaert's score ( $p$ 's  $< .05$ ). See Table 6 for an overview of all items.

From these results, it can be concluded that concreteness was correctly manipulated, since concreteness correlated strongly with perceptibility and imageability, and showed large overlap with the concreteness scores from Brysbaert et al. (2014).

**Table 6:** A list of target stimuli for the spatial dimension and their corresponding concreteness score, Brysbaert et al. (2014) score, and mean difference (in ms), divided into two columns (proximal and distal items).

Item	N	M	Brysbaert	$\Delta$	Item	N	M	Brysbaert	$\Delta$
<i>peace</i>	22	1.95	1.80	.15	<i>cosmos</i>	22	1.95	2.40	-.45
<i>chilly country</i>	20	2.20	2.50	-.30	<i>distance</i>	24	2.04	2.38	-.34
<i>neighborhood</i>	23	2.70	2.50	.20	<i>fortress</i>	22	2.82	3.57	-.75*
<i>democracy</i>	22	2.77	1.67	1.10*	<i>universe</i>	25	2.84	2.47	.37
<i>royal house</i>	20	3.35	2.93	.42	<i>war</i>	20	2.85	2.87	-.02
<i>home</i>	21	3.52	3.13	.39	<i>jungle</i>	22	3.00	3.67	-.67*
<i>university</i>	23	3.96	2.93	1.03*	<i>empire</i>	21	3.00	2.87	.13
<i>city</i>	24	4.00	3.73	.27	<i>dictatorship</i>	25	3.32	2.27	1.05*
<i>station</i>	22	4.36	4.80	-.44	<i>rain forest</i>	21	4.33	4.67	-.34
<i>river</i>	24	4.50	4.73	-.20	<i>ocean-floor</i>	23	4.57	4.53	.04
<i>pasture</i>	24	4.75	4.53	.22*	<i>pyramid</i>	23	4.74	4.60	.14
<i>bridge</i>	24	4.83	4.73	.10	<i>submarine</i>	20	4.80	4.60	.20*
<i>bike path</i>	26	4.88	4.73	.15*	<i>volcano</i>	22	4.82	4.73	.09

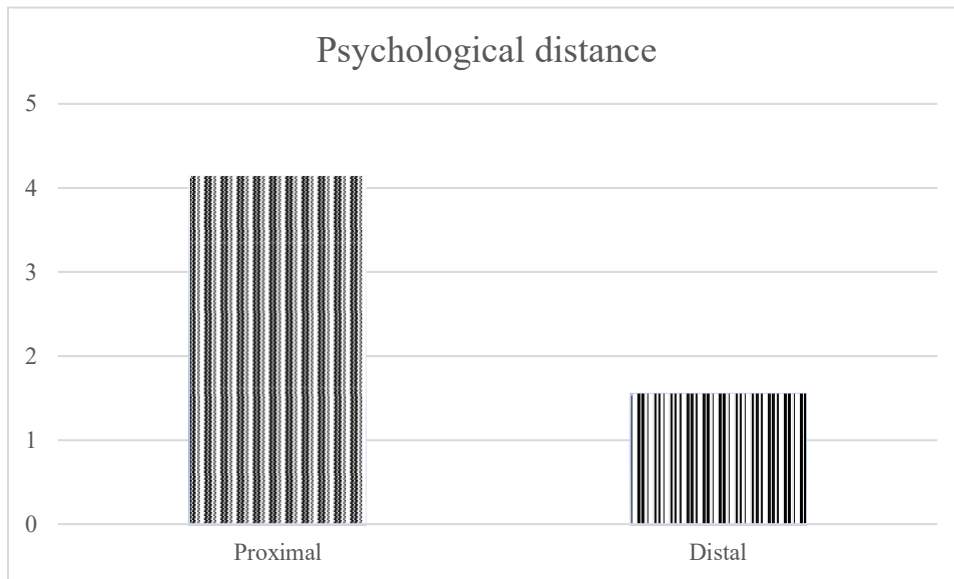
\*  $p < .05$

### Psychological distance

A comparison of means showed that on average the 13 proximal items were perceived as more proximal ( $M = 4.14$ ,  $SD = .48$ ) than the 13 distal items ( $M = 1.56$ ,  $SD = .38$ ). The results can be viewed in Figure 7. This difference was significant ( $t(38) = 29.07$ ,  $p < .001$ ). Thus, proximal items were correctly manipulated to be perceived as proximal in psychological distance, whereas distal items were correctly manipulated to be perceived as distal in psychological distance.

**Figure 7:** A bar chart with psychological distance scores for the proximal and distal condition

in the spatial dimension.



### *Temporal dimension*

#### Linguistic concreteness and psychological distance

To analyse whether concreteness differed between the proximal and distal items, a one-way repeated measures ANOVA was performed with six conditions (see Figure 8 for the results). The groups of proximal, distal, and non-proximal items were split in half based on their concreteness scores<sup>11</sup>, creating the following six groups:

1. Proximal-concrete (6 items)
2. Proximal-abstract (7 items)
3. Non-proximal-concrete (5 items)
4. Non-proximal-abstract (5 items)
5. Distal-concrete (5 items)
6. Distal-abstract (5 items)

Mauchly's test indicated that the assumption of sphericity had not been violated ( $\chi^2(14) = 14.88$ ,  $p = .39$ ). The results showed that concreteness differed across conditions ( $F(5, 135)$

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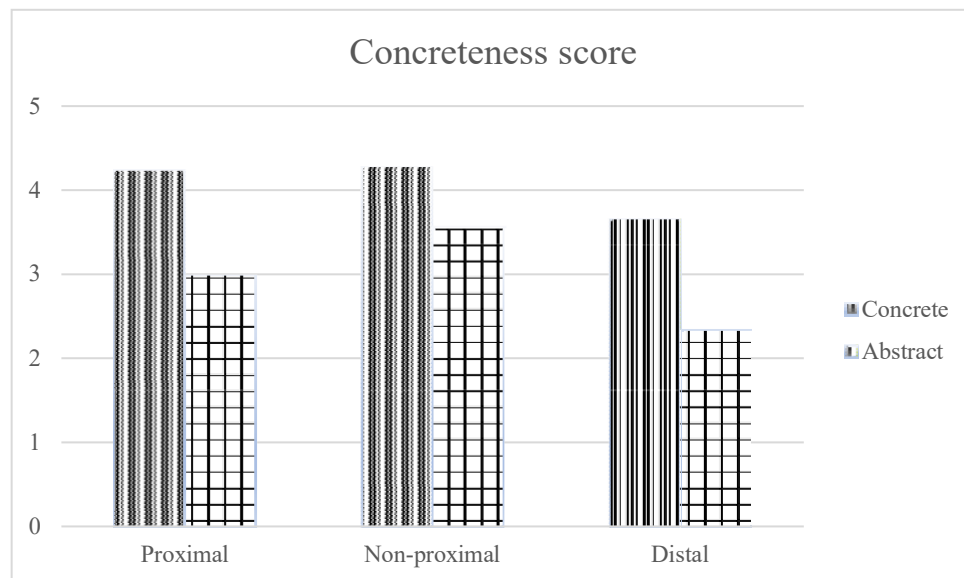
<sup>11</sup> A score above 4.00 meant an item was considered concrete; a score below 3.00 meant an item was considered abstract. However, the lowest scoring non-proximal item had a score of 3.33. Therefore, the division was adjusted for that group with the cut-point being 3.95. Above that score, items were concrete, below that score items were categorized as abstract. For proximal and distal items, items with a score between 3.00 and 3.99 were divided among concrete and abstract groups to make them equal in number of items.

= 38.42,  $p < .001$ ). Post-hoc analyses were used to make pairwise comparisons between six conditions. For concrete items, proximal-concrete ( $M = 4.23$ ,  $SD = .72$ ) and non-proximal-concrete items ( $M = 4.27$ ,  $SD = .84$ ) did not significantly differ from each other ( $p = 1$ ). Neither did non-proximal-concrete items differ significantly from distal-concrete items ( $M = 3.65$ ,  $SD = .78$ ;  $p = .08$ ).

For abstract items, proximal-abstract ( $M = 2.98$ ,  $SD = .76$ ), distal-abstract items ( $M = 2.33$ ,  $SD = .80$ ) and non-proximal-abstract ( $M = 3.54$ ,  $SD = .75$ ) differed significantly from each other ( $p$ 's  $< .04$ ).

Thus, concreteness was not the same across psychological distance. Both concrete items and abstract items did not have the same concreteness scores across conditions, except for proximal-concrete and non-proximal-concrete items.

**Figure 8:** A bar chart with concreteness scores for the proximal, non-proximal, and distal condition in the temporal dimension, divided into concrete and abstract items.



#### Validity of concreteness and comparison with Brysbaert et al.'s (2014) scores

To check the validity of the concreteness scores, they were correlated with perceptibility and imageability scores. The subscale consisted of three questions and showed high reliability ( $\alpha = .82$ ). Furthermore, the concreteness scores for all 33 items were compared to their concreteness scores of Brysbaert et al. (2014) to check validity. The results showed that concreteness scores for 18 items did not differ significantly from the scores by Brysbaert et al. (2014) ( $p$ 's  $> .11$ ). Participants gave 13 items a higher average mean score, whereas 2 items scored lower on concreteness than Brysbaert's score ( $p$ 's  $< .05$ ). See Table 9 for an overview of

all items.

From these results, it can be concluded that concreteness was correctly manipulated, since concreteness correlated strongly with perceptibility and imageability. However, almost half the items significantly differed from the concreteness scores by Brysbaert et al. (2014), and nearly all of the items scored significantly higher than the concreteness score by Brysbaert et al. (2014).

**Table 9:** A list of target stimuli for the temporal dimension and their corresponding concreteness score, Brysbaert et al. (2014) score, and mean difference (in ms), divided into two columns (proximal and distal items).

Item	N	M	Brysbaert	$\Delta$	Item	N	M	Brysbaert	$\Delta$
<i>present</i>	18	2.89 (1.32)	1.73	1.16*	<i>prehistory</i>	18	2.33 (1.09)	1.47	.86*
<i>Thursday</i>	14	3.29 (1.27)	2.13	1.16*	<i>renaissance</i>	16	2.38 (.89)	1.47	.91*
<i>study</i>	18	2.83 (.86)	2.40	.43*	<i>primordial time</i>	18	2.11 (1.18)	1.93	.18
<i>summer</i>	17	3.06 (1.30)	2.53	.53	<i>big bang</i>	17	2.29 (1.16)	2.20	0.09
<i>June</i>	19	3.16 (1.07)	2.60	.56*	<i>middle ages</i>	15	2.67 (.90)	2.29	.38
<i>college</i>	17	3.53 (1.18)	3.07	.46	<i>ice age</i>	17	2.76 (1.09)	2.47	.29
<i>summer day</i>	18	2.83 (1.10)	3.20	-.37	<i>hieroglyph</i>	18	3.56 (1.20)	4.00	-.44
<i>student</i>	16	3.94 (1.06)	3.27	.67*	<i>amphitheatre</i>	19	4.05 (.78)	4.07	-.02
<i>groceries</i>	18	3.61 (.92)	3.87	-.26	<i>guillotine</i>	20	4.30 (.98)	4.29	.01
<i>lunch</i>	17	3.76 (.83)	4.00	-.24	<i>dinosaur</i>	19	4.00 (1.16)	4.67	-.67*
<i>raindrop</i>	20	4.60 (.60)	4.93	-.33*	<i>December</i>	21	3.33 (1.16)	1.87	1.46*
<i>sandwich</i>	19	4.68 (.67)	4.93	-.25	<i>new year eve</i>	19	3.95 (1.22)	2.47	1.48*
<i>book</i>	16	4.69 (.70)	4.93	-.24	<i>autumn</i>	19	3.42 (.96)	2.73	.69*
* $p < .05$					<i>winter</i>	16	3.56 (1.03)	2.87	.69*
					<i>Christmas</i>	16	3.94 (.77)	3.07	.87*
					<i>evening of packages</i> <sup>12</sup>	15	4.07 (.80)	3.31	.76*
					<i>Christmas dinner</i>	14	3.93 (.83)	4.07	-.14
					<i>winter coat</i>	20	4.60 (.75)	4.60	
					<i>deep-fried raisin bun</i> <sup>13</sup>	17	4.82 (.53)	4.80	.02
					<i>snow</i>	17	4.71 (.59)	4.80	-.09

### Psychological distance

Psychological distance was analysed by performing a one-way repeated measures ANOVA with three groups of proximal items, distal items, and non-proximal items. Figure 10 summarizes the results. Mauchly's test indicated that the assumption of sphericity had not been violated ( $\chi^2(2) =$

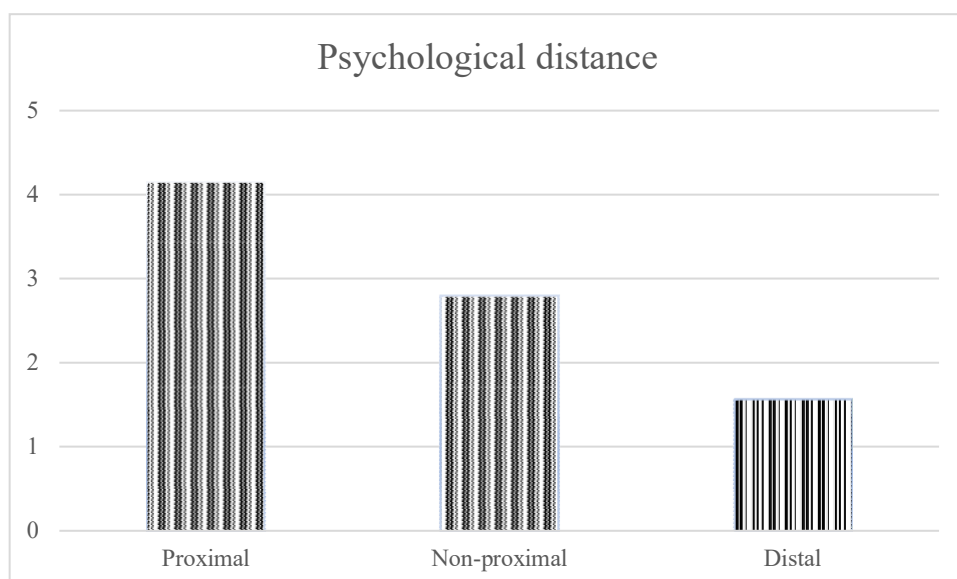
<sup>12</sup> The word *pakjesavond* literally translates to 'evening of packages' and can be compared to the English Christmas Eve. It is a public holiday early December during which children receive presents from Saint Nicolas.

<sup>13</sup> The word *oliebol* translates to 'oil ball'. It is a deep-fried bun of dough which is commonly eaten in the Netherlands around New Years Eve.

1.19,  $p = .55$ ). The results showed that psychological distance differed across conditions ( $F(2, 76) = 265.53, p < .001$ ).

Post-hoc analyses were used to make pairwise comparisons between three conditions (proximal, distal, non-proximal). Results showed that all three conditions significantly differed from each other ( $p$ 's  $< .001$ ). Proximal items had the highest mean score ( $M = 4.32, SD = .48$ ), followed by non-proximal items ( $M = 2.79, SD = .74$ ). Distal items ( $M = 1.42, SD = .53$ ) scored the lowest on psychological distance. This means that non-proximal and distal items were not perceived as equally distant, because non-proximal items had a higher mean score on psychological distance.

**Figure 10:** A bar chart with psychological distance scores for the proximal, non-proximal, and distal condition in the temporal dimension.



### *Hypothetical dimension*

#### Linguistic concreteness

To analyse whether concreteness differed between the proximal and distal items, a one-way repeated measures ANOVA was performed with four conditions. See Figure 11 for a summary of the results. The groups of proximal and distal items were split in half based on their concreteness scores<sup>14</sup> creating the following groups:

<sup>14</sup> A score above 4.00 meant an item was considered concrete; a score below 3.00 meant an item was considered abstract. Items with a score between 3.00 and 3.99 were divided among concrete and abstract groups to make them equal in number of items.

1. Proximal-concrete (6 items)
2. Proximal-abstract (7 items)
3. Distal-concrete (7 items)
4. Distal-abstract (6 items)

Mauchly's test indicated that the assumption of sphericity had not been violated ( $\chi^2(5) = 6.64, p = .25$ ). The results showed that concreteness differed across conditions ( $F(3,111) = 33.16, p < .001$ ).

Post-hoc analyses were used to make pairwise comparisons between four conditions (proximal-concrete; proximal-abstract; distal-concrete; distal-abstract). Proximal-concrete items ( $M = 4.49, SD = .42$ ) had the highest concreteness score and differed significantly from distal-concrete items ( $M = 3.91, SD = .62$ ) and other conditions ( $p$ 's  $< .001$ ). Proximal-abstract items ( $M = 3.28, SD = .77$ ) and distal-abstract items ( $M = 3.24, SD = .84$ ) did not significantly differ from each other ( $p = 1$ ).

Therefore, it can be concluded that abstract items did not differ between proximal and distal conditions, but that concrete items did differ between proximal and distal conditions.

**Figure 11:** A bar chart with concreteness scores for the proximal and distal condition in the hypothetical dimension, divided into concrete and abstract items.



#### Validity of concreteness and comparison with Brysbaert et al.'s (2014) scores

To check the validity of the concreteness scores, they were correlated with perceptibility and imageability scores. The subscale consisted of three questions and showed high reliability ( $\alpha$

= .85). Furthermore, the concreteness scores for all 26 items were compared to their concreteness scores of Brysbaert et al. (2014). The results showed that concreteness scores for 15 items did not differ significantly from the scores by Brysbaert et al. (2014) ( $p$ 's > .07). Participants gave 9 items a higher average mean score, whereas 2 items scored lower on concreteness than Brysbaert's score ( $p$ 's < .35). See Table 12 for an overview of all items.

From these results, it can be concluded that concreteness was correctly manipulated, since concreteness correlated strongly with perceptibility and imageability. However, almost half the items significantly differed from the concreteness scores by Brysbaert et al. (2014), and nearly all of the items scored significantly higher than the concreteness score by Brysbaert et al. (2014).

**Table 12:** A list of target stimuli for the hypothetical dimension and their corresponding concreteness score, Brysbaert et al. (2014) score, and mean difference (in ms), divided into two columns (proximal and distal items).

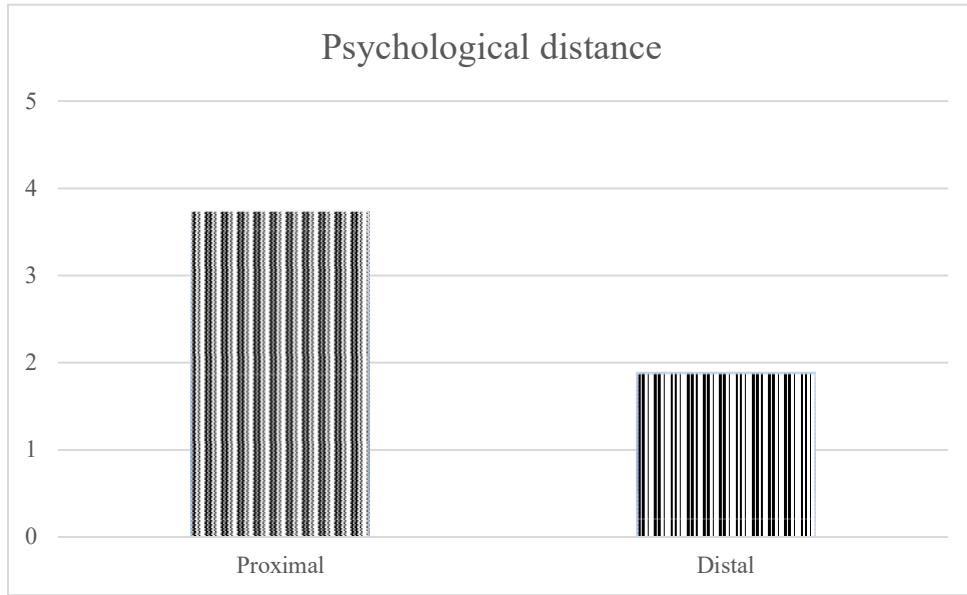
Item	N	M	Brysbaert	$\Delta$	Item	N	M	Brysbaert	$\Delta$
<i>centaur</i>	24	3.46 (1.35)	2.00	1.46*	<i>crossing guard</i>	23	3.65 (1.37)	1.90	1.75*
<i>goddess</i>	22	3.09 (1.07)	2.33	.76*	<i>genius</i>	20	3.00 (1.12)	1.93	1.07*
<i>goblin</i>	20	2.05 (.69)	2.43	-.38*	<i>messenger</i>	23	2.74 (1.25)	2.43	.31
<i>wizard</i>	22	3.45 (1.01)	2.80	.65*	<i>detective</i>	22	2.68 (1.25)	2.80	-.12
<i>griffin</i>	21	3.24 (1.38)	3.14	.10	<i>deputy headmaster</i>	25	3.84 (.90)	2.83	1.01*
<i>fairy</i>	22	3.55 (.96)	3.27	.28	<i>social worker</i>	23	3.74 (.69)	3.33	.41*
<i>centaur*</i>	19	3.26 (1.59)	3.50	-.24	<i>doctor</i>	21	4.48 (.60)	3.60	.88*
<i>ghost</i>	24	3.38 (1.10)	3.80	.08	<i>writer</i>	22	4.00 (.82)	3.73	.27
<i>witch</i>	21	3.90 (.83)	3.87	.03	<i>teacher</i>	22	4.00 (.93)	3.93	.07
<i>werewolf</i>	20	4.05 (.76)	4.87	-.82	<i>baker</i>	23	4.61 (.66)	4.60	.01
<i>dragon</i>	21	4.10 (.94)	4.07	.03	<i>monkey</i>	21	4.62 (.74)	4.73	-.11
<i>unicorn</i>	20	4.35 (.88)	4.20	.15	<i>elephant</i>	22	4.86 (.35)	4.93	-.07
<i>giant</i>	23	3.78 (1.04)	4.27	-.49*	<i>cow</i>	24	4.63 (.77)	5.00	-.37*

### Psychological distance

A comparison of means showed that on average, the 13 proximal items were perceived as more proximal ( $M = 3.73$ ,  $SD = .53$ ) than the 13 distal items ( $M = 1.88$ ,  $SD = .74$ ). The results are shown in a bar chart (Figure 13). This difference was significant ( $t(37) = 13.66$ ,  $p < .001$ ).

Thus, proximal items were correctly manipulated to be perceived as proximal in psychological distance, whereas distal items were correctly manipulated to be perceived as distal in psychological distance.

**Figure 13:** A bar chart with psychological distance scores for the proximal and distal condition in the hypothetical dimension.



#### *Between-dimensions analysis*

##### Linguistic concreteness

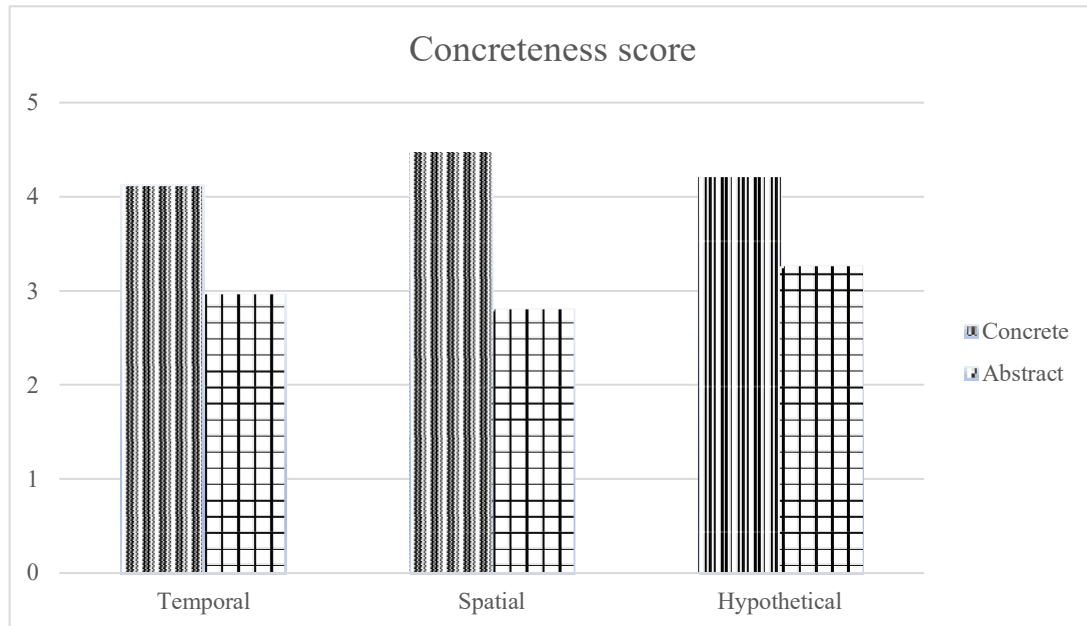
To analyse whether concreteness differed across dimensions, a one-way repeated measures ANOVA was performed with six conditions: spatial-concrete, spatial-abstract, temporal-concrete, temporal-abstract, hypothetical-concrete, and hypothetical-abstract. See Figure 14 for a summary of the results.

Mauchly's test indicated that the assumption of sphericity had been violated ( $\chi^2(14) = 51.90, p < .001$ ), and degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ( $\epsilon = .62$ ). The results showed that concreteness differed across conditions ( $F(3,115) = 57.66, p < .001$ ).

Post-hoc analyses were used to make pairwise comparisons between six conditions. Results showed that abstract items across all three dimensions were equally abstract. Spatial-abstract ( $M = 2.80, SD = .79$ ), temporal-abstract ( $M = 2.96, SD = .71$ ) and hypothetical-abstract ( $M = 3.25, SD = .61$ ) did not significantly differ from each other ( $p$ 's  $> .06$ ). For concrete items, hypothetical-concrete ( $M = 4.20, SD = .39$ ) did not significantly differ from temporal-concrete ( $M = 4.11, SD = .54; p = 1$ ) and spatial-concrete ( $M = 4.47, SD = .43; p = .08$ ). Spatial-concrete was, however, significantly more concrete than temporal-concrete ( $p = .03$ ).

Thus, abstract items were the same across three conditions, whereas concrete items were more concrete in the spatial dimension than in the temporal dimension.

**Figure 14:** A bar chart with concreteness scores for concrete and abstract items, divided by dimension.



### Psychological distance

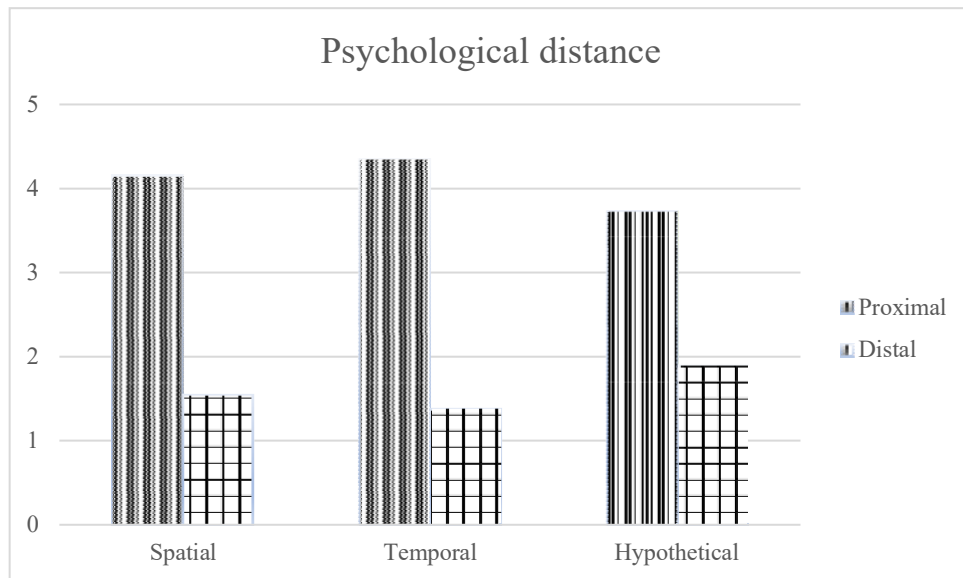
To analyse whether psychological distance differed across dimensions, a one-way repeated measures ANOVA was performed with six conditions: spatial-proximal, spatial-distal, temporal-proximal, temporal-distal, hypothetical-proximal, and hypothetical-distal. A bar chart summarizes the results (Figure 15).

Mauchly's test indicated that the assumption of sphericity had been violated ( $\chi^2(14) = 31.85, p = .004$ ), and degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ( $\epsilon = .98$ ). The results showed that concreteness differed across conditions ( $F(4, 133) = 255.04, p < .001$ ).

Post-hoc analyses were used to make pairwise comparisons between six conditions. A main effect of psychological distance was found as proximal items were significantly more proximal than distal items across all three dimensions ( $p$ 's  $< .001$ ). Within the proximal items, no differences were found between spatial ( $M = 4.14, SD = .48$ ) and temporal dimensions ( $M = 4.34, SD = .47; p = 1$ ). Both dimensions were more proximal than proximal items in the hypothetical dimension ( $M = 3.73, SD = .53$ ). This was significant ( $p$ 's  $< .03$ ). Distal items did not significantly differ between the spatial ( $M = 1.54, SD = .35$ ) and temporal dimension ( $M = 1.37, SD = .46; p = .9$ ), neither between the spatial and hypothetical dimension ( $M = 1.88, SD = .74; p = .3$ ).

Psychological distance did not have comparable scores across all three dimensions of psychological distance.

**Figure 15:** A bar chart with psychological distance scores for the proximal and distal condition, divided by dimension.



## Conclusion and discussion

Study 1 aimed to demonstrate that linguistic concreteness acts as an independent factor, apart from psychological distance (H1). It was analysed whether concreteness differed between conditions. An analysis of spatial items confirmed hypothesis 1. Concrete items were not rated more distal or more proximal than abstract items. Results from the temporal dimension and the hypothetical dimension reject the hypothesis. In the hypothetical dimension, proximal items were more concrete than distal items. In the temporal dimension, proximal items were more concrete than distal items, and distal items were more abstract than proximal items.

Thus, the independence of linguistic concreteness differed per dimension.

Second, it was predicted that the dimensions of psychological distance would differ from each other (H2). Comparisons of psychological distance ratings and concreteness ratings across dimension confirmed this hypothesis. Psychological distance was rated the same in the spatial and the temporal dimension. These results differed from the ratings in the hypothetical dimension. For concreteness ratings, it was demonstrated that abstract items had similar ratings across dimensions, but that concrete items did not. Thus, the dimensions cannot be compared to each other.

### *Linguistic concreteness*

The results from the three dimensions do not consistently support the hypothesis that linguistic concreteness and psychological distance are independent. Therefore, it might be interesting to consider explanations of the results. The fact that the items from the spatial dimension are most suitable to support the claim that there is no relationship between psychological distance and linguistic concreteness can be explained by the suggestion from Trope and Liberman (2010) that the spatial dimension is actually the easiest dimension in that it is best controllable, best perceivable and the most universal in comparison to other dimensions. It is very simple to see whether an object is near or far away. The distance to an object can simply be manipulated by moving yourself to or from the object. And it is relatively simple to agree on the distance from an object by putting the distance into (kilo)meters or miles. Furthermore, since the spatial dimension deals with distance in the physical world, it often refers to tangible objects. Placing a chair in the distance will not make the chair a more abstract object, it will simply increase the distance between the perceiver and the chair. In other words, it is plausible that the spatial dimension is the best dimension to manipulate in linguistic concreteness and psychological independent of each other.

In the other dimensions, psychological distance is not as tangible, and it might therefore be that the psychological distance and linguistic concreteness cannot be separated from each other as well. In the case of the hypothetical dimension, it could be suggested that imaginary objects are not as observable as real objects. Therefore, they are automatically less concrete. Furthermore, this difference only occurs for concrete objects, because abstract items are already less observable. This goes for real as well as imaginary abstract concepts.

When considering the results from the temporal dimension, the same argument can be used. Comparing the proximal items to the distal items, it is plausible that distance in time automatically resulted in a selection of more abstract concept. As mentioned, all distal items were items referring to past ages, whereas all proximal items referred to one's present life. It makes sense that people perceive a book as more concrete than a guillotine. Presumably, most people have never seen a real guillotine, whereas a book is something they encounter on a daily basis. It also explains why participants were able to recognize the non-proximal items as more far away than the proximal items yet perceived them as equally or more concrete. The items from the non-proximal condition still referred to events and objects that can easily be perceived such as a winter coat. Furthermore, the abstract items from the non-proximal condition referred to festivities that evoke rich imagery (e.g., the item *new year eve* is associated with fireworks, champagne, and parties), which explains why these items were more concrete than the duller proximal abstract items (e.g., the item *present*).

Thus, it can be concluded that the relationship between linguistic concreteness and psychological distance is not the same across dimensions. Whereas it is relatively easily to manipulate both concepts independent of each other in the spatial dimension, this has proven itself more difficult in the temporal and the hypothetical dimension.

#### *Dimensions of psychological distance*

The difference between psychological distance ratings in the spatial and temporal dimension on one side and the hypothetical dimension on the other side could be explained by the claim of Trope and Liberman (2010) that the dimensions are not the same. More specifically, the hypothetical dimension is the most difficult dimension in that the distinction between hypothetical proximity and distance is acquired at a later age compared to the other dimensions. The distinction between *here* and *there* as opposed in the spatial dimension, or *now* and *then* in the temporal dimension, is quite clear, whereas the boundary between what is real and what is imaginary is vaguer. What is real or imaginary cannot be measured in space or time. It is a matter of personal belief and perception.

## **Chapter III: Study 2**

## Methodology

In the present study, the following hypotheses were tested:

H3. Participants respond faster in the CLT congruent condition than in the CLT incongruent condition.

H4a. In the CLT congruent condition, participants respond faster in the concreteness congruent condition than in the concreteness incongruent condition.

H4b. In the CLT congruent condition, participants respond faster in the abstractness congruent condition than in the abstractness incongruent condition.

To test this, the Implicit Association Test (IAT; Greenwald et al., 1998) was used. The idea behind the IAT is that the strength of an association between concepts can be measured in response times. Pairings of two concepts were used that are either congruent or incongruent. The concepts were (1) construal level and (2) psychological distance, which were combined to be congruent with CLT or incongruent with CLT as follows:

1. CLT's congruent pairing: low construal level with psychological proximity and high construal level with psychological distance.
2. CLT's incongruent pairing: low construal level with psychological distance and high construal level with psychological proximity.

It was assumed that participants would have a faster response time with CLT congruent pairings than with incongruent pairings (H3), following the studies by Bar-Anan et al. (2006) that demonstrated that this is actually the case.

To test hypotheses H4a and H4b, a third concept was added to the IAT. This concept was (3) linguistic concreteness, which was manipulated within (2) psychological distance. Psychologically proximal and distal items were manipulated to be either concrete or abstract. This created four groups of items<sup>15</sup> that were either congruent with concreteness and abstractness, or incongruent with concreteness and abstractness as follows:

- A. Concreteness congruent items: psychological proximity with concrete items (PC)

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<sup>15</sup> There are four groups instead of eight, because they were only distinguished within CLT congruent pairing.

- B. Abstractness congruent items: psychological distance with abstract items (DA)
- C. Concreteness incongruent items: psychological distance with concrete items (DC)
- D. Abstractness incongruent items: psychological proximity with abstract items (PA).

It was predicted that (3) linguistic concreteness would have a complementary effect on CLT. More specifically, participants would respond faster with concreteness congruent items than with concreteness incongruent items. This effect, however, would only occur in CLT congruent pairings. This is caused by the fact that linguistic concreteness would always be dissimilar with either (1) construal level or (2) psychological distance in the incongruent condition in any pairing, causing possible effects of linguistic concreteness to wear off.

### *Material*

For the present study, a total of 24 items were selected, belonging to the three concepts of (1) construal level, (2) psychological distance, and (3) linguistic concreteness. This resulted in 6 different categories of items as follows:

- (1) Construal level: 4 items denoting concreteness and 4 items denoting abstractness.
- (2) Psychological distance and (3) linguistic concreteness: 4 ‘proximal-concrete’ (PC) items, 4 ‘proximal-abstract’ (PA) items, 4 ‘distal-concrete’ items (DC) and 4 ‘distal-abstract’ (DA) items.

For material selection, results from Study 1 were used. Analyses in Study 1 showed that results from the spatial dimension aligned best with hypotheses from Study 1. From that, it could be concluded that spatial items were most useful for a second study (see the Discussion of Study 1), Psychological distance items were selected from the pool of 26 spatial items used in Study 1 (see Study 1, Table 2 for an overview of items). The selected items had to match the following criteria:

- Concrete items had a score above 4.00
- Abstract items had a score below 3.00
- Items were excluded if the concreteness score significantly statistically differed from Brysbaert’s concreteness score.

For construal level, 8 items were selected from the wordlist of Brysbaert et al. (2014). All items needed to have a concreteness score below 2.00. Half the items denoted concreteness and half

the items denoted abstractness. All items were adjectives. See Table 16 for a full overview of all 24 items and their corresponding concreteness scores from either Study 1 or Brysbaert's wordlist.

**Table 16:** A list of target stimuli for the IAT and their corresponding concreteness scores, divided into two columns (concrete/low construal and abstract/high construal).

PA items	Concreteness	DA items	Concreteness
<i>peace</i>	1.95	<i>war</i>	2.85
<i>chilly country</i>	2.20	<i>universe</i>	2.84
<i>neighbourhood</i>	2.70	<i>distance</i>	2.04
<i>royal house</i>	3.35	<i>cosmos</i>	1.95
<b>Total</b>	2.66	<b>Total</b>	2.55

PC items		DC items	
<i>river</i>	4.50	<i>ocean-floor</i>	4.57
<i>bike path</i>	4.88	<i>pyramid</i>	4.60
<i>bridge</i>	4.83	<i>rain forest</i>	4.67
<i>pasture</i>	4.75	<i>volcano</i>	4.82
<b>Total</b>	4.76	<b>Total</b>	4.58

Low construal	Concreteness*	High construal	Concreteness*
<i>general</i>	1.07	<i>specific</i>	1.60
<i>universal</i>	1.40	<i>detailed</i>	1.87
<i>global</i>	1.67	<i>defined</i>	1.60
<i>complete</i>	1.47	<i>exact</i>	1.33
<b>Total</b>	1.40	<b>Total</b>	1.60

\*Scores from Brysbaert

Using the concreteness scores from Study 1, it was made sure that the 16 psychological distance items used in the present study either overlapped or differed in scoring. To test this, two one-way repeated measures ANOVAs were performed (see appendix C for the results). The results show that the 16 items differ across conditions in both psychological distance and concreteness. The proximal items were significantly more proximal than the distal items, whereas the concrete items were significantly more concrete than the abstract items

### *Participants*

36 college or university students participated in this study, of whom 25 were female and 11 were male. On average, they were 21.75 ( $SD = 2.84$ ) years old. All participants were students enrolled at the Radboud University Nijmegen and were native Dutch speakers.

### *Design and instrument*

This study had a 2 x 2 (linguistic concreteness x psychological distance) within subject design within the CLT congruent pairing condition, and next to that one CLT incongruent pairing condition<sup>16</sup>. The IAT followed the standard blocks of categorization trials outlined by Greenwald et al. (1998). The IAT was made up out of 7 blocks. The first block consisted of 20 trials of psychological distance / linguistic concreteness items. Block 2 consisted of 20 trials of construal level items. In block 3, the items from block 1 and 2 were combined into a combined practice block of 20 items. Block 4 was identical to block 3, but consisted of 40 combined data collection trials. In block 5, the items from block 2 were practiced in reversed label position in 20 trials. Block 6 was another combined practice block of 20 trials with the new label positions from block 5. Block 7 was a combined data collection block with 40 trials, identical to block 6. A schematic overview of the IAT design has been included (Figure 17).

Order of pairings was counterbalanced, meaning participants either completed block 3 with concrete items and PC/PN items paired on the same side, or participants completed block 3 with concrete items and DC/DN items paired on the same side. Furthermore, label position was counterbalanced. Either, participants practiced block 2 with concrete items on the left side or with concrete items on the right side. Lastly, within blocks, trials were randomized.

**Figure 17:** Overview of the IAT design

<b>Block 1</b>	<b>Block 2</b>	<b>Block 3</b>	<b>Block 4</b>	<b>Block 5</b>	<b>Block 6</b>	<b>Block 7</b>
20 trials	20 trials	20 trials	40 trials	20 trials	20 trials	40 trials
practice trials	practice trials	practice trials	data collection trials	reversed practice trials	reversed practice trials	reversed data collection trials
PC/PN/DC/DN items	concrete/abstract items	combined	combined	concrete/abstract items	combined	combined

<sup>16</sup> The design could technically be put together as a (2 x 2) + 1 within subject design.

### *Procedure*

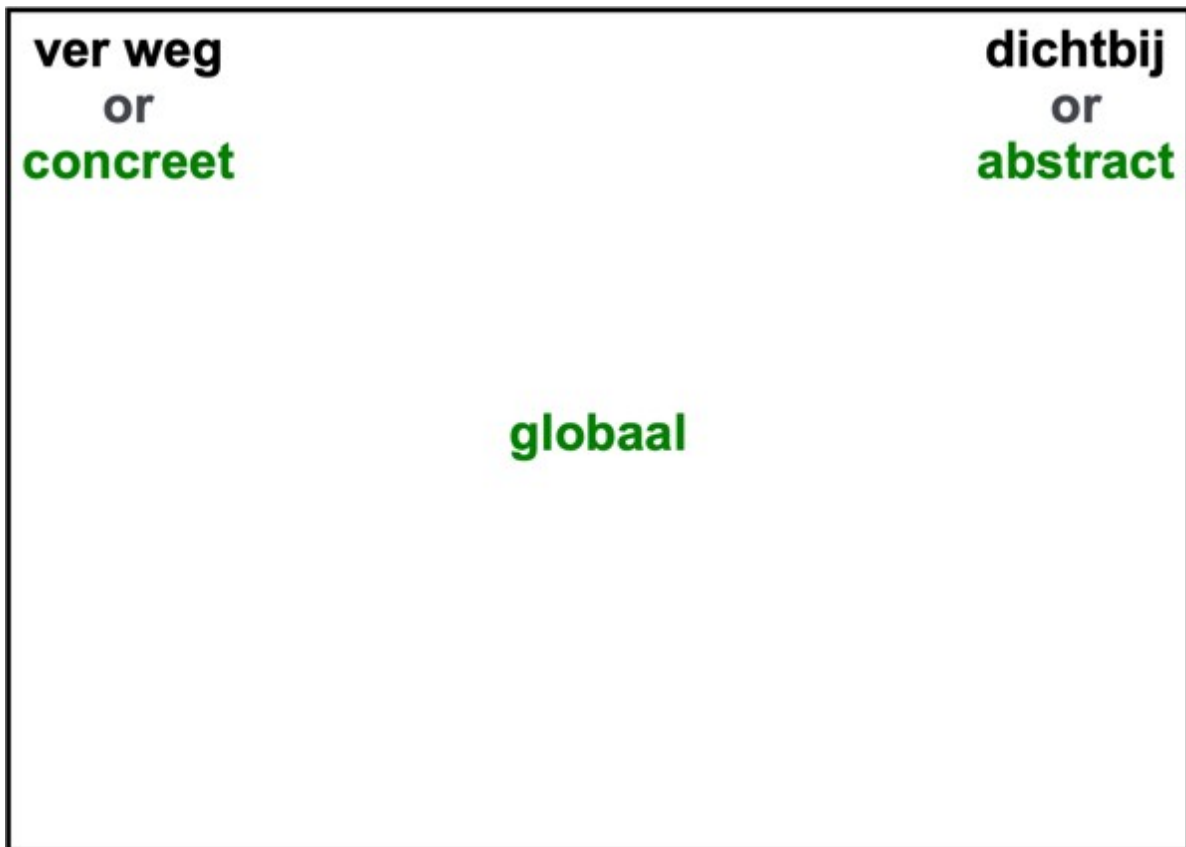
The IAT was generated using Qualtrics software, Version XM. Five participants pretested the IAT to check for possible errors. The IAT was completed on a computer. If participants opened the program on a mobile device, the instruction to use a laptop would appear and the program would be shut down.

Participants were recruited between June 21, 2019 and June 30, 2019 through personal contacts and recruited in public spaces at the Radboud University Nijmegen. IATs were completed either on a laptop carried by the researcher or on a desktop in a computer lab. The IAT could be accessed through an internet browser or a hyperlink. Starting the IAT would take participants directly to the first page of the survey, where a short text explained that participants would be playing a game by pressing a button as fast as possible. The text furthermore stated that instructions would be given at the beginning of each block. These instructions would be in English. If participants were not confident about their English proficiency, they could use the Dutch translations of the instructions, which were given out on paper. The instructions on the screen were in English, because the IAT was written using a standard IAT programming tool, which was English-oriented. The instructions could not be altered. Therefore, Dutch translations of the instructions were given out on paper cards, so participants could use them if needed. Furthermore, the text stated that participants gave permission to use their responses anonymously for academic purposes when they proceeded to the next page by clicking on the ‘Start’ button, and they could withdraw from the study at any moment.

Participants gave left responses with the left forefinger (pressing the E key) and right responses with the right forefinger (pressing the I key). Each block started with instructions in black letters, indicating the response keys and explaining the purpose of the so-called game. Participants had to press the space bar to start a trial.

Stimuli were presented in black or green letters against a white screen background and remained on the screen until the participant correctly responded. In case of an error trial, a red X would appear underneath the target word. Once corrected, the IAT would continue to the next trial. A black ‘+’ would appear on the screen during intertrial intervals of 250 ms. The categories were presented in the top left and right corner of the screen. For construal level, the categories were *concrete* and *abstract*. For PC/PN/DC/DN items, the categories were *proximal* and *distal*. During combined blocks, the categories from one concept would be written in green, together with target stimuli from that concept. The categories and target stimuli from the other concept would be written in black. This was done to facilitate the participants and indicate to which concept the appearing target stimulus belonged. An excerpt from the IAT is added in Figure 18.

**Figure 18:** Excerpt from the IAT.



After completing the IAT, participants were asked for demographic information. Then, they were fully debriefed and thanked.

Completing a survey would take 8 to 12 minutes. At the end of the survey, a paragraph thanked participants for their participation. Their data would be handled confidentially. An email address was provided to address any issues regarding the survey.

To motivate people into taking the survey, two gift cards of €10 were promised to be given out to two of the participants. In order to win a gift card, participants were asked to fill out their email address. The researcher would be in touch if the person had won one of the gift cards. Winners were randomly selected from all email addresses.

### *Analysis*

To analyse the difference in response times between the CLT congruent and CLT incongruent pairing, a D score was computed. This D score is a variant of Cohen's *d*, and is computed by calculating the mean response latencies for the combined data collection trials from block 4 and 7, divided by the associated pooled standard deviation. The D score could be interpreted in such a way that a negative score would show that the CLT incongruent condition had a faster response time than the CLT congruent condition. A positive score would mean that the CLT congruent condition had a faster response time than the CLT incongruent condition. The D score was computed using the computer programme IATgen (Carpenter et al., in press).

To analyse the response times between the four groups of concreteness congruent and incongruent items, a one-way repeated measured ANOVA was used. Response times were collected per participant per item. Fault responses and outliers were excluded from analysis. In case of significant results, Bonferroni post-hoc pairwise comparisons were used to identify the differences between condition.

## Results

In this chapter, the results from Study 2 will be presented. The presentation of the results has the following structure: first the results of CLT congruent versus CLT incongruent pairings are explored. Then, results between concreteness conditions will be assessed from the data collection trials.

### *D-score for CLT congruent versus CLT incongruent pairings*

To compare response times between the CLT congruent and CLT incongruent pairings, a D score was calculated. Results showed that performance was faster in the CLT-congruent condition than in the CLT-incongruent condition ( $D = 0.68$ ,  $SD = 0.39$ ;  $t(35) = 10.51$ ,  $p < .01$ ).

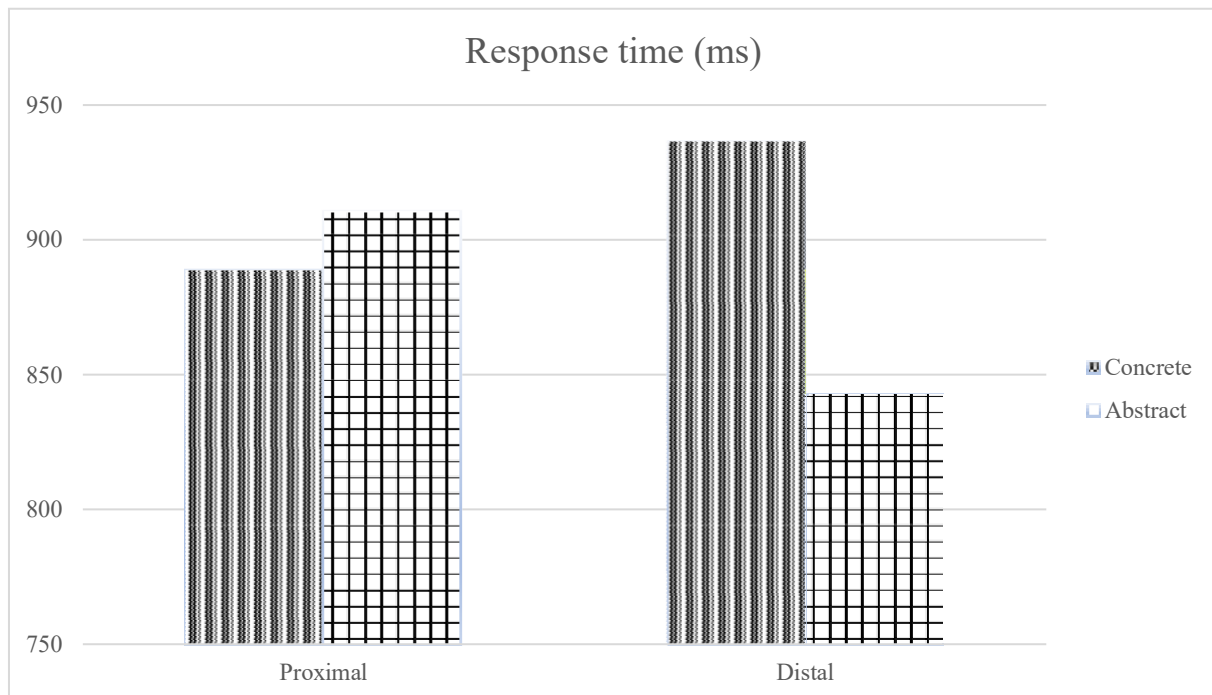
### *Response times*

To compare response times between the concreteness/abstractness congruent and concreteness/abstractness incongruent conditions, a one-way repeated measures ANOVA was performed with four conditions (concreteness congruent (PC); abstractness congruent (DA); concreteness incongruent (PA); and abstractness incongruent (DC). The results are summarized in Figure 19.

Mauchly's test indicated that the assumption of sphericity had been violated ( $\chi^2(5) = 42.82$ ,  $p < .001$ ) therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity ( $\epsilon = .91$ ). The results showed that concreteness differed across conditions ( $F(3, 622) = 7.17$ ,  $p < .001$ ).

Post-hoc analyses were used to make pairwise comparisons. The results showed that participants responded faster in the abstractness congruent condition than in the incongruent condition. Performance was faster in the distal-abstract condition ( $M = 842.64$ ,  $SD = 155.53$ ) than in the distal-concrete condition ( $M = 936.36$ ,  $SD = 250.49$ ;  $p = 1$ ). No differences were found between the concreteness congruent and incongruent conditions. Proximal-concrete items ( $M = 888.69$ ,  $SD = 204.69$ ) did not have a faster response time than proximal-abstract items ( $M = 909.90$ ,  $SD = 266.70$ ;  $p = .15$ ).

**Figure 19:** Differences in response times (ms) between proximal-concrete and proximal- abstract items, and distal-concrete and distal-abstract items.



## Conclusion and discussion

The aim of the present study was to identify how linguistic concreteness affects the overgeneralized association between psychological distance and construal. Specifically, it was hypothesized that, first of all, participants respond faster in the CLT congruent condition than in the CLT incongruent condition (H3). The results from Study 2 are in line with this hypothesis. Participants responded faster when they had to pair low construal level and proximal items on the same side, and high construal level and distal on the other side, than when construal level item positions were reversed. Thus, all four conditions within congruent pairings were processed faster than incongruent pairings.

Hypothesis 4a was that, in the CLT congruent condition, participants respond faster in the concreteness congruent condition than in the concreteness incongruent condition. The results do not support this hypothesis. Response times were not faster when proximal items were concrete than when they were abstract. Thus, concrete language does not affect the association between psychological distance and construal level.

Lastly, it was predicted that, in the CLT congruent condition, participants respond faster in the abstractness congruent condition than in the abstractness incongruent condition. The results support this hypothesis. For distal items, participants responded faster when the items were abstract than when they were concrete. Therefore, it can be concluded that abstract language affects the association between psychological distance and construal level.

### *Linguistic concreteness*

The results from study 2 do not consistently support the hypotheses that linguistic concreteness facilitates the association between psychological distance and construal level (H4a and H4b). Effects were found for abstractness, but not for concreteness. These results are not in line with concreteness theories (Schwanenflugel & Shoben, 1983; etc.<sup>17</sup>) that claim concreteness has an advantage over abstractness. If it were the case that there is facilitation of linguistic concreteness was caused by these concreteness advantages, it was expected that response times were consistently lower for concrete items than for abstract items. The results do not prove this.

Instead, abstract language facilitates the association. Apparently, in the case of high construal level there is something to gain, whereas for low construal level this is not the case. A possible explanation is that concrete language has no effect because people have a concrete

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<sup>17</sup> See Chapter I, Theoretical framework for a discussion.

mindset by default (Malkoc, Zauberman & Bettman, 2010). Therefore, it does not make a difference what type of language is used. People are used to having a concrete mindset. However, if you switch to an abstract mindset (high construal level), the combination of distal and abstract language has advantages over concrete language.

The results are in line with the expectation that CLT congruent pairings have a faster response time than CLT incongruent pairings (H3). This can be explained by the results from Bar-Anan et al. (2006) and Bar-Anan et al. (2007). They found evidence for the overgeneralized association between construal level and psychological distance. This association is so strong that the effects of linguistic concreteness cannot nullify them. It does not matter whether participants are exposed to concrete or abstract language, psychological distance is automatically activated. However, the present study has shown that linguistic concreteness needs to be taken into account when selected stimuli, because it can influence the results.

## **Chapter IV: General discussion**

## General discussion

The aim of this thesis was to gain a better understanding of the relation between psychological distance, construal level and linguistic concreteness. The results of Study 1 and Study 2 provide evidence for the idea that linguistic concreteness affects dimensions of psychological distance differently, depending on the dimension.

The degree to which linguistic concreteness is independent of psychological distance varies (H1). The results from Study 1 demonstrate that linguistic concreteness can be separated from psychological distance in the spatial dimension. The concreteness of target stimuli does not change with an increase in distance. However, in the hypothetical and temporal dimension, linguistic concreteness coincided with perceived distance. Yet, we cannot draw the conclusion that linguistic concreteness is thus dependent of psychological distance in some dimensions.

What can be taken away from the results of Study 1 is that the dimensions are not similar (H2). If the dimensions were all the same, the same manipulation of concreteness would have led to the same results. This is not the case. Study 1 confirms that the spatial dimension is an easily controllable dimension (Trope & Liberman, 2010). This can be explained by the fact that both the linguistic concreteness and psychological distance of spatial items are anchored in the physical world. The temporal dimension is on the other hand not as easily controllable. Whereas psychological distance can be perceived fairly easy (i.e., by placing events and objects on a timeline we seem to be able to discriminate between the distance from the present to the middle ages and to winter), concreteness is not as unambiguous for the temporal dimension.

That linguistic concreteness is not *dependent* of psychological distance can be concluded from the results of the temporal dimension in Study 1. If linguistic concreteness were dependent of psychological distance, an increase in psychological distance would result in an increase or decrease in concreteness. When the proximal and distal items are compared, this seems to be the case: the linguistic concreteness of both concrete and abstract items decreases when psychological distance increased. It is, however, interesting to note that the results from the non-proximal items provide evidence for the contrary. Items in the non-proximal condition were perceived as ‘in the middle’ between proximal and distal items.

However, the linguistic concreteness scores are not ‘in the middle’ as well. As a matter of fact, the abstract items from the non-proximal condition were more concrete than the

proximal items. This leads to the conclusion that temporal items are not necessarily more abstract when they are more distal. They can also be more concrete or the same.

A possible explanation for these findings is linked to memory. An event that people have not experienced lacks details and is therefore more abstract than an event that people have experienced (i.e., you know more about your birthday five years ago than about the Boston Tea Party, because you were actually present at your birthday and thus have a memory of that event). This can explain why the non-proximal items were as concrete as the proximal items, whereas the distal items were less concrete. When the results from the hypothetical dimension are included, there seems to be ground to support this idea. In the hypothetical dimension, the same problem can be witnessed as with temporal distance. The distinction between hypothetically proximal and distal items is the distinction between events and objects you can perceive (in the real world) and events and objects you can imagine (in the imaginary world). The only difference is that for temporal distance, it can be changed (i.e., we can choose items that refer to one's life or not to one's life), whereas for the hypothetical dimension the dichotomy between real and imaginary/imagined is fundamental to psychological distance.

This leads to the question what would happen in the social dimension. The dimension was excluded from Study 1, because it was impossible to find suitable target stimuli. The first question that arises is whether concrete social items exist. The situated simulation views of conceptual representation (Barsalou & Wiemer-Hastings, 2005) states that concrete language is based on perception and motor information, but concrete language focuses on social and affective information. It might be the case that the social dimension is in essence linked to abstract language. Secondly, it is interesting to contemplate what would happen in the social dimension, because Trope and Liberman (2010) claim that the social dimension forms the basis for psychological distance, because the self of the perceiver is the starting point. If the social dimension is fundamental, and intrinsically linked to abstract language, what does that mean for the relation between linguistic concreteness and CLT? These contemplations invite for future research.

Linguistic concreteness does affect the overgeneralized association between construal level and psychological distance, but the effects are limited. The results from Study 2 confirm that abstract language can facilitate the association between high construal level and distance (H4b). When target words are linguistically abstract, it is easier to link the two concepts than when target words are linguistically concrete. But Study 2 does not provide evidence for the idea that concrete language helps in a low construal level and proximity setting (H4a).

It can be stated that the results are not in line with concreteness research. If the advantages of concreteness were the cause of the effect, we would have expected the findings to look different, because all concrete items would have had an advantage over the abstract items. This is not the case. Therefore, the possibility can be ruled out that concrete language has an advantage over abstract language in this setting.

It is worth considering what might explain these results. The reasoning behind hypothesis 4a and 4b is that the type of linguistic concreteness triggers your mindset. It can be imagined as standing on a junction and deciding if you need to go left or right. The idea is that concrete language tries to pull you to one side, whereas abstract language tries to pull you to the other side. However, the fallacy is that people do not stand ‘in the middle’ of a mind-set. As Malkoc et al. (2010) stated, a concrete mind-set is the default. In principle, people construe representations at a low-level. Therefore, we can assume that people were in a concrete mind-set when they started the IAT. The linguistic concreteness of the stimuli did not affect this concrete mindset, because the association is strong enough to ‘ignore’ linguistic concreteness. Therefore, linguistic concreteness did not speed up or slow down the association between low-level construal and proximity. However, when people had to match high-level construal with distance, linguistic concreteness was able to give a push in the right direction. Because of the default mindset, abstract language helped process the high-level and distance association. If these suspicions are correct, it suggests that this effect can also be found in opposite direction. That is, if people are brought into an abstract mind-set, does concrete language facilitate the association between low-level construal and proximity? This would be interesting to examine in future research.

An alternative explanation is that the (lack of) effects was not caused by the effects of linguistic concreteness on CLT, but rather by the nature of the target stimuli. It is possible that the abstract distal items did not only refer to events and objects that are far away, but coincidentally refer to events and objects a person does not encounter as often as the other target stimuli. Therefore, it was easier to link the ‘difficult’ items to one category, whereas the other items required a bit more thought.

Furthermore, it should be noted that the nature of concreteness is still unknown territory. What exactly constitutes concreteness is not something a layman can explain very easily. A rating from 1 to 5 reflects an unexplainable definition many people have of the concept concreteness. Therefore, its relationship to CLT is also one of obscurity.

In conclusion, this research is unique in that it considered CLT and its relationship with linguistic concreteness. The findings contribute to the idea that linguistic concreteness is not as straightforward as one might suspect and that perhaps psychological distance is involved as well. Furthermore, the findings have implications for the Construal Level Theory, because they suggest that there are novel ways of operationalizing concreteness and psychological distance that need to be uncovered. The results show that CLT and linguistic concrete are linked in more intricate ways than related research on either one of the concepts has yet explained and invite for future research to explore.

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## Appendices

**Appendix A:** Tables with items (in Dutch) from Study 1.

Spatial		Hypothetical	
Proximal	Distal	Proximal	Distal
<i>vrede</i>	<i>kosmos</i>	<i>centaurus</i>	<i>klaarover</i>
<i>kikkerland</i>	<i>verte</i>	<i>godin</i>	<i>genie</i>
<i>buurt</i>	<i>vesting</i>	<i>kwelgeest</i>	<i>bode</i>
<i>democratie</i>	<i>heelal</i>	<i>tovenaar</i>	<i>speurneus</i>
<i>koningshuis</i>	<i>oorlog</i>	<i>griffioen</i>	<i>conrector</i>
<i>thuis</i>	<i>rimboe</i>	<i>fee</i>	<i>hulpverlener</i>
<i>universiteit</i>	<i>keizerrijk</i>	<i>centaur</i>	<i>dokter</i>
<i>stad</i>	<i>dictatuur</i>	<i>spook</i>	<i>schrijver</i>
<i>station</i>	<i>regenwoud</i>	<i>heks</i>	<i>docent</i>
<i>rivier</i>	<i>zeebodem</i>	<i>weerwolf</i>	<i>bakker</i>
<i>weiland</i>	<i>piramide</i>	<i>draak</i>	<i>aap</i>
<i>brug</i>	<i>onderzeer</i>	<i>eenhoorn</i>	<i>olifant</i>
<i>fietspad</i>	<i>vulkaan</i>	<i>reus</i>	<i>koe</i>
Hypothetical		Temporal	
Proximal	Distal	Proximal	Distal
<i>medestander</i>	<i>onbekende</i>	<i>heden</i>	<i>prehistorie</i>
<i>vriend</i>	<i>pestkop</i>	<i>donderdag</i>	<i>renaissance</i>
<i>bekende</i>	<i>aartsvijand</i>	<i>studie</i>	<i>oertijd</i>
<i>bezoemvriend</i>	<i>vreemdeling</i>	<i>zomer</i>	<i>oerknal</i>
<i>bondgenoot</i>	<i>vijand</i>	<i>juni</i>	<i>middeleeuwen</i>
<i>medestudent</i>	<i>opponent</i>	<i>college</i>	<i>ijstijd</i>
<i>ouders</i>	<i>tegenstander</i>	<i>zomerdag</i>	<i>hierogrief</i>
		<i>student</i>	<i>amfitheater</i>
		<i>boodschappen</i>	<i>guillotine</i>
		<i>lunch</i>	<i>dinosaurius</i>
		<i>regendruppel</i>	<i>december</i>
		<i>boterham</i>	<i>oudejaarsavond</i>
		<i>boek</i>	<i>herfst</i>
			<i>winter</i>
			<i>kerst</i>
			<i>pakjesavond</i>
			<i>kerstdiner</i>
			<i>winterjas</i>
			<i>oliebol</i>
			<i>sneeuw</i>

## Appendix B: Excerpts from the survey from Study 1.



Q1.1.

Welkom!

Tijdens dit experiment wil ik je vragen enkele woorden te scoren. Het woord staat telkens bovenaan de pagina met daaronder de gerelateerde vragen. Zorg dat je gefocust kunt werken zonder afgeleid te worden. Denk niet te lang na over je antwoorden, maar ga met je gevoel mee. In totaal zijn er 15 woorden. Het experiment duurt ongeveer 6 minuten.

Met je deelname geef je de onderzoeker toestemming om je gegevens geanonimiseerd te gebruiken voor academische doeleinden. Je kunt je op elk gewenst moment terugtrekken.

Start experiment



Q2.1.

*Lees deze uitleg rustig door. Er zullen dadelijk vragen over deze onderwerpen worden gesteld.*

### Concreetheid

Woorden verschillen in concreetheid. Hoe concreet een woord is, heeft te maken met de duidelijkheid of voorstelbaarheid van het ding waarnaar verwezen wordt. 'Auto' is bijvoorbeeld een zeer concreet woord, terwijl 'liefde' minder concreet is.

### Afstand

Dingen kunnen dichtbij zijn of ver weg. De computer of het mobiele apparaat waar je nu aan werkt, is bijvoorbeeld enkele centimeters van jou verwijderd, terwijl de sterrenhemel duizenden kilometers ver weg is.

Naar de vragen

Q15.1. **KEIZERRIJK**

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Q15.2. Hoe concreet vind je dit woord op een schaal van 1 tot 5?

helemaal niet concreet	2	3	4	zeer concreet
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Q15.3.

Hoe goed kun je je dit woord voorstellen op een schaal van 1 tot 5?

helemaal niet goed	2	3	4	zeer goed
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Q15.4. Hoe goed kun je dit woord zien (met je ogen) op een schaal van 1 tot 5?

helemaal niet goed	2	3	4	zeer goed
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Q15.5.

Als je denkt vanuit jouw eigen positie (in jouw woonplaats, in Nederland), hoe dichtbij vind je dit woord op een schaal van 1 tot 5?

zeer ver weg	2	3	4	zeer dichtbij
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## Appendix C: Statistical analysis for Study 2 item selection

Using the concreteness scores from Study 1, it was made sure that the 16 psychological distance / linguistic concreteness items used in the present study either overlapped or differed in scoring. First of all, all concrete items had to be significantly more concrete than the abstract items. Secondly, proximal items had to be significantly more proximal than distal items. To test this, two one-way repeated measures ANOVAs were performed. The results are reporting as follows:

### *Linguistic concreteness*

A one-way repeated measures ANOVA was conducted to compare the means of concreteness across conditions. Mauchly's test indicated that the assumption of sphericity had been violated ( $\chi^2(5) = 16.25, p = .006$ ), therefore degrees of freedom were corrected using Greenhouse-Geisser ( $\epsilon = .52$ ). The results (see Table 20) showed that concreteness differed across conditions ( $F(2, 84) = 90.59, p < .001$ ).

Post-hoc analyses were used to make pairwise comparisons between four conditions (proximal-concrete; proximal-abstract; distal-concrete; distal-abstract). There was a significant main effect of concreteness. Both concrete conditions (proximal-concrete:  $M = 4.75, SD = .40$ ; distal-concrete:  $M = 4.58, SD = .64$ ) were more concrete than the abstract conditions (proximal-abstract:  $M = 2.69, SD = .99$ ; distal-abstract:  $M = 2.55, SD = 1.12$ ), and this was statistically significant ( $p$ 's  $< .001$ ). However, proximal-concrete items did not significantly differ from distal-concrete items ( $p = .70$ ), and neither did proximal-abstract items significantly differ from distal-abstract items ( $p = 1$ ). Therefore, it can be concluded that the concrete items elicit a significantly higher concreteness score than abstract items, and that no difference can be found between proximal and distal items.

**Table 20:** Concreteness scores between conditions.

	Proximal	Distal
Concrete	4.75 (.40) <sup>a</sup>	4.58 (.64) <sup>a</sup>
Abstract	2.69 (.99) <sup>b</sup>	2.55 (1.12) <sup>b</sup>

In case of identical subscript:  $p > .05$

### *Psychological distance*

A one-way repeated measures ANOVA was conducted to compare the means of psychological distance across conditions. Mauchly's test indicated that the assumption of sphericity had not been violated ( $\chi^2(5) = 8.40, p = .14$ ). The results (see Table 21) show that concreteness differed across conditions ( $F(3, 105) = 193.67, p < .001$ ).

Post-hoc analyses were used to make pairwise comparisons between four conditions (proximal-concrete; proximal-abstract; distal-concrete; distal-abstract). The results show that the psychological distance score was highest in the proximal-concrete condition ( $M = 4.41, SD = .62$ ), and was different from all three other conditions (proximal-abstract:  $M = 3.56, SD = .81$ ; distal-concrete:  $M = 1.45, SD = .48$ ; distal-abstract:  $M = 1.58, SD = .63$ ). This effect was significant ( $p$ 's  $< .001$ ). Furthermore, the score was also significantly higher in proximal-abstract than in both distal conditions ( $p$ 's  $< .001$ ). Psychological distance did not significantly differ between the distal-concrete and distal-abstract conditions ( $p = 1$ ). In sum, this means that psychological distance was significantly higher in proximal items than in distal items, and furthermore that proximal-concrete items were perceived as more proximal than proximal-abstract items.

**Table 21:** Psychological distance between conditions.

	Proximal	Distal
Concrete	4.41(.62) <sup>a</sup>	1.45 (.48) <sup>c</sup>
Abstract	3.56 (.81) <sup>b</sup>	1.58 (.63) <sup>c</sup>

In case of identical subscript:  $p > .05$

The results show that the 16 items differ across conditions in both psychological distance and concreteness. The proximal items are significantly more proximal than the distal items, whereas the concrete items are significantly more concrete than abstract items.