THE INFLUENCE OF LANGUAGE ON RECOGNITION MEMORY FOR MOTION EVENTS

by

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ABSTRACT

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Satellite-framed languages and verb-framed languages differ in how they encode motion events. English encodes or lexicalizes *Path* in verb particles, prepositional phrases, or *satellites* associated with the main verb. In contrast, Turkish tends to encode *Path* in the *main verb* of a clause. When describing motion events, English speakers typically use verbs that convey information about manner rather than path, whereas Turkish speakers do the opposite. In this study, we investigated whether this cross-linguistic difference between English and Turkish influences how the speakers of these languages perform in a non-linguistic recognition memory task. In a video description task, English speakers used more manner verbs in the main verb of sentences than Turkish speakers did. In the recognition memory task, English speakers attended more strongly than Turkish speakers did to path of motion. English and Turkish speakers attended equally to manner of motion, however, providing no support for the linguistic relativity hypothesis.
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CHAPTER I
INTRODUCTION

Focus of the Study

In this study, we investigated whether cross-linguistic typological differences in the expression of motion events between English and Turkish influence how speakers of these languages perform in a non-linguistic task.

Languages vary strikingly in how they encode motion events. Talmy (2000) suggests that languages such as English and Turkish differ in the key aspect of how they encode motion events. English “habitually” encodes or lexicalizes Path in particles, prepositional phrases, or satellites associated with the main verb and is called a satellite-framed language. In contrast, Turkish tends to encode Path in the main verb of a clause and is called a verb-framed language.

Do language specific patterns of motion event encoding along the lines of Talmy’s typology of verb-framed vs. satellite-framed languages influence non-linguistic cognition? Numerous studies have tested whether this difference has consequences for speakers’ non-linguistic mental representations of motion events. Some studies offer no support for the proposal that syntax influences “thinking for speaking” about motion events (Papafragou, et al. 2002). However, Gennari et al. (2002) and Finkbeiner et al. (2002) have found language specific effects in a non-linguistic task only under prior
verbal encoding. These contradictory results may stem from methodological differences. The present study employed different stimuli and a different task from those used in these prior studies in order to investigate whether cross-linguistic differences between English and Turkish influence their speakers’ memory performance.

A number of comparative studies between English and Turkish have only focused on linguistic descriptions of motion events (Demirtaş, 2009; Özçalışkan, 2005; Özçalışkan & Slobin, 1999, 2000, 2003). This is the first study which is designed to test whether cross-linguistic differences in how motion events are encoded in Turkish and English predict how speakers of these languages perform in a recognition memory task. This was tested using a method most similar to that of Gennari et al. (2002) and Finkbeiner (2002).

*Language and Cognition*

Languages, while sharing many characteristics, differ in numerous ways and require different things of their speakers. For example, in the English sentence, “Felix Baumgartner jumped from space,” the past tense must be included in the main verb if the event occurred in the past. However, in Turkish, you need to include in the verb how you got this information. If you witnessed the event, you would say “atladı,” one verb form, but if you read or heard about it, you would say “atlamış,” another verb form (Boroditsky, 2009). On the other hand, in Mandarin Chinese, tense is not an obligatory component of a sentence. So, Chinese speakers can say “Felix Baumgartner jump from space,” even though the event happened in the past (Luk, 2006).

As an example from the domain of motion events, the English sentence “She runs
"out of the house" cannot be translated word for word into Turkish; instead, it must be expressed as “(O) koşarak evden çıkar” (She exits the house running) (Naigles & Terrazas, 1998).

V-languages tend to use path verbs with subordinate manner expressions and S-languages tend to use manner verbs with associated path forms. However, some verbs conflate manner and path. An example of such a verb in the frog story is Turkish tirmanmak ‘climb’. While the Turkish verb tirmanmak ‘climb’ is used only for upward motion (The same is true of equivalent ‘climb’ verbs in other V-languages (Slobin, 2004)), the English verb climb can be used in combination with other paths (“climb down from a tree” or “climb out on a branch”). Is it possible to say that these different requirements have an influence on the way we think? It is really difficult to give an exact answer to this question. Therefore, there is still a big debate among linguists, psycholinguists, and cognitive psychologists.

Linguistic Relativity vs. Universalism

There has been increasing interest in research on the relationship between language and thought. Does language change the way we view the world? Do we think differently than speakers of other languages just because we speak different languages? Linguists, philosophers, anthropologists, and psychologists have long been interested in these questions that have been a focal point of debates on language and cognition. For some linguists such as Whorf and Sapir, the answer to these questions has been an obvious yes. Neither Edward Sapir nor his follower Benjamin Lee Whorf actually proposed any single hypothesis explicitly about the influence of language on non-
linguistic cognition, but the idea has been ascribed to Whorf and Sapir (Filipovic, 2011). Two main proposals, linguistic determinism and linguistic relativity, emerged on the basis of their writings.

The most radical proposal, linguistic determinism, argues that language rigidly shapes or determines a speaker’s conceptualization of experience. Language directly influences non-linguistic cognition such that speakers of different languages conceptualize and experience the world differently. Simply put, linguistic determinism is an inability to think about things that can’t be expressed in one’s language. For example, Whorf suggested that Hopi speakers do not conceptualize time in a way similar to speakers of American English and other European languages. According to Whorf, Hopi is a “timeless” language and therefore speakers of that language cannot understand the distinction between the present and the past, because the Hopi language had no way of making distinction between the present and the past. Linguistic determinism has been rejected on both theoretical and empirical grounds because it is widely accepted that it is possible to express just about anything in any of the world’s languages.

However, a more moderate interpretation of the proposal is called linguistic relativity, stating that differences among languages cause differences in the thoughts of their speakers. Linguistic relativity means that people are more likely to think about or notice things that are prominently marked in their languages. Simply put, linguistic relativity suggests that habits of using language influence habits of thinking. Although there is little empirical support for the strongest interpretation of Whorf’s hypothesis, linguistic determinism, the less extreme interpretation of linguistic relativity continues to
generate influential research. It has motivated linguists and cognitive psychologists to take a closer look at the relation between language and thought, especially in the domains of color, time, space, and motion (Filipovic, 2011). In this study, the semantic domain is motion because typological differences between English and Turkish lead to differences in the lexicalization of motion events.

A strong linguistic relativity view suggests that language always influences thought, even when one is not expecting to talk about what one is thinking about. In other words, a person’s language influences the way that person thinks about objects and events even when that person is not actually using the language (Filipovic, 2011). A weak linguistic relativity view, however, claims that the languages that people speak can influence speakers’ cognitive processes while they are actively engaged in communication, spoken or written. Language may influence conceptualization of experience only when this experience is linguistically mediated (Gennari et al., 2002). Therefore, the main question of linguistic relativity is how much of our conceptual system is language driven or language biased (Filipovic, 2011).

Slobin (1996a; 1996b; 1997; 2000) suggested a new Whorfian linguistic relativity hypothesis called the “thinking-for-speaking” hypothesis. According to this framework, language effects are only observed during the language-using process when speakers must pay more attention to those aspects of events that their language obligatorily encodes than to those that are optional (Filipovic, 2011).

In addition to the strong and weak versions of the linguistic relativity hypothesis, Gennari et al. (2002) have brought up a new possibility, namely “language as a strategy.”
According to the language as a strategy view, language should influence speakers’ conceptual experience when language is used in certain tasks as a facilitation mechanism to mediate experience (Gennari et al., 2002).

However, the linguistic relativity hypothesis and its assertions have been criticized by a number of scholars. Universalist views have been associated with Chomsky, Pinker, and Jackendoff. For example, Jackendoff (1990, 1996) claims that the human conceptualization system is framed by universal characteristics. In particular, Jackendoff claims that language is a separate, independent module in the mind and there are some properties that all languages share. Early empirical tests of the linguistic relativity hypothesis found largely negative results, consistent with linguistic universals. For example, Berlin and Kay (1969) showed that speakers of different languages do not differ in the way they view colors, despite some color terms being present in some languages, and absent in others. Later studies have provided evidence consistent with the linguistic relativity hypothesis, however, coming from the conceptual domains of time, color, space, objects, and motion. In the sections that follow, an overview of studies that investigate the relation between language and thought from some of these different perspectives will be provided. The studies are categorized according to their domain of focus.

Space

Spatial cognition is central to human cognition and is a frequent test bed for the Sapir-Whorf hypothesis. Languages differ from one another in the use of spatial frames of reference used for describing spatial locations and their effects on spatial reasoning.
Levinson (1996) described three distinct frames of reference that are coordinate systems used to specify the locations of objects with respect to other objects. In the intrinsic frame of reference, the figure object is located with respect to intrinsic (inherent) features of the ground object (e.g., The eraser is at the tip of the pencil). The intrinsic frame of reference can also be used to describe motion (e.g., The car is moving backwards). In the relative frame of reference, the location of an object is expressed in relation to both the viewpoint of the perceiver and position of another object (e.g., The eraser is to the left of the pencil). The absolute frame of reference requires a mental compass (e.g., cardinal directions) because the location of an object is described independently of the position of its speakers or other objects (e.g. The eraser is to the north of the pencil) (Levinson, 1996). Some languages only use one of these, whereas others might use a combination of two, or all three. For example, English speakers use either a relative frame of reference or an intrinsic frame of reference to describe spatial relationships in space. They say either “The eraser is to the left of the pencil” (Relative) or “The eraser is at the tip of the pencil” (Intrinsic) but they do not say, “The eraser is to the north of the pencil” (Absolute). However, speakers of Guugu Yimithirr use only the absolute frame of reference to describe spatial relationships in space (Majid et al., 2004).

Some studies tested the Whorfian hypothesis in the spatial domain; that is, whether differences in spatial language affected non-linguistic conceptualizations of space. Pederson et al. (1998) conducted a series of experiments to investigate the relationship between language and thought through a cross-linguistic and cross-cultural study of spatial relationships. They placed three toy animals on a table, then subjects
were told to remember the animals “just as they are” and were asked to rearrange the toys on a second table placed in the opposite direction. Speakers of a relative frame language (Dutch) differed in their performance in a memory task from speakers of an absolute-frame language (Tzeltal). While speakers of Tzeltal reproduced the absolute positions of the toys, the speakers of Dutch reproduced the egocentric positions (Gallistel, 2002). This result is consistent with the Whorfian hypothesis. However, in a more recent study, Li and Gleitman (2002) attempted to replicate the Pederson et al. study, conducting similar experiments with English speakers. In their experimental design, participants rearranged toy animals on a table, then turned 180° and replicated the arrangement on a second table. The speakers of English employed both the egocentric and absolute frames of references, perhaps because English speakers use both relative and absolute frames of reference in their language (Gallistel, 2002). They claimed that language might not be the key factor in the choice of spatial perspective because the difference in recall between the different language groups was due to different landmark cues. They concluded that the differences in the Pederson et al. study were due to environmental factors rather than differences between the languages (Li and Gleitman, 2002). In particular, the speakers of Tzeltal (Absolute-frame language) were tested outside, whereas the speakers of Dutch (Relative-frame language) were tested in a laboratory.

Other studies in the domain of spatial cognition investigated whether cross-linguistic differences in lexicalization of spatial categories correspond to how the speakers of different languages conceptualize the relations between objects (Bowerman and Choi, 2001) and how different languages such as English, Korean, Dutch, Finnish,
and Spanish describe events of putting things in places (Bowerman, 1996a). English differentiates between putting things into containers and putting things onto surfaces. Korean, however, distinguishes between tight and loose fit or attachment. For example, “putting an apple in a bowl” does not require a different spatial relational term from “putting a letter in an envelope” in English but these two sentences require different spatial relation terms in Korean because the first is an example of loose fit and the second is an example of tight fit (Boroditsky, 2006; Jarvis and Pavlenko, 2010).

It is often claimed that spatial representations are universal. However, languages differ in their linguistic descriptions of spatial relations of either dynamical or static entities. For example, English uses adpositions (prepositional or postpositional phrases), while Turkish uses case markers that distinguish static and dynamic scenes (Arik, 2012). Turkish speakers can distinguish, e.g., “apple INTO bowl” from “apple ONTO table,” but this distinction is normally left to inference (Slobin et al., 2008). Slobin and Bowerman (2008) adapted Talmy’s scheme in distinguishing the four conceptual components of a placement event [figure, action, goal, relation (path of motion)] to illustrate the difference between four satellite-framed languages (English, German, Dutch, and Finnish) and four verb-framed languages (Turkish, Spanish, Hindi, and Tzeltal). For example, English speakers express the placement “Action” in the main verb and encoded the “Relation” between the apple and the bowl in a particle (put the apple in) or a prepositional phrase (“put the apple in the bowl”). In contrast, Turkish speakers express both the placement “Action” and the “Relation” between the apple and the bowl in the main verb [“elmayı kutunun içine koy” (insert the apple at the bowl)]. However, Turkish speakers do not
have to express the relation between the apple and the bowl [“elmayi (figure) kutuya (goal) koy (action)”] (Slobin et al., 2008).

Time

Since Whorf analyzed how the Hopi people conceptualized time, this conceptual domain has become a practical test bed for the Sapir-Whorf hypothesis. In his analysis, Whorf focused on the differences between the Hopi language, English, and other Standard Average European (SAE) languages and wrote that “After long and careful study and analysis, the Hopi language is seen to contain no words, grammatical forms, constructions or expressions that refer directly to what we call "time," or to past, present, or future, or to enduring or lasting, or to motion as kinematic rather than dynamic (i.e., as a continuous translation in space and time rather than as an exhibition of dynamic effort in a certain process), or that even refer to space in such a way as to exclude that element of extension or existence that we call "time," and so by implication leave a residue that could be referred to as ‘time.’ Hence, the Hopi language contains no reference to ‘time,’ either explicit or implicit.” (Carroll, 1956).

People's ideas of time differ across languages in many ways. Although all languages use spatial terms, different languages use different spatial terms to talk about time. Some recent studies have focused especially on how speakers of different languages think about time spatially (Boroditsky, 2001; Casasanto et al., 2009). Boroditsky (2001) empirically investigated the relationship between variations in talking about time and conceptualizations of time. Boroditsky (2001) conducted a series of experiments to test how native speakers of English and Mandarin Chinese encoded time concepts using a
non-linguistic task and noted that the way their speakers think about time reflected the differences between the English and Mandarin. In Experiment 1, English and Mandarin speakers were asked a spatial priming question including either a horizontal spatial relation between two objects (Example of horizontal spatial prime, “Black worm is ahead of the white worm.”) or a vertical spatial relation (Example of vertical spatial prime, “The black ball is above the white ball.”) followed by a True/False target question about time. The results of the first experiment showed that while Mandarin speakers tended to conceptualize time vertically (e.g., up/down spatial terms), English speakers tended to think about time horizontally (e.g., front/back spatial terms) even though both groups were tested in English. For example, English speakers were faster to verify that “March comes earlier than April” after horizontal primes than after vertical primes. They concluded that “If Mandarin speakers do show a vertical bias in thinking about time even when they are ‘thinking for English,’ then language must play an important role in shaping speakers’ thinking habits.” Experiment 2 was designed to explore how much and in what ways learning a new language influences its speakers’ thinking about time. Participants were twenty-five Mandarin-English bilingual speakers. They found a positive correlation between the age of acquisition of English and the bias to think about time vertically. Mandarin speakers who started learning English at a younger age showed less bias to think about time vertically. In another related experiment within the same study, native speakers of English who were taught to talk about time using vertical spatial terms showed the same vertical bias in performing the tasks as did the Mandarin speakers (Boroditsky, 2001). The main finding that emerged from these experiments is that
language play a crucial role in shaping thought, but does not rigidly determine thought
because one can learn a new way of thinking as a result of learning a new language
(Boroditsky, 2006). This result is inconsistent with the linguistic determinism.

*Color*

Most empirical studies of the relation between linguistic and non-linguistic
representations have focused on the domain of color because color perception has been a
traditional test case of Whorf’s principle of linguistic relativity (Berlin & Kay, 1969;
Lucy and Schweder, 1979; Kay and Kempton, 1984; Davidoff and Roberson, 2000). The
main question that has emerged from the universalist vs. relativist debate with respect to
color perception: Do color terms influence color perception? (Reiger and Kay, 2006).

Some early studies that provide evidence inconsistent with linguistic relativity
come from the area of color perception. For example, Berlin and Kay (1969) investigated
whether speakers of different languages differ in the way they view colors, as a result of
some color terms being present in some languages, and absent in others. They identified
eleven basic color categories (white, black, red, green, yellow, blue, brown, purple, pink,
orange, and grey) that exist for all human beings, regardless of language and culture, and
proposed that perception of these categories is universal. These basic categories are
considered distinct from other terms (for example, turquoise) because all members of a
community know them. This view proposes that the organization of cognitive
representations of color is restricted by perception, even though the organization of
linguistic categories for color varies widely.

Similarly, contrary to the linguistic relativity hypothesis, Rosch argued that color
categories are universal rather than language based. Her cross-cultural investigations of color categories compared naming and memory for colors between an American population and an agricultural population in New Guinea called the Dani. The Dani people have only two basic color terms. In the first experiment, Rosch found that the two populations with widely differing color vocabularies remembered colors in very similar ways that were not affected by differences in color naming. In a second experiment, Rosch also found that despite having only two color terms, the Dani found it easier to recognize and learn the the eight basic color categories of English (Rosch’s seminal experiments were reported in Heider, 1972). Thus, her cross-cultural research showed evidence of greater learning and memory performance for basic colors by subjects who did not code the categories linguistically. She concluded that colors form universally natural categories (Davidoff, 2001).

However, Davidoff criticized the interpretation of Rosch’s results and in the light of methodological concerns about the interpretation of Rosch’s data, Davidoff attempted to replicate Rosch’s experiments by using neurophysiological data and interference studies. His cross-cultural research investigated whether perceptual categories derive from the words in the speaker’s language. In this study, native English speakers were compared to monolingual Berinmo speakers whose language includes five basic color terms. In Experiment 1, English speakers showed categorical perception for green-blue boundaries but not for those across the ‘nol – wor’ (a color category in Berinmo) boundary in a similarity judgment task. However, for Berinmo speakers, the opposite was true. Berinmo speakers showed categorical perception for only ‘nol-wor’ boundary.
Berinmo does not mark the distinction between blue and green, but it has a color boundary (between ‘nol’ and ‘wor’) in a position that does not exist in English. In Experiment 2, Berinmo and English speakers again showed dissociation between categories that were distinguished linguistically or not. For English speakers, the division between the green and blue was easier to learn than only blue category and the division between yellow and green was easier to learn than the division between the Berinmo color categories. The third experiment was a recognition memory task and demonstrated an effect of linguistic category. The results with English and Berinmo speakers showed, in three tasks with different instructions that categorical perception was consistently more closely associated with the linguistic categories of each language than with underlying perceptual mechanisms. He concluded that perceptual categorization is determined by linguistic relativity. This study supports the strong linguistic relativity hypothesis that perceptual categories are organized by the linguistic systems of our mind (Davidoff, 2001).

In a previous study, Kay and Kempton (1984) found that linguistic color category boundaries play a crucial role in non-linguistic color similarity judgments. In their study, perceptions of English speakers were deformed in the blue-green area while Tarahumara speakers, who do not distinguish between blue and green linguistically, showed no deformation. Colors named with different terms were judged as more different than those similarly named. However, the linguistic effect disappeared when the instructions led participants to avoid this strategy. This suggests that participants used information drawn from their linguistic classifications to make a difficult judgment (Gennari et al., 2002).
In another study, Lucy and Shweder (1979) investigated linguistic and non-linguistic influences on color memory. They conducted a series of related experiments to understand the relationship between memory and color discriminability. In five related experiments, they assessed the relationship between memory and color stimuli discriminability, focality, two-person communication accuracy, and referential confusability. They argued that Rosch’s memorability tests were biased toward focal chips, because focal chips were easier to find in an array. They began with Rosch’s array and removed chips, randomly rearranged, and removed chips again, until the new array showed no relation between focality and findability. The results demonstrated that the various linguistic directories are better predictors of memory accuracy than focality in both short-term and long-term recognition memory tasks when perceptual discriminability is controlled. In their study, Lucy and colleagues suggested that memory for color stimuli is mediated by basic color descriptions. They introduced evidence regarding the role of language as a factor in human color memory (Lucy and Shweder, 1979).

Objects

Languages also differ how they categorize objects. It may seem surprising that mental representations of concrete objects should be susceptible to influences of language, but this appears to be the case (Casasanto, 2012).

Malt, Sloman, and Gennari (2003) investigated whether languages develop their own naming patterns for objects rather than having universal linguistic categories for sets of common objects. They examined the relations among linguistic categories for 60
common containers for speakers of American English, Mandarin Chinese, and Spanish and found substantial differences in the naming patterns of the speakers of these languages. Based on these findings, they argued that linguistic categories are not necessarily formed around the same prototypes across languages; rather, there exist different types of relationships between the linguistic categories of different languages. Malt, Sloman, Gennari, Shi, and Wang (1999) compared naming for 60 common containers by speakers of English, Chinese, and Spanish and they found a similar pattern. For instance, the 16 objects named bottle in English were spread across seven linguistic categories in Spanish. These findings support the idea that English speakers learning Spanish need to form new conceptual categories with specific properties, one for bottles that hold liquids, for instance, and another for those that hold dry materials (Jarvis and Pavlevenko, 2008).

In conclusion, languages appear to influence many aspects of human cognition, including space, time, color, and objects. Further studies have also found effects of language on people’s understanding of motion.
CHAPTER II
MOTION EVENTS

In the following section, I focus on the domain of motion and present Talmy’s cross-linguistic typological classification of motion events, along with Slobin’s “thinking for speaking” hypothesis, in order to introduce how languages show differences. After that, I present a number of empirical tests of Talmy’s linguistic typology as it relates to motion events and the effects of this typology on the conceptualization of motion events. Lastly, the English and Turkish languages are compared to see the influences of different typological characteristics on their motion event descriptions.

Talmy’s Linguistic Typology

Linguist Leonard Talmy (1991, 2000) describes cross-linguistic differences in the expression of motion events and introduces a typology of motion events which includes four basic or internal components (Figure, Ground, Motion, and Path), and two external (Manner and Cause) components which modify or cause the motion event. Furthermore, he classified languages into two groups on the basis of how they linguistically encode or lexicalize these internal and external components.

According to Talmy (1985), a motion event is the movement of an entity through a space, and consists of the following four basic internal components: Motion, Figure, Ground, and Path (Talmy, 2000) and two external components: Manner and Cause:

Motion: The existence of motion or location in the event.
**Figure:** The entity that is moving or located with respect to another object.

**Ground:** The entity which serves as a reference point with respect to which the figure moves or is located.

**Path:** The path followed by the figure of the motion event.

**Manner:** The manner of motion by which the figure moves along the path (e.g. *walking* vs. *running*).

**Cause:** The source or reason of the motion event.

For example, in the English sentence “The ball rolled down the hill,” the ball is the Figure, or the moving object that is changing places; the hill expresses the Ground, or the place relative to which the Figure is moving; into refers to the Path followed by the Figure of the event; and the rolling action is the manner which serves as the main verb in the event. The verb root (‘roll’) itself conflates Manner and Motion. Lexicalized manner of motion seems to be an optional component in motion expressions, since an expression of motion events can appear without it (e.g. ‘The ball went down the hill’) (Filipovic, 2007).

**S-Languages vs. V-Languages**

Talmy (1991, 2000) categorizes most of the world’s languages into two major types: satellite-framed languages and verb framed languages. According to Talmy (1991, 2000), languages tend to encode path of motion either in a main verb (e.g. enter, exit, ascend, descend, etc.) or in an obligatory particle, prepositional phrase, or satellite (e.g. in/out, up/down, etc.). Languages such as English (Germanic languages), Russian (Slavic
Languages), and Mandarin Chinese that “habitually” encode or lexicalize *Path* in the particles, prepositional phrases, or *satellites* associated with the main verb are called satellite-framed languages, or S-languages. Another important characteristic of satellite-framed languages is that these languages conflate manner with the existence of motion, such that manner is encoded within the verb (e.g., skip, stroll) (Ghalam, 2007).

In contrast, languages such as Turkish (Turkic Languages) and Spanish (Romance Languages) that tend to encode *Path* in the *main verb* of a clause are called verb-framed languages, or V-languages. Verb-framed languages conflate the existence of motion with path information. For example, in the English (a satellite-framed language) verbs ascend, descend, enter, and exit, path is encoded in the main verb. However, these verbs are not commonly used in English and other satellite-framed languages, while they are the predominant verbs used in verb-framed languages. To illustrate the differences between S-framed and V-framed languages, I provide examples from English and Turkish on how these languages differ when they are encoding a motion event (Ozcaliskan, 2012):

1. English:
   
   The boy ran **into** the room.

   ![MOTION+MANNER](MOTION+MANNER) ![PATH](PATH)

2. Turkish:

   Çocuk koşarak **odaya girdi**.

   ![MANNER](MANNER) ![MOTION+PATH](MOTION+PATH)

   (The boy **entered** the room **running**)

As you can see, in Turkish, the main verb *girmek* (enter) describes path, and
manner of *running* (kosarak) is described by an external verb particle. Turkish speakers use subordinate verb constructions (e.g., “enter running”) or adverbial phrases (e.g., “enter immediately”) to convey manner of motion. However, in English, the main verb *run* describes the manner of the motion and the path (into) is described by a prepositional phrase or satellite (Slobin 2004).

English prefers motion verbs that convey manner (walk, run, crawl, etc.), mixable with prepositions (in, up, to, across, etc.). Turkish, however, prefers verbs of inherent directionality, i.e., Path verbs like *girmek* (enter), *çıkmak* (exit), *yükselmek* (ascend), *alçalmak* (descend), etc., with more restricted non-directional verbs of motion (Filipovic, 2007).

*Manner of Motion vs. Path of Motion*

Manner of motion is one of the distinctive features of S-languages and V-languages. That is, S-languages and V-languages differ widely with respect to the ways in which they encode motion events. Manner verbs (e.g., hopping, rolling, bouncing, etc.) refer to the way in which an agent carries out a motion. While path of motion is an obligatory component of a motion event, manner is considered as an optional component (Slobin, 2004). The expression of path defines a motion event in Talmy’s typology. Path verbs (e.g. in/out, up/down, across, etc.) refer to the way followed by the agent of the motion.

*Other Linguistic Differences Between English and Turkish*

Many studies have clearly revealed that English speakers tend to use manner verbs while describing motion events. However, manner verbs are less frequent in
According to Talmy, English speakers tend to use pure manner verbs with subordinate path expressions and Turkish speakers tend to use pure path verbs with associated manner forms. However, Slobin (2004) claimed that some verbs conflate path and manner in some domains of motion. An example of such a conflated verb, *türkmanmak* “climb,” is provided by Slobin (2004). Unlike the English verb *climb*, which can be used with a prepositional phrase expressing either upward or downward motion, the Turkish verb *türkmanmak*, or “climb,” is used only for upward motion (Slobin, 2004). For example, “climb down from a tree” cannot be literally translated into Turkish. Turkish speakers tend to use *inmek* “descend” instead of “climb down.”

Although this linguistic typology of verb conflation patterns has motivated linguists and cognitive psychologists to take a closer look at the influence of linguistic typology on non-linguistic cognition, there is no study in Turkish that takes a closer look at the relationships between linguistic and non-linguistic cognition. In that respect, the present study is the first study between Turkish and English comparing their speakers’ performance in a non-linguistic task.

Another typological difference between English and Turkish comes from alternative descriptions of manner. Ozcaliskan & Slobin (1999) found that English speakers use a much larger lexicon of manner verbs than Turkish speakers. For example (Slobin 2004):

3. Turkish:

(O) eve doğru sessize yaklaştı.
(He silently approached the house)

4. English:

He very very quietly slunk towards the house.

*Slobin’s “Thinking for Speaking” Hypothesis*

Similar to the linguistic relativity hypothesis, the basic claim in Slobin’s *thinking for speaking* hypothesis is that acquiring a native language means learning particular ways of speaking. There is a strong relationship between Talmy’s linguistic typology and Slobin’s “Thinking for speaking” framework. Thinking for speaking can be viewed as a new, moderate version of Whorf’s linguistic relativity hypothesis. According to Slobin (2006), the basic claim of the “thinking for speaking” hypothesis is that “if a domain is elaborated in linguistic expression, users of that language will continually attend to and elaborate that domain cognitively.”

*Literature Review of Motion Events*

Comparative studies between English and Turkish with regard to linguistic typology and motion events have mostly focused on linguistic descriptions of motion events (see Demirtaş, 2009; Özçalışkan, 2004, 2005; Özçalışkan & Slobin, 1999, 2000, 2003) and speech & gesture in describing motion events (see Özçalışkan, 2012; Kita & Özyürek, 2003; Özyürek & Kita, 1999; Özyürek, Kita, Allen, Furman, & Brown, 2005; Özyürek, Kita, Allen, Brown, Furman & Ishizuka 2008). To the best of my knowledge, prior to this study, there was no research investigating how speakers of English and Turkish perform in a non-linguistic task. Unlike the prior studies, this study was designed to test whether cross-linguistic typological differences between Turkish and English...
predict how speakers of these languages perform in a non-linguistic recognition memory task. This was tested using a method most similar to that of Gennari et al. (2002) and Finkbeiner et al. (2002).

Some studies in the domain of motion have offered no support for Slobin’s thinking for speaking hypothesis. Papafragou, Massey, and Gleitman (2002) found no effects of language when comparing English and Greek speakers’ performance in non-linguistic tasks: a recognition memory task and a forced-choice similarity judgment task. They designed an experiment to compare the performance of English (a satellite-framed language) and Greek (a verb-framed language) speakers in a non-linguistic recognition memory task and similarity judgment task involving motion events. In Experiment 1, participants were monolingual native speakers of either English or Greek grouped into three age groups: the young group (4-7 years), the middle group (9-12 years), and the adult group (18-35 years). The stimuli for Experiment 1 were frog stories for children consisting of a set of black and white drawings. They also created alternates for each drawing by systematically changing either the path or the manner of the motion. In session 1, participants were presented all four original action scenes and asked to describe them. In session 2, for each of the original scenes, they viewed either the same scene again or an altered scene and were asked to judge for each picture whether it was the same or different. In Experiment 1, there was no main effect of language on recognition memory for either children or adults.

Papafragou et al. (2002) carried out a new experiment to investigate how the path–manner distinction enters into subjects’ mental representation of motion events.
They elicited forced-choice similarity judgments in triads, where participants had to compare a target motion event to one variant altering the manner and one changing the path. This time motion events were represented in the more dynamic format of sequences of pictures and the task was categorization rather than memory. In this experiment, the native speakers of Greek and English were given a sequence of three digital color photographs to depict each motion event and instructed to select the choice in which the man was “doing the same thing” as in the sample. The results revealed that categorization of motion events did not differ across languages.

This study showed linguistic preferences in a linguistic description task, but these effects evaporated in non-linguistic tasks. English and Greek children and adults did not show different performance in the non-linguistic tasks, although the English and Greek speakers differed significantly in terms of their linguistic preferences. English speakers were more likely than Greek speakers to use manner verbs. No difference was found on subsequent recognition and categorization tasks. Additionally, there was no statistically significant correlation between the type of verb used for the description of an event and performance on the recognition and similarity judgment tasks. These results are consistent with the universalist view in that conceptualization was independent from linguistic patterns.

A possible flaw in Papafragou et al.’s design is that instead of dynamic motions, static pictures were presented to depict motion events. In the present study, participants viewed short video clips, each depicting a motion event, to make dynamic information about both path and manner more accessible. It remains possible that English speakers
would have been more likely than Greek speakers to focus on manner of motion, if dynamical motions were presented instead of static pictures.

There are a few studies that have supported the proposal that language specific patterns influence speakers’ non-linguistic cognition or reasoning about motion. In a recent study, Kersten et al. (2010) conducted three experiments to investigate whether one’s native language influences the conceptualization of motion events. In Experiment 1, native English speakers and native Spanish speakers were given a category-learning task to examine the speakers of these languages’ attention to manners of motion. First, participants were presented with a series of animated events consisting of two novel bug-like creatures and then four different categories corresponding to the animated bug-like creatures’ manners of motion appeared on the screen. They were asked to select one of the four categories and given feedback regarding to the correct answers. Participants were presented with either a path discrimination task or a manner discrimination task and four categories for all participants were labeled by four different novel nouns or verbs (i.e., spogging). The results of the study showed that English speakers were more likely than Spanish speakers to attend to manner of motion when classifying novel, animated objects and events into categories. Conversely, Spanish and English speakers’ performances were similar at classifying on the basis of path of motion.

In Experiment-2, the stimuli and procedures were identical to Experiment 1 but the four categories were not given novel linguistic labels. The results revealed that English speakers performed better than Spanish speakers in a manner of motion discrimination task regardless of whether categories were labeled by novel words,
suggesting that an English-speaking tendency to focus on manner of motion is a general phenomenon and not limited to word learning. These results are consistent with linguistic relativity theory, claiming that attentional preferences acquired during language learning lead to more general differences in cognitive performance between speakers of different languages.

Several other studies support the proposal that syntax influences “thinking for speaking” about motion events. Finkbeiner et al. (2002), Gennari et al. (2002), and Papafragou et al. (2002) used similarity judgment tasks in which participants had to match a target motion event to either one variant altering the manner or one changing the path. In a nutshell, Finkbeiner et al.’s participants found same-manner variants more similar to targets than same-path variants independently of language, while Gennari et al.’s (2002) study found the inverse results and Papafragou et al.’s (2002) results showed no significant preference either way. These contradictory results have caused methodological concerns (Bohnemeyer et al., 2006).

Finkebeiner et al. report a set of experiments that examined how cross-linguistic differences influence participants’ decisions in a similarity-judgment task. In Experiment 1, participants were given encoding stimuli containing ten novel animations that were not easily labeled because these animations were moving in a novel manner. Participants were asked to encode the animations briefly into memory and then they were asked to indicate which one of the animations (same-path or same-manner alternates) was most similar to the target animation. English speakers showed a larger manner bias than the Spanish and Japanese speakers. In other words, they observed a relativity effect when the
targets were presented prior to their variants. However, in Experiment 2, they did not observe a language effect when participants were not required to remember the scenes. Therefore, these experiments revealed a task-dependent effect.

In a second study, Gennari et al. examined the influence of language-specific lexicalization patterns on non-linguistic tasks: a recognition memory task and a similarity judgment task. The participants were English and Spanish speakers and equally divided into three groups: naming first, free encoding, and a shadow condition. In the naming first condition, participants were instructed to encode events verbally. However, in the other two conditions, there was no explicit requirement of verbal encoding. In the shadow condition, participants repeated nonsense syllabi with the goal of preventing language processing of the events by loading verbal working memory. The stimuli consisted of 108 short motion videotapes (36 target events, 36 same-path alternates, 36 same-manner alternates). First, participants were given an encoding list (36 target videos), followed by a 10-20 minute retention interval to make recognition harder. In all conditions, participants performed a recognition memory task and then similarity judgments were collected for all triads.

Their specific prediction as it relates to the strong language based hypothesis was that English speakers should attend more strongly than Spanish speakers to the same-manner alternate, because English speakers should pay more attention to manner of motion than Spanish speakers when viewing the target event. However, they did not find a language effect in the recognition memory task after either verbal or non-verbal encoding and in the similarity judgment task after non-verbal encoding. A difference
between the English and Spanish speakers was found only in the similarity judgment task after describing motion events verbally.

One potential limitation of Gennari et al.’s stimuli is that alternates did not only differ from the target videos in manner of motion, but also in the actions of external objects (e.g., drag vs. carry a stool) (Bohnemeyer et al., 2006). In the present study, however, stimuli consisted of stationary external objects and only the figure in the motion events moved or was located with respect to an external object.

In a third study, Naigles and Terrazas (1998) investigated how differences between English and Spanish speakers in the ways they talk about motion events are to be explained by syntactic rule or lexical pattern. They assessed English and Spanish speakers’ interpretations of novel verbs and asked English and Spanish speakers to learn novel motion verbs presented in two different types of sentence frames (manner frame: “a girl is kradding toward the tree” and path frame: “a girl is kradding the tree”) and looked at what component of motion, path or manner, English and Spanish speakers used to novel verbs to encode. The stimuli were four sets of video clips, each depicting an actor performing a motion event that involved both a manner and a path, accompanied by the auditory sentences. The results of the study demonstrated that English speakers were more likely to choose the manner variants than Spanish speakers when told to “point to kradding”. Naigles and Terrazas (1998) concluded that speakers of different languages represent their different generalizations about the composition of motion verbs both lexically and syntactically.

Another line of research has focused on the influence of cross-linguistic
differences on how people allocate attention during motion perception. In an eye-tracking study, Papafragou, Hulbert, and Trueswell (2008) compared the eye movements of English and Greek speakers while preparing verbal descriptions or memorizing motion event animations. During the verbal description task, speakers’ eyes rapidly focused on the event components encoded in their respective languages. Greek and English speakers allocate attention to particular regions differently in accordance with their language, but only in the linguistic task and only when the languages differ in terms of the kind of information encoded in the verb. However, in the memorization task, speakers allocated attention similarly regardless of the language they speak. They indicated that attention allocation during event perception is not affected by the perceiver’s native language; effects of language arise only when linguistic forms are recruited to achieve the task, such as when committing facts to memory.

In another study, Papafragou and Selimis (2010) investigated how cross-linguistic encoding patterns interface with event cognition by comparing labeling and categorization preferences for motion events by English- and Greek-speaking adults and 5- year-olds. The stimuli were similar to prior studies of motion categorization (Papafragou et al., 2002; Gennari et al., 2002). Unlike their prior study that used static depictions of motion, they used 48 animated motion video clips. The motion stimuli were presented on two computer screens placed next to each other. Each animation played once on the screen on the left and once on the screen on the right. Then participants were asked to match the sample to one of the variants. While participants were shown the sample event, they heard a sentence in their respective language that contained a non-
specific verb (e.g., English: Look! The turtle is doing something). Then they were shown
the two variants and were asked to pick the one that best matched the sample. The
categorization results showed that categorization preferences from speakers of different
languages split along typological lines, with English speakers being more likely to offer
manner choices than Greek speakers.

Consequently, research on the conceptualization of motion events has shown
some evidence that language specific patterns play a role on cognition. However, there is
no consensus; it is still a big debate in the areas of linguistic and cognitive sciences.
While some researchers limit the effects to linguistic tasks (Papafragou et al., 2002),
others find effects in non-linguistic tasks (Gennari et al., 2002; Finkbeiner et al.; 2002,
Naigles & Terrazas, 1998; Papafragou et al., 2008; Papafragou and Selimis. 2010).
Differences in the experimental design, stimuli type and the languages of the participants
may be caused the differences in the results.

The present study employs different stimuli and a different task from those used
in these prior studies in order to investigate whether cross-linguistic differences between
English and Turkish influence their speakers’ memory performance. Unlike the static
representations of manner of motion used by Papafragou et al. (2002) and Papafragou et
al. (2008), in the present experiments, the manners of motion are dynamic, involving the
relative movement of an individual’s body parts in a specific manner to move around.

Unlike Gennari et al.’s (2002) stimuli, in the present study, alternates only differ
from the target video clips in either manner of motion or path of motion. So, only the
figure in the motion events moved or was located with respect to a stationary external
object.
CHAPTER III

PRESENT STUDY

This study investigated whether cross-linguistic typological differences between English and Turkish predict how speakers of these languages perform in a non-linguistic task. I compared English and Turkish speakers’ performance on a recognition memory task after a non-linguistic encoding task. The semantic domain in question is motion, because it is more difficult to lexicalize manner of motion in Turkish than in English due to typological constraints. Unlike the prior comparative studies between English and Turkish, this study is the first which is designed to test whether cross-linguistic typological differences of motion events in English and Turkish influence their speakers’ performance on a non-linguistic task. To test the influence of motion type on recognition memory, this study utilized a methodology similar to prior studies by Gennari et al. (2002) and Finkbeiner et al. (2002).

Hypotheses

Given the theories of linguistic relativity and the universalist view, the hypotheses of the current study are as follows:

Hypothesis 1: English and Turkish speakers express path and manner differently in tasks that require them to describe a motion event. When describing motion events, Turkish speakers should typically use verbs that convey information about path rather than manner,
whereas English speakers should do the opposite. In other words, English speakers should be much more likely to produce manner verbs in the main verb of sentences than Turkish speakers do.

**Hypothesis 2:** Memory performance for motion events varies for speakers of the two languages. This is the linguistic-relativistic prediction. On this account, differences between Manner and Path languages in the frequency and salience with which path vs. manner are encoded should result in systematic differences in how people in each language group attend to and process path vs. manner information in nonlinguistic cognitive tasks. Specifically, Turkish speakers should pay less attention to manner of motion than English speakers do. This hypothesis is consistent with the linguistic relativity hypothesis because this idea claims that language shapes or determines a speaker’s conceptualization of experience even when that person is not actually using language.

**Hypothesis 3:** English and Turkish speakers should not differ in their performance and no effect of language should be obtained in the recognition memory task after encoding. This hypothesis is consistent with the universalist view.

**METHODS**

**Participants**

There were 74 native speakers of English (Age range: 18-24, 40 males, 34
females) and 52 native speakers of Turkish (Age range: 18-30, 28 males, 24 females) participating in this experiment. Turkish speakers, all undergraduates at Sakarya University, were tested in Sakarya, Turkey, and English speakers, all undergraduates at Florida Atlantic University, were tested in Boca Raton, FL. English speaking participants received one course credit for participating. All Turkish speakers exclusively used Turkish in their activities and none considered himself/herself to be fluent in English. All English speakers used English as their primary language. All participants were tested in their native language.

Materials

The stimuli for this experiment consisted of short video clips, comprising a set of eighty-four motion events.\(^1\) The experiment was displayed on a 17-inch color computer monitor without any accompanying sound using the SuperLab stimulus presentation program for monolingual English speakers, and on a portable laptop for monolingual Turkish speakers. Each video clip depicted a unique motion event, involving an actor performing a combination of a specific path of motion and a specific manner of motion. The actors in the video clips were ten female actors. Each video lasted between 1s to 23s (\(M=6s\)). Each of the fifty different \textit{paths of motion} consisted of one of seven different directions of motion (down, up, into, out of, past, around, away from, to) with respect to one of 50 unique stationary external objects (e.g. soda machine, statue, staircase). One example of a path of motion is \textit{away from statue}. The fifty different \textit{manners of motion} involve the movement of an individual’s body parts in a specific manner to move around.

\(^{1}\) I thank Dr. Johanna D. Berger for providing me with the video clips used in her studies.
One example of a manner of motion is walking on heels (see Appendix 1 for complete list of fifty paths of motion and fifty manners of motion).

Encoding Lists

There were two encoding lists, each consisting of thirty-six unique motion events. Twenty-four out of the 36 items were the same in both encoding list-1 and encoding list-2. However, the remaining 12 target items were different in encoding list-1 and encoding list-2.

Recognition List

The recognition list was made up of sixty unique motion events, consisting of 24 old items, 24 alternate items, and 12 new items. Old items replicated the items seen in both encoding list-1 and encoding list-2. For example, one old item, actor nine tiptoes into the gazebo, was included in both recognition lists and both encoding lists. Each manner and path was presented only once during the recognition test. Thus, a participant would never see a manner or a path that had been shown earlier in the recognition test. If the participant remembered seeing that manner or path earlier, it would have to be from the encoding list.

Twenty-four alternate items were created corresponding to 12 target items on the encoding list-1 and 12 target items on the encoding list-2 by systematically changing either the path or the manner of the target items. There was only one list of recognition items but some of the items on the list had different meanings for different participants because they would have seen different target items during the encoding sessions. In the path-same alternate, the path given in the target was preserved while changing the
manner of the motion. However, in the manner-same alternate, the manner was preserved while changing the path of the motion. For example, for participants who saw encoding list-1, the alternate item, *actor seven walking away from the statue*, was a manner-same alternate item, because they would have seen the target item, *actor seven walking up the staircase*, at encoding; but for participants who saw encoding list-2, the alternate item, *actor seven running up the staircase while punching the air*, was a path same alternate item, because they would have seen the target item, *actor seven running away from the statue while punching the air*, at encoding (see Appendix 2 for sample stimuli for this experiment). The reason for doing this was that some of the items may have been a little unusual for some reason (e.g., the actor might have had an unusual expression on her face), and participants might have noticed the unusual nature of those items and thus may have been very likely to reject them if they hadn't seen that same unusual feature earlier. In this design, that unusual item affected equally the rate of false recognition of the manner same and path same items, because the unusual item would be a manner-same item for half of the participants and a path-same item for the other half of the participants. Thus, having some unusual items might lower the overall rate of false recognition of the non-target items, but it does not affect the comparison between the manner-change and path-same items because it affects both equally.

To make recognition harder and increase the overall rate of false recognition, the recognition list also included 12 new items that were not a part of any encoding items.

*Procedure*

Participants controlled the instructions and stimulus presentation. They were
tested in their respective languages. The author, a native speaker of Turkish, translated the instructions into Turkish. The experiment lasted between 30 to 45 minutes. The experiment was carried out in the cognitive psychology research laboratories of the Boca Raton campus of Florida Atlantic University and in an office in one of the buildings on the campus of the Sakarya University in Turkey. The room was not used by anyone at the time of the experiment, so disturbance to the participants during the experiment was minimal.

**Encoding Session**

First, participants were instructed to view the upcoming series of video clips and try to remember as much as possible about each of these video clips. Participants were given the following instructions: “In this task, you will see a number of video clips, each involving a motion event (e.g., an actor walking into a room). Please try to remember as much as possible about each of these video clips. If you have questions, please ask to experimenter now. Otherwise, press ‘B’ to begin the experiment.”

A series of thirty-six video clips was presented individually to each participant. After viewing each video clip, participants pressed the ‘c’ key to see the next video clip. The video clips came from either encoding list-1 or encoding list-2 and each participant received a different random order of these video clips.

**Distraction Session and Demographic Questionnaire**

The encoding session was followed by a demographic questionnaire (i.e., assessing age, gender, ethnicity, race). After the demographic questionnaire, participants were given five distraction questions about mathematical and logical reasoning to make
recognition harder and increase false recognition of recognition foils. Participants were
given the following instructions: “Now, you will see a number of questions based on
mathematical, logical and visual-spatial reasoning. Please press “C” to continue.” The
distraction session and demographic questionnaire took approximately 15-20 minutes.

Recognition Session

Participants were given a recognition memory task consisting of 24 old items, 24
alternate items and 12 new items. After the distraction session and demographic
questionnaire, a new set of instructions was shown to participants. Participants were
instructed to respond to each video by indicating whether or not they had seen the video
by pressing a key on the keyboard. They were also instructed to answer how confident
they were of their answer (just guessing, pretty sure, or absolutely sure).

Participants received the following instructions: “You will now see a number of
video clips, some of which you saw in the first part of the experiment and some of which
are new. After you see each video clip, you will be asked “Did you see this video clip in
the first part of the experiment?” If you saw the same video clip during the first part of
the experiment, you should press “Y” for “Yes”. If you didn’t see the same video clip
during the first part of the experiment, press “N” for “No.” After selecting either the
“Yes” or “No” choices, you will be asked to select whether you are just guessing, pretty
sure of, or absolutely sure of your “Yes”/ “No” response. Please, press “B” to begin the
experiment.”

Each participant was presented with a series of sixty video clips from the
recognition list randomly. After viewing each video clip, they answered whether or not
they viewed the video clip during the encoding session. After that, participants answered how confident they were of their response (1-just guessing, 2-pretty sure, or 3-absolutely sure). After each confidence rating, the next video clip appeared.

*Video Description Session*

After the recognition memory task, participants were presented ten short video clips and asked to provide a description for each video. Participants received the following instructions: “Next, you will see 10 short video clips. Describe the event shown in the clip with a single phrase. A short phrase should describe what happens in the movie as a single event. Please, write your descriptions on the description sheet. If you have questions, please ask to experimenter now. Otherwise, please press "B" to begin the experiment.”

*Design*

First, an SPSS analysis of variance (ANOVA) was conducted on the total number of items on which a participant used a manner verb as a main verb in the video description task. The independent variable for this analysis was language group (English and Turkish). I also recorded the mean number of descriptions in which path and manner appeared anywhere in the description (i.e., not necessarily in the main verb).

In this experiment, the primary analysis involved a 2 x 4 ANOVA, in which the independent variables were item type (old vs. manner-same vs. path-same vs. new items) and language group (English vs. Turkish). In this analysis, the dependent variable was the proportion of yes responses to each item type. Before considering the hypothesis regarding false alarms to alternate types (path-same vs. manner-same), I will provide an
overview of memory performance in the recognition test. I will specifically look at overall hit rates (proportion of correct “yes” responses to old items) and false alarms (probability of incorrect “yes” responses to manner-same and path-same items). After that, I will separately compare English and Turkish speakers for each item type to better understand the significant interaction between language and item type.

For manner vs. path differences, I focus on the evaluation of the hypothesis regarding false alarms to one or the other type of alternate. The hypothesis stemming from linguistic relativity is that English speakers should pay more attention to manner of motion than Turkish speakers do. The dependent variable was the probability of incorrect “yes” responses to the alternate items.

The last analysis involved a 2 x 4 ANOVA, in which the independent variables were language group and item type. The dependent variable in this analysis was the average confidence ratings (just guessing, pretty sure, absolutely sure) following “Yes” responses to each item type.

RESULTS

Analysis of Linguistic Descriptions (Main Verb)

In this analysis, we asked whether speakers included manner or path information only in the main verb. We coded the main verb in each description as manner or path to understand whether English and Turkish speakers differed in their linguistic descriptions of ten video clips they viewed during the video description task. English-speaking participants used a manner verb as the main verb in 91.9% of their descriptions, while Turkish-speaking participants did so in 40.5% of them (see Figure 1). In Turkish, the
mean proportion of path verbs was .52 (i.e. Turkish speakers used a path verb in 52% of their descriptions), while the mean proportion of descriptions that contained manner modifiers (adverbials or gerunds) was .44 (Path + Subordinated manner verb). The mean proportion of path verbs that involved manner modifiers is a subset of the 52% that involved path verbs. In English, the mean proportion of manner verbs as a main verb was .92, while the mean proportion of descriptions that contained path expression (particles or prepositions) was .52 (Manner + Path Expression). The mean proportion of that involved path expression is a subset of the 91.9% that involved manner verbs.

An ANOVA on the mean proportion of descriptions on which a participant used a manner verb as a main verb (i.e., no clause structure), with language group as an independent variable, revealed a significant main effect of language, \( F(1, 65) = 141.90, \) \( MSE = 416.68, p < .001, \) indicating that there was a significant difference between English and Turkish. English speakers used more manner verbs in the main verb of sentences than Turkish speakers while describing motion events.

These results indicate that English and Turkish have a preferred pattern of describing the motion events and a preferred type of verb consistent with Talmy’s (1985) cross-linguistic typology. When describing motion events, Turkish speakers expressed manner information in the main verb of sentence less often than English speakers, as found by Ozcaliskan and Slobin (1996a, 1996b).

*Analysis of Linguistic Descriptions (Clause Structure)*

In a separate analysis, we asked whether speakers included manner or path information in their linguistic descriptions anywhere in the sentence, including the main
verb and path or manner modifiers. Turkish speakers used manner information anywhere in the sentence, including the main verb and modifiers (e.g., adverbs or gerunds) in 85% of their descriptions while English speakers did so in 91.9%. An ANOVA on the mean proportion of descriptions on which a participant used a manner verb or a manner modifier, with language group as an independent variable, revealed a significant main effect of language, $F(1, 65) = 6.61, MSE = 9.27, p < .05$, indicating that there was a significant difference between English and Turkish speakers. English speakers used more manner verbs than Turkish speakers while describing motion events regardless of whether manner information was encoded in the main verb or distributed in the sentence.

However, English speakers used path information anywhere in the sentence, including the main verb and modifiers (e.g., verb particles, prepositions) in 53% of their descriptions, while Turkish speakers did so in 52%. We conducted the same analysis using as the dependent variable the proportion of descriptions including path information regardless of whether this information was encoded in the main verb or path modifiers, with language group as an independent variable. This analysis revealed no significant main effect of language, $F(1, 65) = 0.04, MSE = .23$, indicating that there was no significant difference between English and Turkish speakers.

Various linguistic productions were available in both English and Turkish in the video description task:

1. Path Verb Descriptions:
2. Path verb only
English: She is approaching a water fountain.

Turkish: Kız odaya giriyor. (She entered the room).

3. Path verb + Subordinated manner verbs

English: ------

Turkish: * Kız surunerek kapıdan çıkıyor. (She exits the room crawling).

* Kız seke seke merdivenlerden çıkıyor. (She ascends the stairs hopping hopping.)

4. Manner Verb Descriptions:

5. Manner verb only

   English: She is walking

   Turkish: Kız dans ediyor (She is dancing)

6. Manner verb + Manner modifier

   English: She is creeping on the floor.

   Turkish: Kız cimlerde yuvarlanıyor. (She is rolling on the grass)

7. Manner verb + Path Modifier

   English: She is somersaulting to grass.

   Turkish: Kız cesmeye (to) koşuyor. (She is running to the water fountain).

8. Manner verb + Manner modifier + Path Modifier

   English: She is crawling on the floor from one room to another.

   Turkish: ------

Old vs. Manner-same vs. Path-same vs. New Items – Proportion of “yes” responses

Before evaluating the predictions regarding false alarms to manner-same and
path-same items, I provide an overview of recognition memory performance. Figure 2 depicts the hit rates (proportion of “yes” responses to old items) and false alarms (probability of incorrect “yes” responses) to the different item types. A primary analysis of variance (ANOVA) on the proportion of “yes” responses in the recognition memory task, with language group and item type as independent variables, revealed no significant main effect of language, $F(1, 124) = 0.49, MSE = 0.02, p > .05$, indicating that Turkish and English speakers had similar overall rates of “yes” and “no” responses in the recognition memory test. There was a significant main effect of item type, $F(3, 372) = 1092.55, MSE = 15.67, p < .001$, as well as a significant interaction of language and item type, $F(3, 372) = 4.37, MSE = 0.06, p < .05$. Old items had the highest proportion of “yes” responses ($M = 0.84, SD = 0.12$), followed by path same items ($M = 0.21, SD = 0.17$), manner same items ($M = 0.16, SD = 0.18$), and new items ($M = 0.04, SD = 0.07$). To better understand the significant interaction between language and item type, the effects of language group were analyzed separately for the four item types. This analysis revealed that there was a significant difference between English and Turkish speakers in their acceptance of manner same items, $t(124) = -2.32, p < .05$. Turkish speakers ($M = 0.20, SD = 0.19$) incorrectly identified manner-same items as target items more often than English speakers did ($M = 0.12, SD = 0.16$). In contrast, there were not significant differences between the two language groups in the proportion of “yes” responses to old items (overall hit rates), $t(124) = 1.29, p > .05$; in the proportion of incorrectly accepting the path-same items, $t(124) = 0.70, p > .05$ and the new items, $t(124) = -1.45, p > .05$, indicating that Turkish speakers performed just as well as English speakers at correctly
accepting the old items and incorrectly accepting the path-same and new items.

*Coding of manner-same and path-same items*

False recognition of the manner-same items tells us about attention to path information because the path given in the target was changed while preserving the manner of the motion. Speakers’ ability to reject these items is dependent upon attention to path. False recognition of the path-same items, however, tells us how much a speaker paid attention to manner of motion because the manner given in the target was changed while preserving the path of the motion. If speakers noticed the manner in the encoding items, then seeing a different manner in the path same items should lead them to reject those items.

*Manner vs. Path Differences*

Now, I focus on the predictions regarding false alarms to manner-same or path-same items. The prediction of the linguistic relativity hypothesis is that, because English speakers are more likely to focus on manner information than Turkish speakers are, Turkish speakers should incorrectly identify the path-same items as target items more often than English speakers do. Table 2 shows the mean number of false alarms for each item type. A 2 x 2 ANOVA comparing language and item type yielded no significant main effect of language, \( F(1, 124) = 0.10, MSE = 0.04, p > .05 \), a significant main effect of item type, \( F(1, 124) = 6.92, MSE = .12, p < .05 \), as well as a significant interaction of language and item type, \( F(1, 124) = 7.97, MSE = .14, p < .05 \). The difference between English \( (M = 0.12) \) and Turkish \( (M = 0.20) \) speakers’ “yes” responses to manner-same items was much larger (mean difference = 0.08) than English \( (M = 0.22) \) and Turkish \( (M \)
Overall, these results indicate that the only difference in the recognition task between the two languages is that the probability of incorrectly identifying manner-same items differed across languages. This result suggests that in the recognition memory task, English speakers paid more attention to path of motion than Turkish speakers did. However, the probability of incorrectly identifying path-same item did not differ across languages. So, English speakers pay as much attention to manner of motion as do Turkish speakers. This will be discussed in greater detail in the discussion section of this article.

Confidence Ratings for “yes” responses

Figure 4 depicts participants’ average confidence ratings following “yes” responses to each item type. A 2 X 4 ANOVA on these confidence ratings, with language group and item type as independent variables, revealed no significant main effect of language, $F(1, 124) = 3.17, MSE = 3.47, p = .08$. However, there was a significant main effect of item type $F(3, 372) = 142.09, MSE = 98.261, p < .001$, as well as a significant interaction of language and item type, $F(3, 372) = 2.90, MSE = 2.00, p < .05$. Follow up t-tests revealed that there was a significant difference between English and Turkish speakers’ average confidence ratings following “yes” responses to manner-same items, $t(124) = 2.21, p < .05$.

In contrast, there were not significant differences between the two language groups in the average confidence ratings following “yes” responses to old items, $t(124) = 1.03, p > .05$; path-same items, $t(124) = 0.66, p > .05$ and new items, $t(124) = 1.91, p = .06$. Participants were more confident in their “yes” responses to old items ($M = 2.78$), with
insignificant differences between confidence ratings for path-same ($M = 2.25$), manner-same ($M = 2.17$), and new items ($M = 1.88$). For old item types, participants were generally very confident (absolutely sure) when they selected that the item was also seen at encoding.
CHAPTER IV
DISCUSSION

In this study, I compared the performance of English and Turkish speakers in a non-linguistic recognition memory task involving motion events, and in their descriptions of the motion events. In this chapter, I summarize and examine the findings of the experiment. Lastly, the limitations of this study and suggestions for future research are discussed.

I hypothesized, first, that English and Turkish speakers express manner and path differently while describing motion events. Specifically, English speakers should typically use terms in the main verb that convey information about manner rather than path, whereas Turkish speakers should do the opposite. In other words, English speakers should be much more likely than Turkish speakers to produce manner verbs in the main verb of a sentence. This hypothesis simply replicated assumptions from previous cross-linguistic studies. When we focus on the main verb in the descriptions of motion events, the results show that English speakers overwhelmingly used more manner verbs than Turkish speakers, and in English, path of motion was indicated less than in Turkish (Hypothesis 1 was supported). If we focus on the main verbs in the descriptions, we can clearly say that the linguistic task showed what is already known about English and Turkish verb usage documented in prior studies of motion events (Ozcaliskan and Slobin, 1999, 2000, 2003; Ozyurek and Ozcaliskan, 2000; Allen, Ozyurek, Kita, Brown, Furman,
Ishizuka, and Fuji, 2007; Demirtas, 2009; Toplu, 2011).

However, which piece of information is coded in the main verb may not necessarily tell us anything about the relative salience of that piece of information in different languages. So, one could argue that the more important piece of data from the linguistic descriptions is whether a particular component of an event is mentioned at all, regardless of whether it is mentioned in the main verb or in some other part of a sentence. In the analysis of clause structure (i.e., main verb and modifiers), the results showed that English and Turkish speakers significantly differed in their overall rate of mention of manner. English speakers used more manner verbs than Turkish speakers regardless of whether manner information was encoded in the main verb or distributed in the sentence while describing motion events. However, they did not significantly differed in their overall rate of mention of path. English speakers find ways to express path other than using verbs to convey paths.

The recognition memory task aimed at testing linguistic relativity, asking whether lexical and structural differences between English and Turkish in the expression of motion events would predict memory performance in a non-linguistic recognition memory task. We asked whether Turkish speakers would be more likely than English speakers to falsely remember events that varied from the target in manner. We found a linguistic effect in the recognition memory task that was inconsistent with language specific patterns. The probability of incorrectly identifying manner-same items significantly differed across languages. English speakers paid more attention than Turkish speakers did to path of motion. However, English and Turkish speakers did not
significantly differ in their acceptance of the path-same items, which measure attention to manner of motion. Turkish speakers paid as much attention to manner as did English speakers (*Hypothesis 2* was not supported).

The finding that English speakers attended to path as well as manner of motion provides support for Talmy’s (2000) claim that path is a core component of a motion event and is expressed at a higher rate than manner in English. Slobin (2004) has also pointed out that path is an obligatory component of motion event expressions, so we can’t compare languages in terms of accessibility of path as a category. Although most of the previous research on motion events and its influence on cognition has expected English speakers to be more likely to focus on manner than on path because manner of motion is more frequently encoded in manner verbs, path is also notably marked in English with particles and prepositions (Kersten et al., 2010). For example, Kersten (1998a) found that adult English speakers focused more frequently on path than on manner in a novel verb-learning task, indicating that path was a more salient feature of a motion event than was manner for these participants. He concluded that people are biased to associate verbs with path of motion, or motion defined with regard to the path of one object with respect to another external object. Gennari et al. (2002) also found that English speakers in a free encoding condition focused more strongly on path than on manner of motion when making similarity judgments. Thus, even speakers of English, a language in which verbs seldom express path information, attend at least as strongly to path as to manner of motion.

The question remains, however, as to what would make path of motion more
salient for English speakers than for Turkish speakers. A possible explanation comes from the finding that English speakers did slightly better overall than the Turkish speakers did. A 2 x 2 mixed design ANOVA comparing English and Turkish speakers on the proportion of “yes” responses to just the old and new items revealed a trend that approached significance ($p = .08$) for better discrimination of old and new items in the English speakers. One possible reason why English speakers performed slightly better than the Turkish speakers is that English speakers participating in this study might have been more familiar with the recognition memory test format and experimental setup than Turkish speakers were. This discrimination of old and new items was contaminated by floor effects on the false recognition of new items, however, so it could be that a small inclination toward higher overall performance in English speakers shows up more easily in the slightly harder discrimination of old and manner same items. Thus, it could be that the better performance of English speakers on the manner same items simply reflects slightly better overall memory performance in the English speakers.

Although the present results are not consistent with linguistic relativity, they also do not straightforwardly support the universalist hypothesis. This hypothesis suggests that English and Turkish speakers should not differ in their performance and no effect of language should be obtained in the recognition memory task. Our results did not support the universalist hypothesis because there was a significant difference between English and Turkish speakers in the recognition memory task. English speakers attended more strongly than Turkish speakers did to path of motion, even though the two groups did not significantly differ in their attention to manner of motion.
The present study has undertaken the work of inquiring about both the linguistic expression and the conceptual representation of motion events, with a cross-linguistic perspective. It is also the first study which focuses on Turkish motion events by taking both the linguistic and the non-linguistic dimension into consideration, and by using real-life stimuli to collect behavioral data. Our findings suggest some implications for future cross-linguistic studies:

1. The linguistic productions obtained from the video description task have not been deeply semantically and syntactically analyzed. A future study may further explore the linguistic data obtained from dynamic scenes and elaborate on the analysis of Turkish linguistic data.

2. To better understand the interaction between linguistic and cognitive mechanisms behind the findings, a future study may further extend the current experimental design to bilingual and monolingual speakers of the other path and manner languages.

CONCLUSIONS

This study investigated whether different lexicalization patterns of motion events in English and Turkish predict how speakers of these languages perform in a recognition memory task. We addressed this question by analyzing performance of English and Turkish speakers in a non-linguistic recognition memory task and their linguistic descriptions in a video-description task. As we hypothesized, when describing motion events, English speakers typically used manner verbs in the main verb of sentences rather than path verbs, whereas Turkish speakers did the opposite. However, in a recognition
memory task, English speakers attended more strongly than Turkish speakers did to path of motion. The results do not support the linguistic relativity hypothesis.
### TABLES

**Table 1.** Frequent verb used in video description task in English and Turkish

<table>
<thead>
<tr>
<th>Video</th>
<th>Main Verb</th>
<th>External object</th>
<th>English</th>
<th>Turkish</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manner</td>
<td>door</td>
<td>crawl (on)</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Path</td>
<td></td>
<td>x</td>
<td>cikmak (exit)</td>
</tr>
<tr>
<td>2</td>
<td>Manner</td>
<td>pool table</td>
<td>hop (around)</td>
<td>ziplamak (hop)</td>
</tr>
<tr>
<td></td>
<td>Path</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>3</td>
<td>Manner</td>
<td>door</td>
<td>spin (out)</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Path</td>
<td></td>
<td>x</td>
<td>cikmak (exit)</td>
</tr>
<tr>
<td>4</td>
<td>Manner</td>
<td>grass</td>
<td>roll (on)</td>
<td>takla atmak (roll)</td>
</tr>
<tr>
<td></td>
<td>Path</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>5</td>
<td>Manner</td>
<td>soccer net</td>
<td>jumping (into)</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Path</td>
<td></td>
<td>x</td>
<td>girmek (enter)</td>
</tr>
<tr>
<td>6</td>
<td>Manner</td>
<td>stairs</td>
<td>hop (up)</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Path</td>
<td></td>
<td>x</td>
<td>cikmak (ascend)</td>
</tr>
<tr>
<td>7</td>
<td>Manner</td>
<td>elevator</td>
<td>dance (out)</td>
<td>dans etmek(dance)</td>
</tr>
<tr>
<td></td>
<td>Path</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>8</td>
<td>Manner</td>
<td>stairs</td>
<td>walk (up)</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Path</td>
<td></td>
<td>x</td>
<td>cikmak (ascend)</td>
</tr>
<tr>
<td>9</td>
<td>Manner</td>
<td>hill</td>
<td>roll (down)</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Path</td>
<td></td>
<td>x</td>
<td>inmek (descend)</td>
</tr>
<tr>
<td>10</td>
<td>Manner</td>
<td>water fountain</td>
<td>running (towards)</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Path</td>
<td></td>
<td>x</td>
<td>gelmek (come)</td>
</tr>
</tbody>
</table>

**Note.** Turkish speakers generally expressed manner of motion with a manner modifiers included adverbials, gerunds etc. (i.e., Merdivenleri **yuruyerek** cikiyor, “she ascends the stairs **walking**”).

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Table 2. Mean number of false alarms as a function of item type.

<table>
<thead>
<tr>
<th></th>
<th>Manner-same item</th>
<th>Path-same item</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>0.12 (0.16)</td>
<td>0.22 (0.17)</td>
</tr>
<tr>
<td>Turkish</td>
<td>0.20 (0.19)</td>
<td>0.19 (0.17)</td>
</tr>
</tbody>
</table>

*Note.* Standard deviations are in parenthesis.
FIGURES

Figure 1. Mean number of manner and path verbs used in English and Turkish during video description task.
Figure 2. Proportion of yes responses for old, manner, path and new items in the recognition memory task as a function of language groups and item types.
Figure 3. The proportion of incorrect "yes" responses to manner-same and path-same items.
Figure 4. Mean confidence ratings following yes responses for each motion type.

Confidence ratings were made on a three point scale (1 = just guessing, 2 = pretty sure, 3 = absolutely sure).
APPENDICES

Appendix 1

List of the manner and path of motions used.

<table>
<thead>
<tr>
<th>MANNER OF MOTION</th>
<th>PATH OF MOTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 high-knees run</td>
<td>1 into shed</td>
</tr>
<tr>
<td>2 touch ground, jumps arms up</td>
<td>2 away from soda machine</td>
</tr>
<tr>
<td>3 walk while doing jumping jacks</td>
<td>3 out of dorm room</td>
</tr>
<tr>
<td>4 crawl on stomach</td>
<td>4 into sandpit</td>
</tr>
<tr>
<td>5 skip</td>
<td>5 past map sign</td>
</tr>
<tr>
<td>6 walk on heels</td>
<td>6 away from fountain</td>
</tr>
<tr>
<td>7 march</td>
<td>7 su havuzundan uzaklasma</td>
</tr>
<tr>
<td>8 leapfrog</td>
<td>8 su borusuna dogru</td>
</tr>
<tr>
<td>9 walk like a monkey</td>
<td>9 down Ramp 1</td>
</tr>
<tr>
<td>10 pretended to be on tightrope</td>
<td>10 up Staircase 1</td>
</tr>
<tr>
<td>11 walk while doing pat-a-cake</td>
<td>11 into Building 1</td>
</tr>
<tr>
<td>12 spin</td>
<td>12 out of Building 2</td>
</tr>
<tr>
<td>13 somersaults</td>
<td>13 away from fire hydrant</td>
</tr>
<tr>
<td>14 cartioca</td>
<td>14 yangin muslugundan uzaklasma</td>
</tr>
<tr>
<td>15 race-walk</td>
<td>15 to bike rack</td>
</tr>
<tr>
<td>16 walk like a robot</td>
<td>16 out of restroom</td>
</tr>
<tr>
<td>17 shuffle</td>
<td>17 around stop sign</td>
</tr>
<tr>
<td>18 run while kicking buttock</td>
<td>18 up Ramp 2</td>
</tr>
<tr>
<td>19 pretended to swim</td>
<td>19 away from dumpster</td>
</tr>
<tr>
<td>20 limp</td>
<td>20 cop konteynirindan uzaklasma</td>
</tr>
<tr>
<td>21 jump</td>
<td>21 out of tennis court</td>
</tr>
</tbody>
</table>

59
<table>
<thead>
<tr>
<th>MANNER OF MOTION</th>
<th>PATH OF MOTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>walk with arms stretched forward</td>
<td>into soccer net</td>
</tr>
<tr>
<td>uyurgezer gibi yurumek</td>
<td>futbol kalesinin icine</td>
</tr>
<tr>
<td>running-long-jump</td>
<td>to volleyball net</td>
</tr>
<tr>
<td>kosarak uzun atlamak</td>
<td>voleybol filesine dogru</td>
</tr>
<tr>
<td>lunges</td>
<td>past Statue 1</td>
</tr>
<tr>
<td>one dogru hamleler yaparak yurumek</td>
<td>heykeli (1) gecme</td>
</tr>
<tr>
<td>run legs straight ahead</td>
<td>past Statue 2</td>
</tr>
<tr>
<td>kolları ileri geri sallayarakkosmak</td>
<td>heykeli (2) gecme</td>
</tr>
<tr>
<td>crab walk hop</td>
<td>around Statue 3</td>
</tr>
<tr>
<td>yengec gibi yurumek</td>
<td>heykelin (3) etrafinda</td>
</tr>
<tr>
<td>hop</td>
<td>up Staircase 3</td>
</tr>
<tr>
<td>hoplamak</td>
<td>merdiven (3) cikma</td>
</tr>
<tr>
<td>dance</td>
<td>down Staircase 4</td>
</tr>
<tr>
<td>dans etmek</td>
<td>merdiven (4) inme</td>
</tr>
<tr>
<td>cartwheel</td>
<td>away from electrical box</td>
</tr>
<tr>
<td>el yardim ile yanlanasina takla atmak</td>
<td>elektririk pansosundan uzaklasma</td>
</tr>
<tr>
<td>walk like an Egyptian</td>
<td>to Statue 4</td>
</tr>
<tr>
<td>Mısırlı gibi yurumek</td>
<td>heykele (4) dogru</td>
</tr>
<tr>
<td>flap like a bird</td>
<td>out of elevator</td>
</tr>
<tr>
<td>kus gibi kanat cirpmak</td>
<td>asansorun disina</td>
</tr>
<tr>
<td>waltz</td>
<td>into pool</td>
</tr>
<tr>
<td>vals yapmak</td>
<td>havuzun icine</td>
</tr>
<tr>
<td>walk backwards</td>
<td>past TV</td>
</tr>
<tr>
<td>geri geri yurumek</td>
<td>Televisyonu gecme</td>
</tr>
<tr>
<td>crawl on knees</td>
<td>around picnic table</td>
</tr>
<tr>
<td>dizlerinin ustunde emeklemek</td>
<td>piknik masasinin etrafinda</td>
</tr>
<tr>
<td>walk</td>
<td>away from Statue 5</td>
</tr>
<tr>
<td>yurumek</td>
<td>heykelden (5) uzaklasma</td>
</tr>
<tr>
<td>run while punching air</td>
<td>up Staircase 5</td>
</tr>
<tr>
<td>havaya yumruk atarak kosmak</td>
<td>merdiven (5) inme</td>
</tr>
<tr>
<td>ballet dance</td>
<td>around palm tree</td>
</tr>
<tr>
<td>bale dansi yapmak</td>
<td>palmiye agacinin etrafinda</td>
</tr>
<tr>
<td>walk on all fours</td>
<td>to Statue 6</td>
</tr>
<tr>
<td>dort ayak yurumek</td>
<td>heykele (6) dogru</td>
</tr>
<tr>
<td>scoot</td>
<td>down the hill</td>
</tr>
<tr>
<td>hizlica uzaklasmak</td>
<td>tepeden asagi</td>
</tr>
<tr>
<td>roll</td>
<td>to large tree</td>
</tr>
<tr>
<td>yuvralmak</td>
<td>buyuk agaca dogru</td>
</tr>
<tr>
<td>walk bowlegged</td>
<td>away from bush</td>
</tr>
<tr>
<td>ayrık yurumek</td>
<td>calidan uzaklasma</td>
</tr>
<tr>
<td>tiptoe</td>
<td>into gazebo</td>
</tr>
<tr>
<td>ayaklarinin ucuna basarak ilerlemek</td>
<td>balkonun icine</td>
</tr>
<tr>
<td>stomp</td>
<td>past Statue 7</td>
</tr>
<tr>
<td>agir agir yurumek</td>
<td>Heykel (7) gecme</td>
</tr>
<tr>
<td>right-legged hop</td>
<td>around bench</td>
</tr>
<tr>
<td>sag ayak acierinde ziplamak</td>
<td>stranin etrafinda</td>
</tr>
<tr>
<td>run</td>
<td>to water fountain</td>
</tr>
<tr>
<td>koslak</td>
<td>cesmeye dogru</td>
</tr>
<tr>
<td>walk very slowly</td>
<td>down Playground equipment steps 1</td>
</tr>
<tr>
<td>ok yavas sekilde yurumek</td>
<td>oyunalan ekipmanindan inme</td>
</tr>
<tr>
<td>walk while doing large arm circles</td>
<td>down bleachers</td>
</tr>
<tr>
<td>elle buyuk daireler eizerek yurumek</td>
<td>tribunden inme</td>
</tr>
<tr>
<td>chicken dance</td>
<td>up Playground equipment steps 2</td>
</tr>
<tr>
<td>tavuk dansi</td>
<td>oyunalan ekipmanina cikma</td>
</tr>
<tr>
<td>walk in very big steps</td>
<td>up Ramp 3</td>
</tr>
<tr>
<td>buyuk adimlarla yurumek</td>
<td>Rampa (3) cikma</td>
</tr>
<tr>
<td>walk sideways</td>
<td>out of parking garage</td>
</tr>
<tr>
<td>yanlanasina yurumek</td>
<td>kapali otoparktan cikma</td>
</tr>
</tbody>
</table>
Appendix 2

Example stimuli for experiment.

Encoding List 1: Actor seven walking up the staircase (Manner 1 & Path 2)

Encoding List 2: Actor seven running away from the statue while punching air (Manner 2 & Path 1)

Recognition List: Actor seven walking away from the statue (Manner 1 & Path 1)

Actor seven running up the staircase while punching air (Manner 2 & Path 2)
Appendix 3

Demographics Questionnaire

1. What is your age group?
   A) 18-20
   B) 21-24
   C) 25-30
   D) 31-40
   E) Over 40

2. Are you male or female?

3. What is the highest level of education you have completed?
   A) Completed high school
   B) 1\textsuperscript{st} year of college
   C) 2\textsuperscript{nd} year of college
   D) 3\textsuperscript{rd} year of college
   E) 4\textsuperscript{th} year of college
   F) Completed undergraduate degree
   G) Some graduate school
   H) Completed graduate degree

4. What is your ethnicity?
   A) Hispanic or Latino
   B) Not Hispanic or Latino
   C) I prefer not to answer

5. What is your race?
   A) American Indian or Alaskan Native
   B) Asian
   C) Native Hawaiian or Other Pacific Islander
   D) Black or African American
   E) White
   F) More than one race
6. How would you rate your health at the present time?
   A) Poor
   B) Fair
   C) OK
   D) Good
   E) Excellent

7. Did you have any difficulty seeing any of the instructions or video clips in this experiment?

8. Do you speak any languages other than English?

9. Is English your first language?

10. Have you ever lived in a country in which a language other than English is the dominant language?

11. Are either or both of your parents native speakers of a language other than English?
Appendix 4

Encoding Session Instructions for Turkish Speakers

“Bu deneyde, belli bir yere varmak için, belli bir tarzla hareket eden bir kişinin hareketlerini içeren kısa videolar izleyeceksiniz. Lütfen, videoları mümkün olabildiğince, videoda ki kişiyi ve o kişinin nereye, hangi hareket tarzıyla gittiğini hafızanızda tutmaya çalışın. Her videonun ardından, bir sonraki videoyu görebilmek için ekranda ki “Devam” butonuna tıklayıniz. Eğer herhangi bir sorunuz yoksa, lütfen ekranın sağ alt köşesindeki “Basla” butonuna tıklayarak deneye baslayabilirsiniz”.

Recognition Session Instructions for Turkish Speakers

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