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... a Time upon Once: The Role of Word Order in Social Cognition

School Director: Professor Francesca Peressotti

Supervisor: Professor Anne Maass

PhD Student: Maria Laura Bettinsoli

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To Lorenzo and Tommaso,

My beloved little nephews who have still much to learn.

Table of Contents

Brief Summary

Given its complexity both in structure and meaning, human language is considered a unique form among all living beings' communication channels. There are thousands of extant languages all over the world and each of them differs from others in some features. For decades, scholars have analyzed their language structures and historical development. Nowadays, we are able to distinguish languages and their effects relying on differences highlighted by linguistic and psychological studies. Starting from studies that had focused more on the grammatical and syntactical features of languages, social psychologists have paid particular attention to the mutual influence between language and social cognition. Through several studies, social psychology has tried to demonstrate that language is a powerful tool not only for constructing and representing meaning, but also for transforming social reality. Goal of this research project is to investigate the role of Word Order in social cognition. Although Word Order has been studied in various fields, for example, from typological and from linguistic perspectives, this is a first attempt to investigate how this language feature can affect social-cognitive processes.

Subject (S), Verb (V) and Object (O) are considered the basic elements of a sentence and SVO and SOV represent the most common word orders among languages, although all possible word orders are present in at least some languages (Dryer, 2011). The general idea underlying all studies of my Thesis is that the order in which elements appear in a sentence can affect social cognition in terms of perception and reasoning processes. Attention is caught by the first element that we encounter when reading or listening, which, in turn, induces us to construct a mental model following the proposed order. Across several studies, I try to demonstrate how the order and the implied direction in which elements appear are involved in different social-cognitive processes. The majority of studies reported in my Thesis investigate Word Order effects within the context of a

single language (Italian) whereas two studies tested the same predictions cross-linguistically. Cultural and personal habits were also taken into account as possible moderators of the Word Order effect (such as knowledge of other languages with different canonical order or motivational factors related to health and eating habits). This research project investigates different aspects of Word Order. It does not only focus on the order of Subject, Verb and Object, but in one set of studies (Chapter 1) I investigated the effects of placing in different order Agent, Patient and Action; in other studies (Chapter 3) I tested the consequences of switching the position of two nouns within a linguistic binomial and, in others (Chapter 4, Study 4a) I also considered the impact of where pronouns were positioned within a help request. Basically, this Thesis did not investigate only the grammatical aspect of the basic elements of a sentence (S, V, O), but it examined the role of order from a broader psycho-linguistic perspective.

After reviewing the relevant literature on Word Order from different perspectives in the Introduction, I report three studies through which I investigated the role of word order in *linguistic production*. The main purpose was to study what linguistic strategies people use when transforming and generating sentences starting from elements that are visually presented. I systematically varied the order in which pictures were presented (for instance, grandma – candies – children; candies-grandma-children; children-candies-grandma, etc.). I hypothesized that regardless of the order in which visual stimuli were presented, people would either follow the same order in which the stimuli were presented or generate sentences in which the pictorial stimuli were "transformed" into the canonical language order (for instance, SVO in Italian). After a pilot study in Italian, I decided to compare Italian (1a) and English (1b) participants to investigate whether the greater rigidity of English word order with respect to Italian may reveal differences in terms of linguistic strategies application.

In Chapter 2 I focus on a yet unexplored link between the word order and *causal reasoning*. In three studies I investigated how the ordering of cause and effect (e.g., "cigarette smoking is related to lung cancer" vs. "lung cancer is related to cigarette smoking") can influence the direction

of causal reasoning. Interestingly, results show that by inverting the order of causes and effects, people are driven to adopt different causal thinking in terms of risk and relevance perception of health-related issues. Cause-Effect ordering (vs. Effect-Cause) increases the risk perception but decreases the perception of personal relevance of health-related statements.

The relation between Word Order and emergency intervention was further analyzed in Chapter 3. Through implicit and explicit measures I studied how the intervention likelihood and diffusion of responsibility can be affected by the order in which help requests (Study 3a) and risky situations (Study 3b) are formulated. These two studies revealed that language may, in a subtle way, moderate the likelihood of intervention but the underlining process remains unclear and needs future investigation.

In Chapter 4, I report two studies aimed at investigating how Word Order can affect *causal attribution*. The most important result is that, in both, Italian and English, causal attribution is influenced by the order in which elements appear, with greater attribution to the first element of the sentence

Together the present research project provides first evidence for a subtle but consistent role of Word Order in social cognitive processes. Besides offering an integrative summary of the findings of Chapters 2 through 5, in the final chapter I also discuss the consequences and applications in the field of social cognition and mass communication.

Riassunto

Data la complessità di sistema sia a livello di struttura sia di significato, il linguaggio umano ricopre un carattere di unicità tra tutti i canali di comunicazione esistenti. Ci sono migliaia di lingue esistenti al mondo e ognuna di questa si differenzia dalle altre anche solo per una caratteristica. Da decenni, diversi studiosi hanno prestato particolare attenzione alla struttura e ai processi di sviluppo del linguaggio. Oggi, siamo in grado di distinguere le diverse lingue affidandoci a differenze messe in luce da studi di linguistica e psicologia. Partendo da studi che si sono focalizzati maggiormente sulle caratteristiche grammaticali e sintattiche del linguaggio, gli psicologi sociali hanno invece rivolto l'attenzione all'influenza reciproca tra il linguaggio e la cognizione sociale. Attraverso numerosi studi, la psicologia sociale ha cercato di dimostrare che il linguaggio può essere un potente strumento, non solo nel costruire e rappresentare un determinato significato, ma anche nel plasmare e rimodellare la realtà sociale. L'obiettivo principale di questo progetto di ricerca è quello di esplorare il ruolo dell'ordine delle parole nella cognizione sociale. Sebbene l'ordine delle parole sia stato preso in considerazione in varie discipline, soprattutto da una prospettiva topologica in campo linguistico, questo è un primo tentativo di indagare come tale caratteristica, intrinseca al linguaggio, possa influenzare processi di tipo socio-cognitivo.

Soggetto (S), Verbo (V) e Oggetto (O) sono considerati gli elementi basi di una frase e SVO e SOV rappresentano i due ordini canonici più diffusi tra le varie lingue del mondo, nonostante tutte le altre possibili combinazioni risultino presenti in almeno quattro delle oltre 7000 lingue appartenenti al genere umano (Dryer, 2011). Nel presente lavoro si ipotizza che l'ordine in cui gli elementi compaiono all'interno di una frase, possa influenzare processi cognitivi cruciali all'interno della psicologia sociale. Poiché, la nostra attenzione viene catturata dal primo elemento che incontriamo leggendo un testo o ascoltando il nostro interlocutore, lo scopo di questa tesi è indagare se l'ordine delle parole ci indurrà a costruire una rappresentazione mentale degli eventi

influenzata dalla successione temporale e spaziale in cui immagazziniamo le informazioni e prendiamo coscienza degli eventi circostanti.

Attraverso diversi studi, ho cercato di verificare se l'ordine, e l'implicita dimensione spaziale e temporale, attraverso cui le informazioni vengono presentate, influenzano processi di tipo socio-cognitivo. La maggior parte degli studi che verranno riportati all'interno di questo lavoro, hanno analizzato il fenomeno dell'ordine delle parole in relazione alla lingua italiana, ma ulteriori due studi sono stati condotti in una prospettiva cross-linguistica basandosi sulle medesime ipotesi. Sono state inoltre considerate le abitudini culturali e personali dei partecipanti in relazione alle varie tematiche affrontate negli studi (come per esempio la conoscenza di altre lingue caratterizzate da un diverso ordine canonico o le abitudini salutari) con l'intento di analizzare se tali abitudini potessero essere considerate come moderatori dei diversi effetti dell'ordine delle parole.

L'introduzione della tesi propone una rassegna letteraria, analizzando il fenomeno del Word Order da differenti prospettive sia in termini metodologici che in diversi ambiti disciplinari.

Il principale obiettivo degli studi riportati nel Capitolo 1 è esplorare le strategie linguistiche che le persone decidono di usare nel momento in cui gli viene chiesto di generare frasi partendo da elementi che sono presentati visivamente. La manipolazione sperimentale di questo primo set di studi consiste nella sistematica variazione dell'ordine di presentazione di sequenze di tre immagini rappresentative di un Agente (Ag), un Ricevente (Ric) e l'Azione (Az) che lega i due attori della situazione (per esempio, in una condizione si prevede la presentazione sequenziale dell'immagine di una "signora anziana", poi quella di alcuni "dolci" e infine quella di "due bambini", mentre in un'altra condizione l'ordine viene modificato in modo e come prima immagine appare quella rappresentante i "dolci", poi "bambini" e infine la "signora anziana"). Lo studio prevede sei condizioni diverse affinché tutti i sei possibili ordini vengano riprodotti (AgAzRic, AgRicAz, RicAzAg, RicAgAz, AzAgRic, AzRicAg). L'ipotesi di base di questo studio è che, indipendentemente dall'ordine di presentazione delle varie immagini, i partecipanti ricorrano a costruzioni grammaticalmente corrette e frequenti, generando frasi che seguono l'ordine sintattico

canonico previsto dalla propria lingua nativa, quindi Ag-Az-Ric. L'ipotesi che riguarda in modo specifico l'ordine temporale di presentazione, verifica l'applicazione di alcune strategie linguistiche e in particolare l'uso del passivo, in quei casi in cui i partecipanti vogliano rispettare l'ordine di presentazione delle immagini. Dopo uno studio pilota esplorativo condotto con partecipanti italiani, due studi successivi hanno coinvolto partecipanti di lingua italiana (1a) e inglese (1b). Nonostante queste lingue condividano lo stesso ordine canonico (SVO), numerosi studi in letteratura hanno evidenziato che la lingua inglese è caratterizzata da una maggiore rigidità in termini di ordine delle parole. L'obiettivo è stato quindi analizzare se la diversità tra le due lingue rispetto alla flessibilità di ordine, incida sulla conseguente trasformazione delle immagini in frasi.

Nel secondo Capitolo sono riportati due studi che hanno l'obiettivo di studiare come il Word Order possa influire sull'attribuzione causale. I risultati più rilevanti di questo studio mostrano che, sia in Italiano (Studio 2a) che in Inglese (Studio 2b), l'attribuzione causale è influenzata dall'ordine in cui gli elementi compaiono, e più specificatamente, che l'attribuzione è maggiore nei confronti del primo elemento della frase. Nonostante l'agente della situazione descritta riceva sempre la maggior attribuzione di responsabilità, il fenomeno innovativo messo in luce da questi studi risiede nel fatto che, indipendentemente dal ruolo tematico ricoperto, un elemento posto in prima posizione verrà percepito come maggiormente co-responsabile dell'azione descritta.

Nel Capitolo 3, l'attenzione è posta su una possibile mutua influenza, finora non indagata in letteratura, tra l'ordine in cui i binomi linguistici vengono presentati e il tipo di ragionamento causale che può essere influenzato dal focus attentivo suggerito dalla posizione di causa ed effetto all'interno dei binomi. Con l'aiuto di tre studi, si è analizzato se l'ordine di causa ed effetto (per esempio, "il fumo ha un legame con il cancro ai polmoni" vs. "il cancro ai polmoni ha un legame con il fumo") può influire sulla percezione del legame causale. Poiché il termine in prima posizione gode di un vantaggio in termini di focus attentivo, l'ipotesi principale prevede che la percezione del legame causale fra causa ed effetto possa dipendere dalla posizione di questi termini all'interno del binomio. È interessante notare come i risultati mettano in evidenza che invertendo l'ordine di cause

ed effetti è possibile influire sulla percezione di legame causale. L'ordine Causa-Effetto (al contrario di Effetto-Causa), infatti, sembra aumentare la percezione di rischio e diminuire la percezione di importanza rispetto a cause ed effetti in tema di salute e benessere fisico. Inoltre, questa diversa percezione porta anche a scelte salutari migliori oltre all'intenzione di cambiare le proprie abitudini in futuro. Nel Capitolo 4, invece, sono riportati due studi inerenti la relazione tra Word Order e l'intervento in situazioni di emergenza e di pericolo. Utilizzando sia misure implicite ed esplicite, si è analizzato se la diffusione di responsabilità e la probabilità di intervento siano influenzate dall'ordine in cui vengono formulate le richieste di aiuto (Studio 3a) e presentate le situazioni rischiose (3b). Questi due studi rivelano che il linguaggio potrebbe essere considerato come un moderatore per la diffusione di responsabilità e la volontà di intervento, ma il meccanismo sottostante risulta comunque non del tutto chiaro e necessita di ulteriori studi.

Questo progetto di ricerca, dunque, accerta il carattere implicito e sottile ma consistente del Word Order sui processi socio-cognitivi. Il capitolo finale ha dunque lo scopo di fornire una discussione riguardo alle potenziali conseguenze e applicazioni nel campo della cognizione sociale e della comunicazione di massa alla luce dei risultati ottenuti negli studi presentati nei capitoli precedenti.

Introduction

"Order means the right thing in the right place and at the right moment." (Bauman, 2009)

Our daily experiences are in large parts received and transmitted through language. We read news, listen to the radio, talk and type emails and text messages to numerous people everyday. For decades, linguistics, psychologists and anthropologists have been studying language structure, development and use among populations. The relationship between language and human cognition has been a central issue in the field of social psychology. The main question scholars have attempted to answer regards the potential role of language in shaping individuals' perceptions and interpretations. In conveying meaning speakers may use language in either a spontaneous or a strategic manner, affecting the cognitive processes of the recipients through the choice of specific linguistic devices. The impact of language on social cognition has mainly been discussed from a semantic and a grammatical perspective. For instance, some studies suggest that the use of adjectives and nouns hanges depending on the group of people we are speaking about (Semin & Fiedler, 1991); others demonstrate that the choice of adjectives and verbs affects cognitive processes such as causality attribution (Hartshorne, 2014) and intergroup stereotyping (Maass, Salvi, Arcuri, & Semin, 1989). However, the influence of language on social cognition from a syntax perspective has received relatively little attention. Goal of this research project is to investigate the role of Word Order in social cognition. Although Word Order has been studied in various fields, for example, from typological and from linguistic perspectives, this is a first attempt to investigate how the order in which elements appear in a sentence affect social-cognitive processes.

The idea of this research project starts from the fact that Italian is a language that allows, within limits, deviations from canonical word order, above all among dialects. Basically, this

projects aims at exploring whether the order in which people decide to place words in a sentence could be influenced by strategic choices for conveying messages. By imagining the human mind as a blank mental space that is constantly filled with information, we can easily advance that the order in which information comes to our attention influence the temporal and causal link between elements, which in turn can also reveal the importance we attribute to any single element. As we will report below, previous literature has shown that the first element holds the most prominent position in terms of cognitive interpretation. Not surprisingly, I chose as title a provocative "a Time upon Once", to underline the fact that people are used to think and speak following a given sequence. Although I did not change the original meaning of the classical "Once upon a time", it is an attempt to catch the reader's attention by breaking an order that people are used to, hence to create a novel perspective.

A peculiar human feature is the search for order. Indeed, order contributes to give meaning to actions and guide the interpretation of the reality. The previous literature shows that a large part of cognitive processes follows a specific order. Various studies on horizontal spatial bias demonstrate that there is an order according to which we memorize (Bettinsoli, Maass, & Suitner, in preparation), interpret and represent social actions (Maass, Pagani & Berta, 2007; Suitner & Maass, 2008; Boroditsky, 2009; Maass, Suitner, Nadhmi, 2014), imagine the time line (Boroditsky, 2001) and explore space (Maass, Suitner and Deconchy, 2014). This order follows the writing direction of our native language (for example, from left to right for Italian language vs. from right to left for Arabic language). The construct of Agency maps onto this spatial dimension (Spatial Agency Bias, SAB), as agents of the action are systematically located on the left side and recipients on the right side, so that the action has a rightward trajectory (Chatterjee, Maher, & Heilman, 1995; Maass & Russo, 2003, Fausey, Long, Inamori & Boroditsky, 2010). In this way the object positioned on the left side and hence encountered first in rightward writing cultures might also become the reference point in comparison processes (Pratto, Hegarty, & Korchmaros, 2007). Furthermore phenomena such as "before and after" or "cause and effect" are more easily mentally represented if they follow

the space-time trajectory matching the writing direction. Several cross-cultural studies show how different writing directions (Italian vs. Arabic vs. Chinese) affect the mental time line that tends to correspond to the writing direction of one's native language (Boroditsky, Fuhrman, & McCormick, 2010). This previous literature suggest a mutual influence between temporal and spatial dimension and the order: if on one hand order seems to imply temporal and spatial aspects, on the other hand both time and space elicit the idea of order. For this reason, the present project aims at investigating if different aspects of order, including temporal sequences and spatial positions, affect social cognitive processes.

Given that word order emerges as an important factor in social cognition across so many different lines of research, we wondered whether it is language that creates an order to interpret the situation, and whether, starting from their interpretation of a given situation, speakers choose a specific word order to represent the events. Thus we are interested in the bi-directional between word order in language and social cognitive processes.

Word Order: Definition, differences and variation across world languages

There are about 7000 extant languages that differ in syntactic, semantic and typological features: some characterized by hundreds of sounds, others with just a couple, some with a rightward writing system, some with a bottom-up writing system. Word Order is a typological property of languages, which refers to the ordering of subject (S), object (O), and verb (V) in transitive sentences. There are six logical ways to order subjects, objects and verbs and these are SOV, SVO, VSO, VOS, OVS, and OSV. The first variation across languages consists in the number of possible orders allowed in a given language. For instance, English generally uses an order in which the subject precedes both the verb and the object, which, in turn, means that English is a SVO language. By the same logic, in Welsh the verb is generally placed before the subject and the object and, hence, Welsh is classified as a VSO language. However, Bates, McNew, MacWhinney, Devescovi and Smith (1982), evidenced that some languages, including Italian, allow

the use of different orders even though they are defined as SVO languages. Yet other languages (e.g., German) use different Word Orders according to grammatical rules (e.g., German requires the inversion of subject and verb when introducing a relative clause) and for this reason they are recognized as having no dominant order (Dryer, 2011).

Although there are six possible combinations in which subject, object and verb can be arranged within a sentence, several cross-linguistic studies have demonstrated that the distribution of word orders across the world languages is not equal and regular (Dryer, 2011; Greenberg, 1963; Tomlin, 1986). As can be seen in the Table 1, the subject-first word orders are over-proportionally distributed with respect to both verb and object-initial word orders (Dryer, 2011).

Order of S, O and V	Number of languages	%
SVO	565	41%
SOV	488	35%
VSO	95	7%
VOS	25	2%
OSV	11	1%
OVS	4	0,3%
No Dominant Order	189	14%

Table 1. *Distribution of word orders across world languages (Dryer, 2011)*

Within the field of linguistics there are three main approaches to explain the reason behind such an irregular distribution of word orders across languages: the generativist approach that analyzes language as a set of innate universal principles (Chomsky, 1986; Gibson, Piantadosi, Brink, Bergen, Lim and Saxe, 2013; Greenberg, 1963), the functionalist approach that focuses on the purpose that language serves (Song, 2000; Tomlin, 1986), and the connectionist approach that speaks about language as strictly connected with the human mind (Lupyan & Christiansen, 2002). In contrast to the generativist approach that traces language back to universal principles, functionalist authors argue that the frequency of a certain word order depends on human communicative needs. According to Tomlin (1986) word order frequencies are a consequence of

more fundamental or general linguistic principles. Three principles are presented in his work, namely the "*theme-first principle*", "*verb-object bonding*" and the "*animate-first principle*" (Maurits, Perfors and Navarro, 2010). Thus, the ordering of words reflects their function when (*a*) old information comes before new one (Theme-first principle); (*b*) verbs are more closely linked to the object than to the subject (Verb-Object bonding) and (*c*) subjects precede objects (Animated-first principle). Following Tolmin's logic, these principles do an excellent job of explaining the observed word order frequencies and their unequal distribution; the frequency of each word order is proportional to the number of the principles that a given word order satisfies. All three principles are satisfied in SOV and SVO, two (a and c) are satisfied in VSO, one (b) in VOS and OVS, and none in OSV. Hence, the functionalist perspective considers the most frequent word orders as the most functional for communicative purposes (Song, 2000; Tomlin, 1986). However, recent research argues that it is not clear why and how these principles work because they are primarily prompted by the fact that a large body of cross-linguistic data is in line with them. Basically, they represent an assumption based on the data. Thus, offering them as explanation of the results of that data, would make it a circular argument (see Maurits, Perfors and Navarro, 2010).

Nevertheless, data demonstrate that over time languages drifted away from SOV to a greater extent than they moved towards SOV. Givón (1979) stated that languages have changed from SOV to VSO and from VSO to SVO, while Gell-Mann and Ruhlen (2011) have observed a change from SOV to SVO and from SVO to VSO (Gell-Mann & Ruhlen, 2011; Givón, 1979). The reason behind these changes may lay in the fact that the structure of languages changed over time according to people's communicative needs. Hence, the existence of languages originally ordered in SOV, which are now classified as either SVO or VSO languages, may discredit the functionality of SOV as claimed by the functionalist approach.

The connectionist approach in contrast to the functionalist one, considers language as strictly connected with the human mind. Therefore, the unequal distribution of word orders across languages may depend on the complexity of some word orders. Tabullo et al. (2012) evidenced that

orders that are easier to learn are those that occur more frequently across languages. Evidence for this assumption has been provided by studies applying the paradigm of "artificial language learning". Tily, Frank and Jaeger (2011) trained a group of English participants with an artificial language, ordering of the words was manipulated. Results show that participants learned SOV and SVO languages better. A study with a Spanish population (Tabullo et al., 2012) mirrors these results, suggesting a cross-linguistic preference for subject-initial word orders. Together these studies suggest that there is agreement on the learnability of word orders with higher frequency (SOV, SVO), and hence, that there are some orders that come more naturally and are easier to learn (Grüning, 2003), presumably due to the fact that these orders match basic cognitive processes better and/or reduce ambiguity in communication. In fact, because of biological and cognitive constraints, verb initial word orders are more difficult to learn and, hence, also less frequent (Grüning, 2003; Tabullo et al., 2012; however see Lupyan & Christiansen, 2002; Tily, Frank, & Jaeger, 2011 for contradicting evidence).

Switching from SOV to SVO order: evidence from the gesturing literature

The high frequency of SOV order across the world's languages has been explained by two different accounts. From the one point of view, SOV might have been the basic word order of the ancestral language, thus its predominance is given by the privileged status it had in the past (Gell-Mann & Ruhlen, 2011; Givón, 1979; Newmeyer, 2000; Maurits & Griffiths, 2014). From a different perspective, a preference for SOV derives from studies on gestural communication, which have focused on the ordering of elements. Sign languages spontaneously emerging within deaf populations have shown a consistent preference for SOV, although spoken languages in the environment follow different word orders (Goldin-Meadow & Alibali, 2013; Sandler, Meir, Padden, & Aronoff, 2005; Senghas, Coppola, Newport, & Supalla, 1997). Goldin-Meadow and colleagues (2008) have observed the structure of homesigns around the world, finding a cross-linguistic trend in the ordering of its constituents. Children from the United States, as well as children from China

and Turkey, organize their sentences by arranging subjects before verbs and objects before verbs, which reflect a SOV order (Goldin-Meadow, Özyürek, Sancar, & Mylander, 2008). Interestingly, this preference for SOV order in emerging sign languages does not seem to result from external influences. In fact, Goldin-Meadow and Mylander (1998) have recently shown that home signs, the spontaneous signed languages created by deaf children in the absence of any prior linguistic input, are OV.

In order to investigate if SOV order is somehow more "natural" for the human mind, gestural communication has been studied through experimental designs. Goldin-Meadow and colleagues (2008) investigated how unimpaired speakers order sentence elements when asked to represent simple events with gestures. In this study, participants were speakers of four different languages – English, Spanish, Chinese and Turkish – and had no knowledge about conventional sign languages. Participants were shown a total of thirty-six vignettes, each depicting an Act (a motion event), an Actor (a character who performs an action) and a Patient (an entity who undergoes it). In one condition they were asked to use gestures in order to convey the meaning of each vignette to another participant. In the other condition, they were invited to reproduce the meaning of the situation illustrated by stacking sets of transparent pictures. In both cases participants represented the events in the *Actor-Patient-Act* order, which matches the SOV syntactic order. Interestingly SOV is the basic word order in only one of the languages assessed (Turkish), which means that people do not rely on their native language when asked to communicate by gesturing (Goldin-Meadow et al., 2008). These results were replicated by Langus and Nespor (2010), who conducted four experiments with Italian and Turkish participants. The first experiment applied the methodology used by Goldin-Meadow and colleagues, thus participants were shown a set of thirty-two vignettes of simple motion events and asked to gesture the situation presented. In the second experiment participants had to represent, through gestures, vignettes depicting complex events, which contained either a main or an embedded clause. Where the first and second experiments regarded gesture production, the third and fourth investigated gesture and speech comprehension. In

the latter case, participants were presented with, respectively, video and audio description of motion events. Then they were asked to choose between two vignettes, one of which corresponded to the stimulus watched or heard. For each vignette, the order of its constituents was varied systematically and reaction times of responses for different orders were measured. Regarding the production tasks, participants showed a preference for SOV order in gesturing simple motion events. Interestingly, in gesturing complex events involving more than one sentence, the typical construction of SOV languages was ignored: when subordinate clauses were embedded within the principal ones, participants gestured the subordinate clause immediately after the main one, mainly following SVO rather than SOV order. The cross-linguistic robustness of these results suggests a preference for different orders that can not be attributed to the participant's native languages, given that Italian is a SVO and Turkish a SOV language. The syntactic structure of participants' language was bypassed even in the gesture comprehension task, with SOV order being recognized faster than others. Participants relied on their language only in the speech comprehension task: reaction times of SVO sentences were lower for the Italian sample, whereas the Turkish sample responded quicker to SOV sentences. Langus and Nespor agree with Goldin-Meadow and colleagues in explaining the preference for SOV in improvised gestured communication: the sequence of subjects, objects and verbs seems to match the order with which events are mentally represented (Goldin-Meadow et al., 2008; Langus & Nespor, 2010). Nevertheless, they rejected the assumption of SOV as a "natural" order for human language because through their fourth study (*comprehension task*), they demonstrated that the computational language system favors SVO order (Langus & Nespor, 2010). The most interesting result of Langus and Nespor's study (2010), in line with gestured paradigm studies, is the demonstration that there is a preference for SOV in improvised gesture communication, but, more relevant, and different from other studies, the authors provide evidence that this bias can be outweighed when participants are asked to express complex sentences through gestures. These results have been extended by Gisbon and colleagues (2013) who investigated which order would be preferred in gesturing sentences that involved inanimate and human objects.

Participants were English, Chinese and Korean speakers and results showed a cross-linguistically consistent preference for SOV order when objects (agent and patient) in the events were inanimate or when the agent was animate and the patient inanimate (*irreversible events, e.g., "The boy feeds his dog" or "My father moved the box"*). In contrast, when both the agent and the patient are human, participants become more likely to use the SVO word order, especially in reversible events ("*Paul hugs John*", "*Peter pushes Erick*"). A possible explanation for this pattern of results, which is independent from participants' native language, is the fact that in SVO two potential agents are not presented at the same side of the verb, which reduces ambiguity (e.g., Paul hits Alex). Results suggest that although SOV may be the default cognitive order, speakers may choose other orders that avoid possible noise (Gibson et al., 2013). Interesting suggestions come from Hall et al.'s study (2013) that confirmed the SVO preference in describing semantically reversible events and they explained it as a function of role conflict. By asking to gesture action, individuals were more likely to put themselves in the agent role and, hence, the proximity of subjects and objects in SOV order may generate ambiguity regarding which role has to be played, therefore speakers may switch from SOV to SVO order (Hall, Mayberry, & Ferreira, 2013).

Basic and Flexible Word Orders

Previous studies have demonstrated a consistent preference for SOV and SVO orders in arranging the sentences' syntactic elements (Goldin-Meadow et al., 2008; Goldin-Meadow & Alibali, 2013; Gibson et al., 2013; Hall, Mayberry, & Ferreira, 2013; Langus & Nespor, 2010). Moreover, as shown by typological data, these orders are also the most common in world languages (Dryer, 2011).

Sentences are composed of different elements, which can be combined in different ways to create different meanings. The organization of words in a sentence produces its meaning. For instance, Bates, McNew, MacWhinney, Devescovi, & Smith (1982) studied sentence comprehension with Italian, English and German speakers and found that English participants

interpreted simple sentences mainly by relying on word order, Italian participants made use of semantic cues, and German speakers relied on case marking. According to the authors, these different strategies may arise from the pragmatic use of word order in informal settings: speakers of languages in which word order variation is greater might use semantic/pragmatic cues in language comprehension (Bates et al., 1982). In her study of linguistic typology, Song (2001) found that there are two ways of ordering sentence elements in languages: *basic* word order and *flexible* or free word order. By the same logic, Johnson (1998) distinguished between "syntactic" and "pragmatic" word order. In syntactically ordered sentences, the sequence of the elements is determined solely by grammatical functions, whereas in pragmatically ordered sentences the sequence of the sentence elements seems to be determined by the communicative intention of the speaker. In fact, even languages with a predominant word order generally allow exceptions, especially in spoken language and in languages with case marking (Bentz & Christiansen, 2010). Rather than arranging words in line with syntax (canonical order), speakers may use a flexible order to draw attention to a specific element of the sentence (Johnson & Braber, 1998; Song, 2001), for instance by positioning the most relevant element first (non canonical order, e.g., " *a watch we could give him because he is always late*"). In fact, some psycholinguistic researchers have also noted that the use of non canonical structures is motivated by discourse-pragmatic factors which need to be considered when comparing the processing of canonical and non canonical orders, since canonical orders are not subject to the same degree of discourse dependence (e.g., Bader & Meng, 1999; Kaan, 2001).

Human languages differ in the amount of word order flexibility they permit. As pointed out by Kaiser and Trueswell (2004), for instance, English has a fairly rigid word order such that if the word order of reversible sentences (e.g., John kicks Erik) is changed, the meaning of the sentence also changes. The reason behind this difference in meaning lays in the fact that word order in English helps to encode relations across elements revealing the thematic role of the sentence (e.g., who hits whom). However, other languages, such as Finnish and German, identify roles and relations more easily by case marking on the nouns. Languages differ with respect to the amount

and type of word order violations they tolerate, with some languages being relatively rigid and others allowing speakers to deviate from the canonical word order to transmit messages in a more pragmatic way. An emblematic case of the pragmatic use of word order is one in which an element is placed first in order to draw attention to it. There is ample evidence that the first element receives disproportionate attention, which in turn leads to a memory advantage (*primacy effect*). Interestingly, first positioning enhances attention and accessibility above and beyond any syntactic (S vs. O) or semantic (agent vs. patient) consideration and regardless of the specific language (Gernsbacher & Hargreaves, 1988; Carreiras, Gernsbacher, & Villa, 1995; Kim, Lee & Gernsbacher, 2004). The first element may gain a special position in the listeners and readers' mental representation because it permits the mapping of the subsequent information: if so the first element might be the most vividly stored in memory and consequentially the most accessible. In a series of experiments Gernsbacher and Hargreaves (1988) found this primacy effect. They showed participants sentences containing nouns of two human characters, followed by questions about the described event. Results were consistent across all experiments, demonstrating that participants recalled the first noun better than the second. Similarly, MacWhinney (1977) stated that humans are directly involved in the processing of language through an active construction of a perspective and usually the perspective is the first element of the sentence, which becomes the starting point for organizing the following information (MacWhinney, 1977).

Word Order and meaning in causal and temporal dimension

Does word order also carry meaning and hence affect how utterances are interpreted? Scholars of linguistics such as Givòn (1992, 1993) and Finegan (1999) have long argued that syntactic rules provide meaning and that cross-language differences in syntax rules have consequences for interpretation. Empirical evidence for the role of word order in creating meaning comes from several lines of research that are not directly concerned with the ordering of S, O and V, but that speak, at a more general level, to the cognitive implications of word order. Particularly

relevant for our argument is research showing that the first element channels the interpretation of subsequent information and that it carries specific meaning in terms of agency and causality.

Besides attracting attention, the first element has an over-proportional weight in the interpretation of subsequent information. In his seminal work, Asch (1946) found that the first trait describing a target person had the greatest weight in impression formation, presumably because any subsequent information is interpreted in the light of the first (Hamilton & Sherman, 1996). Besides guiding interpretation, word order also reveals specific meaning as convincingly shown by research on binomials (Hegarty, Watson, Flechter, & McQueen, 2011; McGuire & McGuire, 1982; Mollin, 2012). Mollin's (2012) extensive corpus analyses show that many binomials have a predominant order (*brother and sister, Spring and Summer*) and that some are particularly unlikely to appear in reverse order (frozen binomials). Binomials with a strong canonical order and a low degree of reversibility show specific semantic constraints, such that the first term will be the more powerful and more agentic. According to the literature, the order of nouns in binomials reflects the relationship between their referents in the real world. For instance there is experimental evidence that the first mentioned element is perceived as more active and potent (Johnson, 1967), that typically masculine individuals are named before feminine ones (Hegarty et al., 2011), that higher status groups tend to be mentioned before low status ones (McGuire & McGuire, 1982), that animate nouns precede inanimate ones (McDonald, Bock, & Kelly, 1993) and that positive nouns precede negative ones (Rozin, Berman, & Royzman, 2010). Thus, both linguistic and social-psychological work suggests that binomial word order is not random, and that the first element conveys, among others, a relative advantage in terms of agency, power, status, and masculinity. The binomials also become an implicit mode to compare two terms, two objects, two persons, systematically positioning the point of reference in the first position (Pratto, Hegarty, & Korchmaros, 2007). The literature on comparative judgments suggests that the first term is the starting point of comparison; for instance, recent studies show that language manipulations may change the attribution of the relative power and status to women and men (Bruckmüller, Hegarty, &

Abele, 2012). Bruckmüller and collegues asked participants to read sentences concerning gender differences in a leadership context, framed either in terms of how women differ from men (rendering men the linguistic norm) or in terms of how men differ from women (rendering women the linguistic norm). Results revealed that framing differences in terms of how women (as the effect to be explained) differ from men (as the linguistic norm) enhanced beliefs about men's higher status and greater power in society; it also led to greater acceptance of these inequalities as legitimate, and it caused participants to endorse gender stereotypes of men as agentic and women as communal more than when differences were framed in terms of how men differ from women (Bruckmüller et al., 2012).

Particularly relevant to our research is the question whether and how word order affects cognitive processes. The above-mentioned archival research by Mollin (2012) has shown that the first element of fixed-order binomials tends to be chronologically antecedent to the second (Spring and Summer, before and after) and the cause rather than the effect (trial and error). The author stressed that the degree to which a binomial adheres to the sequencing constraint leads to a greater frozenness of the binomial itself.

A conceptually similar finding emerges from research on situation models in text comprehension that focuses on clauses and sentences rather than on single words (Johnson-Laird, 1983; Zwaan & Radvansky, 1998). Authors have suggested that humans comprehend narrative texts by tracking information about the characters involved in a story, find their position in time and space, and construct temporal and causal representations. While reading the story, people build a situational model, a mental representation of the text's content, which has to be updated every time a new piece of information is encountered (Gernsbacher, Goldsmith, Robertson, 1992; Segal, 1995; Zwaan & Radvansky, 1998). According to the iconicity assumption (Hopper, 1979), in the absence of explicit linguistic markers (e.g., before, because) readers/listeners tend to deduce both chronological order and cause-effect relations from the order in which events are narrated, assigning earlier elements temporal and causal primacy over later elements. Therefore, text

comprehension is generally impaired when the narrative order does not match the chronological or causal order of events (Ohtsuka & Brewer, 1992). Moreover, starting from temporal information individuals usually infer causal relations between events. People generally expect that causes are narrated before effects, perhaps because this is the order in which they perceive "natural" causality. Thus, research on binomials and on situation models concur that the order in which words or clauses are encountered provides information about temporal and causal links between events.

However, as I will hypothesize in this Thesis, word order may not only convey information regarding temporal and causal links between events, but it may also affect other social-cognitive processes such as risk perception. If confirmed, word order may be a powerful tool of communication. In fact, in order to reach achieve its target and to achieve its goals, verbal communication must be appropriate, effective and expressive. Word order is a language feature that provides speakers with ways to express ideas effectively. We have seen throughout this brief literature review that word order is able to focus the listener's attention on certain parts of the message, driving the interpretation of a given message and helping to distinguish between old ad new information. The main question addressed in this Thesis is therefore whether the order of words within sentences influence individuals' perception.

Aims of the present research

The above review shows that word order is related to the mental representation of events, affecting the way in which we convey or interpret information. In particular, research in linguistics provides evidence that word order drives sentences processing and shapes interpretation. However, relatively little is currently known about the effects of word order in the social-cognitive domain. With the exception of studies regarding linguistic binomials (Hegarty, Watson, Fletcher & McQueen, 2011; Mollin, 2012) and situational models (Zwaan & Radvansky, 1998), there is a surprising lack of research on the potential role of word order in social cognition. The present research project represents one of the first attempts to explore word order effects in social cognitive processes. Assuming that events are sequentially processed following the order in which elements are disposed within a message and that the first term takes advantage over the others, one may easily envisage a number of possible bi-directional links between language and cognitive processes in interpreting and representing events. In this Thesis I will report research investigating the effects of word order with regard to four questions.

In the first Chapter on **linguistic production**, following a longstanding research tradition in linguistics (see Bates & MacWhinney, 1982, Pickering, Branigan & McLean, 2002), I investigate how visually presented elements of an event (e.g., 3 pictures representing: grandma, small children, offering candies) are transformed into sentences in a sentence production task. I will report 2 studies, involving Italian and English speakers, investigating how visually presented scenes including agents, patients and acts (e.g., grandma- children - offering candies) are transformed into sentences. Since visual images contain no linguistic cues (such as case and temporal markers), participants are free to arrange the elements within obvious semantic limits (e.g., it is more likely that the grandma is the agent and the children the patients rather than vice versa). I argue that people will, on one side, reproduce the canonical word order of their language, while, on the other,

trying to maintain the same order in which the elements were observed. Thus, the first general aim of this research project is to investigate whether the order in which elements are observed drive the use of different linguistic strategies in transforming images into text.

Second, I will address the question whether word order affects **causal attribution**. Causal attribution is a fundamental process that operates in numerous social contexts, from legal decisions over student evaluations up to self-esteem maintenance. If the first element attracts greater attention and implies greater agency, as prior research suggests, then causal explanations may be affected by word order in an analogous way, with disproportional weight given to the first element. Thus, the main aim of Chapter 2 is to show that, by changing word order, the causal attributions of events shift in predictable ways.

Third, taking this argument one step further, I will investigate whether the link between two elements (e.g., cancer and smoking) changes as a function of word order. I argue that **causal reasoning** in the health domain is affected by word order in the following way. On one side, by mentioning the cause (e.g., smoking) before the effect (e.g., cancer), the risk perception will increase, assuming that the (first mentioned) risk element attracts the attention. On the other side, the perceived personal relevance may show an opposite pattern; by mentioning the effect first, the personal consequences (cancer) come to the forefront. The main aim of Chapter 3 is therefore to understand the role of word order in health-related reasoning, with potential implications for health campaigns.

Fourth, I will explore whether the order in which help requests are formulated affect the **likelihood of intervention**. Given that the first term occupies the most prominent position and catches the attention of readers and listeners, I hypothesize, on one hand, that help requests are more effective when positioning the second singular pronoun in the first (rather than last) position ("you, help me" vs. last position, "help me, you"). On the other hand, I investigate whether the order in which a danger situation is communicated can influence the speed and the ease with which individuals recognize the situation as dangerous and decide to intervene.

In sum, the different roles that word order can play are therefore investigated with respect to different social cognitive processes, including causal attribution, risk perception, and emergency intervention. Given the almost unexplored nature of word order from a social psychological perspective, this research project aims at exploring the potential consequences of word order for cognitive processes. I am not claiming that word order is the only, or even the most important cue on which individuals rely in interpreting and perceiving events, but I believe that word order is a subtle, yet powerful tool in shaping social cognition.

Chapter 1: Word Order and Strategies in Linguistic Production

General introduction to studies

The fundamental features of language knowledge are production and comprehension. Linguistic skills imply the speakers' ability to generate and understand countless and different sentences in their native, and in some cases also in other, languages.

Humans are often asked to interpret and code events. In modern times they principally communicate events using language, whether spoken, written or typed. At the same time, also the communication based on the visual representations of objects and situations has increased significantly. We usually share images in e-mails, messages and through social network platforms, we interpret road and emergency signs and we communicate our emotions through a brand new iconic language, namely, the emoticons language. Verbal language (written or spoken) differs from visual language (images and drawings), because it relies on complex rules based on syntactic, orthographic and grammatical relations. The two codes are often used interchangeably, and translation from one to the other is a task that we daily perform. For example, we may comment that we cannot park there, after observing a corresponding street sign or we describe the content of a child's drawing. Besides semantics, on which cues can people rely to correctly interpret drawn messages and how are such visual images translated into a more complex written and spoken language?

The prime interest of this project consists in investigating whether order of presentation contributes in transforming pictures into verbal sentences. Pictures, indeed, lack syntactic, orthographic and grammatical aspects generally belonging to written and spoken language, nonetheless they are easily turned into sentences. Besides semantics, other aspects may play a critical role in this translation. The focus of the present chapter is to verify whether order is a feature that takes a role in this process. Specifically, I hypothesize that presentation temporal order

affects how images are translated into words given that we can interpret one element at a time following a spatial succession. I expect the serial processing of images to be mirrored in the syntactic arrangement of the sentence. Temporal presentation is the aspect that most resembles the idea of Word Order. As I am trying to demonstrate with this project, word order is an important structural cue in language as it drives individuals to consider elements one at a time following a given order and that this temporal ordering contributes to the psychological ordering of the given elements.

In order to account for differences in sentence comprehension and production with regard to word order, we need, at first, to focus on research involving gesture-comprehension and gesture-production. These studies investigate the cognitive bases of the two most common word orders among languages: SOV and SVO. Langus and Nespor (2010), through 4 studies with Italian (SVO) and Turkish (SOV) participants, proposed that it is possible to dissociate communication from grammar, advancing the hypothesis that the high diffusion of SOV order among languages is due to cognitive mechanisms involved in pre-linguistic communication, such as gesturing. The authors hypothesized that improvised gesture production, as well as comprehension, are not mediated by the computational system of grammar. With three different gesture-production studies, they were able to demonstrate that both Italian and Turkish participants, regardless of their different native canonical order (SVO vs. SOV, respectively), are more likely to gesture and interpret gestured-sentences following a SOV order. This result demonstrates that improvised communication does not rely on the computational system of grammar. Conversely, and supporting the prominence of SVO ordering, when participants were required to comprehend strings of orally flat sequences of words without intonation in their native languages, Italian (SVO) and Turkish (SOV) participants were fastest in choosing the corresponding vignette after hearing sequences in which the words appeared in the order of their respective native language. In this latter comprehension task, Italian and Turkish participants' performance was compared across all the six possible word orders. Finding showed that both groups after hearing word order sequences where the Object follows the Verb

(SVO, VOS, VSO) where faster in recognizing the corresponding vignette with respect to when they heard word sequences where the Object precedes the Verb (OSV, OVS, SOV). Given that Turkish is an Object–Verb language, the findings of this last experiment provided strong evidence for the Verb–Object order preference in the computational system of grammar. Although it is difficult to establish whether a non-native word order is computationally better for speakers of a language that has a different canonical order, there are many reasons, both theoretical and based on language change (as reported in the general introduction), suggesting a preference for the SVO order (Newmeyer, 2000). Even if Langus and Nespor demonstrated that under certain circumstances participants are more likely to show better performance in their native order, they also produced evidence that SVO is the preferred order in the computational system of grammar (Langus and Nespor, 2010). Related to the predominance of SOV and SVO orders, these studies highlighted some interesting cues. The fact that participants chose the correct vignettes faster after seeing gestured videos in the OV rather than in VO order, shows that this link prefers word orders where the Objects comes before the Verbs and that it is not mediated by computational system of grammar. By contrast, during the comprehension of artificially synthesized words in their native languages, participants were fastest in choosing the correct vignette after hearing sequences of words in their native word orders. This result evidenced that the computational system of grammar is involved in processing the word sequences. More relevant, both groups showed shorter reaction times on VO order, suggesting that also the computational system of grammar has a word order preference that is independent of participants' native language.

In order to account for differences across spoken, written and visually represented language, we need also to focus on one of the most relevant models referring to sentence processing, the "*competition model*" (Bates & MacWhinney, 1982). Bates and colleagues (1982), by proposing this model from a functionalist perspective, hold that "the forms of natural languages are created, governed, constrained, acquired and used in the service of communicative functions". Through

several cross-linguistic studies on children and adults, authors demonstrated that the interpretation and processing of sentences depend on numerous cues. In one of these studies, MacWhinney, Bates and Kliegl (1984) compared adult English, Italian, and German speakers with respect to sentence processing. Experimental manipulations consisted in systematically varying cues such as word order, agreement, animacy and stress. Among the numerous aspects involved in sentence interpretation, the authors chose these four types of cue because they differ somewhat between the three investigated languages. Based on previous studies of MacWhinney (1978) and Bates at al. (1982), authors determined the choice of these four types of cue on a distinction between *cue applicability* and *cue reliability*. In comprehension, cues are high in applicability if they are available when you need them, and cues are high in reliability if they are never ambiguous. Consequentially, the most valid cues are those that are high both in applicability and in reliability. Therefore, the main hypothesis tested in MacWhinney et al. study (1984) is that cue validity is the primary determinant of cue strength and, hence, certainty of choice in sentence interpretation. The most relevant result of MacWhinney et al.'s study highlights that the strategies in interpretation of sentences vary across even closely related languages. In particular, when asked which of two nouns was the actor, English speakers relied primarily on word order assigning the actor role in transitive sentences to the first noun, Germans relied on both agreement and animacy, and Italians showed an extreme reliance on agreement. With regard to competition model, these findings imply that the word order has a different weight among the three languages in terms of sentence processing and comprehension. The sentence processing literature suggests that the interpretation and the comprehension of a sentence in real-time is based on a complex cognitive mechanism, involving a multiplicity of cues. Most theories of linguistic production assume that, while producing a sentence, speakers generate a representation of its structure, encoding the relationship between elements as well as their order. There are principally two approaches regarding the underline process: on one hand, Hartsuiker and Westenberg (2000) propose a two-stage approach according to which individuals first establish the hierarchical relations between elements and, then,

place elements in their final order. On the other hand, Pickering, Branigan and McLean (2002) believe that hierarchical relations and linear order are determined at the same time. These two approaches are still under debate, as they have crucial implications for theories regarding language production. Several studies involving structural priming (Pickering et al., 2002) and agreement errors (Franck, Vigliocco & Nicol, 2002, Haskell & MacDonald, 2005) seem to respectively account for one-stage and for two-stage approaches failing to identify converging evidence for one over the other approach.

From another perspective, McDonald, Bock and Kelly (1993), examined three factors that can exert control over word order options allowed by language in terms of priority, accessibility and ease of retrieval. By investigating animacy, word length and prosody in two different tasks (recall and judgment tasks), authors found selective effects of animacy in recall task: animacy seemed to be more involved in grammatical role assignment than in word ordering. Word length had no significant impact and, in fact, short words did not appear earlier with respect to longer words (as seen in Zipf, 1949). Finally, prosody revealed a weak effect on word order only in isolated cases, namely, in absence of animacy contrast. By contrast, in judgment tasks, they found that animate nouns and short words were preferred in each type of proposed sentence suggesting a potential asymmetry between comprehension and production related to word order variations. Findings of this study supported the hypothesis according to which conceptual (*conceptual accessibility*, Boch, 1987), but not lexical and phonological factors play a critical role in grammatical role assignment and in positioning elements within a sentence.

With respect to the role of animacy in grammatical assignment and word order during linguistic production, recently Branigan, Pickering and Tanaka (2007) showed that animate entities are conceptually highly accessible and are therefore retrieved more easily than inanimate entities. By carrying out a cross-linguistic study, they demonstrated that animacy can simultaneously affect both grammatical assignment and word order: Because language production is incremental (entities

are conveyed one at a time), easily accessed information is processed first, hence, animate entities tend to be privileged during production processes. Furthermore, there is good evidence that the accessibility of syntactic information influences syntactic choices: speakers are more likely to use a particular structure if it has been made more accessible through previous production or comprehension (e.g., structural priming, Bock, 1986; Hartsuiker & Westenberg, 2000).

Back to this thesis goals, I am interested in how people interpret and generate sentences starting from elements that are visually and sequentially (one by one) represented. With regard to the previous literature, I wonder whether the *sequential order* of images can be considered an additional cue on which people rely when interpreting images given the absence of grammatical and syntactic cues such as, for example, agreement and intonation. Thus, I am also interested in investigating which are the cognitive and linguistic strategies applied by individuals while they translate images into text.

The idea of these studies arises from the fact that word order is not only a temporal feature of spoken and written language feature, but it is also intrinsically linked to space. Chatterjee, Southwood and Basilico (1999) found that (North American) individuals tend to match drawings and sentences easier when agents are placed to the left of patients following a left-to-right direction in representing actions. They also found that sentence-picture matching was much easier for verbs such as "push" that imply an action that moves away from the agent (see upper left portion of Fig. 1.1) than for verbs such as "pull" that express an action that moves toward the agent (see lower left side of Fig. 1.1). Thus, thematic role assignments (e.g., *who does what to whom*) seem to depend not only on the spatial position of the relevant elements (agent and patient) but also on the direction implied by the verb.
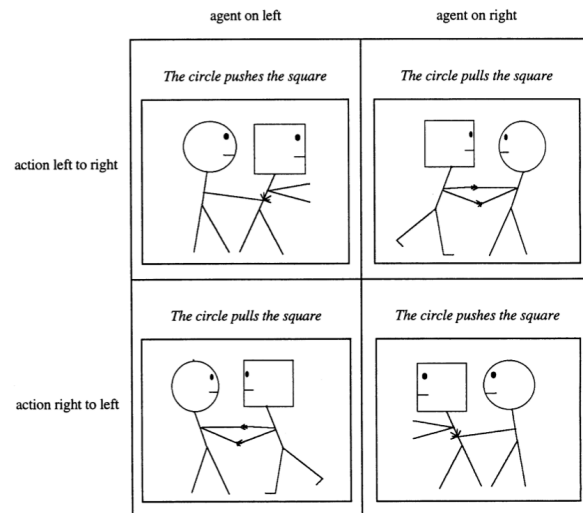
	agent on left	agent on right
action left to right	*The circle pushes the square*	*The circle pulls the square*
action right to left	*The circle pulls the square*	*The circle pushes the square*

Figure 1.1. *Examples of pictures used in sentence picture matching task in Chatterjee et al.(1999), Study 3.*

With regard to word order, a distinction between the ordering of syntactic and semantic constituents is needed. In a transitive sentence like *Peter hugs Emily*, Peter is the subject and Emily is the object. Within this sentence, the subject and the object play a syntactic function. Furthermore, Peter is also the character initiating the action, whereas Emily is the character undergoing it. From a semantic point of view Peter is called the agent and Emily is called the patient. In declarative active sentences the syntactic role of the subject and the semantic role of the agent overlap, although in switching from the active to passive voice things change. In the sentence *Emily is hugged by Peter* the grammatical subject represents the patient of the action, thus the semantic roles have not changed while the syntactic roles have. Although they are distinct concepts, semantic and syntactic roles are significantly correlated. As demonstrated by a large number of world languages, the subject of a sentence is more likely to be also the agent and the object is more likely to be the patient (Tomlin, 1986). The syntactic shift between active and passive verbal forms is an important aspect of theoretical linguistics since it involves also a change in word order (i.e., the patient takes the place of the agent) (Chomsky, 1957). How speakers choose an active or a passive construction among the syntactic options has been widely discussed in the last decades.

Bock (1986) argued that a structural prime is able to activate the corresponding concept that will tend to occupy the earliest position in the sentence. Other studies have shown that also nouns that are concrete and imaginable (Bock and Warre, 1985), prototypical (Kelly et al., 1986) and animate (Bates & MacWhinney, 1982; Bock, 1982) tend to be placed in first position. These features are commonly considered to belong to the agent, which, in turn, means to generate an active sentence. This tendency to place agents in the subject position may be one of the reasons behind the higher frequency of active over passive sentences in English (Quirk et al., 1972) and why there are more languages without (211) than with (162) passive constructions (according to the WALS, Siewierska, 2013 in Dryer & Hasperlmath, 2011). According to the thematic hierarchy (i.e., ordering of thematic roles by prominence, agent-first vs. experiencer-later, Grimshaw, 1990), Ferreira (1994) proposed that the choice of active (vs. passive) voice could depend on the type of the verb combined with animacy of the actor (animate vs. inanimate entities). She labeled *theme-experiencer verbs* those types of verbs that assign the role of the *theme* to the subject of an active sentence and *experiencer* to the object (e.g., in the phrase *Bill amazed Tom*, Tom is the experiencer of the emotion and Bill is the theme). So, she distinguished between agent-theme and theme-experiencer verbs and she demonstrated that both the thematic structure of the verb and the animacy of the elements influenced the participants' choices between active and passive sentences. Theme-experiencer verb elicited more passive sentences than agent-theme verbs and this effect occurred also when both the elements were animate.

With regard to studies concerning the role of animacy in affecting word order, authors claim that the tendency, for instance among English speakers, to produce passive descriptions for pictures that involve inanimate agents and animate patients (e.g., Bock et al., 1992) might be due to a preference for establishing the animate entity as the sentence subject. Consequently, when the animate entity is an agent, the choice will imply the production of an active sentence, whereas, when the animate entity is a patient, this will result in the choice of a passive sentence. However,

this pattern of preferences may be explained in terms of preferences for alternative word orders: speakers might prefer to position an animate entity early in the sentence (Branigan et al., 2007).

In considering the use of the passive form with regard to the order in which elements appear in a sentence, interesting studies have been carried out in social psychology. For instance, Bohner (2001) identified subtle effects of word order in blaming the victims of sexual violence: Reporting rape events in passive form requires to place the victim in the first position (Patient-Verb-Agent e.g., "a woman was raped by a man") enhancing the responsibility of the victim for the described action. Although these results can be considered confounded by the fact that the author did not test separately the role of order and the use of passive or active voice, they highlight that, when the patient of the action appears in the first position (taking the place of the sentence subject), s/he is held more responsible for the event, even in clear cases such as rape.

Within this active-passive framework, I believe that in visually represented events, order can play a critical role in interpreting and transforming images into sentences. The order in which elements are visually presented, indeed, can influence both the thematic role and the direction of the action. For instance, by presenting images of an old woman, a packet of candy and two happy children (corresponding to the Agent-Action-Patient sequence), one may translate these images into a sentence such as "the grandma gives candy to children". By the same logic, in showing the same images with a Patient-Action-Agent sequence (e.g., two happy children, packet of candy, an old woman), one may use the passive voice stating, for example, "children were given candy by grandma". This can be explained by the fact that the interpreter can attribute more importance and responsibility to the Patient because it appears in first position, such that children were given candy because they deserve it. By contrast, in the former case, is the generosity of the grandma that drives the natural gesture of giving candy to children.

In addition to word order, semantics is another relevant cue that has to be considered as moderator in image processing because of its intrinsic role in disentangling the meaning of a represented situation. By focusing on the link between order and semantics, Bates and MacWhinney

(1982) demonstrated that the sematic concept of agency has the dominant role in determining subject status. Byrne and Davidson (1985) argued that for English speaking children, and for any child whose native language a) relies strongly on word order, b) has Subject-first canonical order (SVO or SOV) and c) in which agency and subject status are correlated, noun order will include the semantic distinction between agent and patient. In fact, English children showed that in interpreting sentences they used the Agent-Action-Patient strategy (Bever, 1970) and generally they placed the subject before the verb and the object after the verb in two-object action descriptions (Angiolillo and Goldin-Meadow, 1982). Previous literature on conceptual accessibility (Bock & Warren, 1985; Keil, 1979) shows that, based on our prior experiences, we are able to detect which kind of action is taking place across elements that are visually represented. In fact, the concept of accessibility refers to the ease with which we retrieve information from memory with a corresponding lexical label (Levelt, Roelofs and Meyer, 1999). Starting from this idea we can assume that in the absence of cues typical of written and spoken language, individuals can rely on semantics both in situation comprehension and in identifying the thematic role of a sequence of images.

In order to investigate how people transform visual images into sentences, a pilot and two experimental studies were run in which I systematically varied the order of presentation of the three elements (Agent, Patient, Action, AgPtAct) providing all six possible combinations (AgPtAct, AgActPt, PtAgAct, PtActAg, ActAgPt, ActPtAg) for each sentence. Participants were simply asked to pay attention to the sequence of images and generate a simple sentence that would contain all three pieces of information regarding the three images. The pilot study aimed at exploring the general pattern shown by Italian participants asked to generate sentences regarding a sequence of three images. In addition, I carried out cross-linguistic studies with the same material and the same procedure with Italian and English participants. The choice of a comparison between Italian and English language is due to the fact that these two languages differ in the degree of flexibility and in the use of passive forms of the verb. English, indeed, has a more rigid word order and the use of the passive voice is less usual than in Italian (Hopper & Thompson, 1980; Svartivik, 1966).

The general hypothesis of this series of studies is that individuals who are required to generate sentences starting from elements that are visually and sequentially represented will base their performance mainly on two basic principles. On one hand, they will avoid a-grammatical constructions by producing sentences that follow the canonical and grammatical order of their native language. On the other hand, they will try to respect the order of presentation of images, in particular maintaining the first image in first position. Obviously, when the order of presentation corresponds to the canonical order (Agent-Action-Patient), individuals can easily satisfy these two principles (e.g., "Grandma gives candies to the children"). Whereas in all other presentation orders, participants will be limited in transforming the given information into a grammatically correct and at the same time meaningful sentence. In particular, verb-first sentences are close to impossible so people will find it difficult to maintain the same order in this case. However, when the order is such that the Patient is presented first, individuals can generate sentences that maintain the Patient in the first position through the application of two different linguistic strategies, namely a) by using the passive voice of the verb (e.g., "Children are given candies by Grandma") or b) by recurring to the use of verbs that imply an action that starts from the agent evolves towards the patient in a leftward trajectory (e.g., "Children receive candy from grandma").

The general hypothesis of the following studies is that the temporal order in which images are presented play a crucial role in interpreting and transforming images into text. We expect that sequential order can affect the interpretation of image sequences, leading people to generate sentences at first by relying on canonical word order and, then, by applying different linguistic strategies (such as the use of passive vs. active form of the verbs). Specific hypotheses will be presented for each study below.

Pilot Study

This pilot study represents a first attempt to explore whether and how the order in which images (e.g. a thief, an old woman, and a purse) are shown to participants can influence the process through which they generate a sentence describing the event they have just seen.

Individuals make use of several linguistic strategies as a pragmatic way to convey information (Fiedler, 2008). Relevant to our project is the use of word order as one of those strategies. Studies have demonstrated that in pragmatic communication individuals rely on word order to highlight the relevance of an information (Hamilton & Sherman, 1996) and to categorize (Percy, Sherman, Garcia-Marques, Mata, and Garcia-Marques, 2009) and these processes occur by placing the relevant and stereotypical element first. In this way, the starting point in sharing perspective will be represented by the element perceived as the most prominent (MacWhinney, 1977). These practices are common among speakers and writers alike, we wonder whether order presentation can play such a similar role in interpreting images and translate them into text.

In this pilot participants were shown six different sequences of three images each and they were required to generate a single sentence regarding the three images of each sequence. I chose images representing an Agent (Ag), a Patient (Pt) and the Action (Act) taking place between the two actors. For instance, I sequentially presented an image of a thief (Ag), of an old woman (Pt) and of bag being stolen (Act). Sequences varied presentation order combining all six possible orders (AgPtAct, AgActPt, PtAgAct, PtActAg, ActAgPt, ActPtAg). I will explain materials and procedure in detail in the next section.

I advanced two main hypotheses regarding how people transform image sequences into sentences. I expected that the exact reproduction of order would be the least effortful way to translate images into words, yet this procedure would, in many cases, lead to a-grammatical constructions. To avoid grammatical violations participants will therefore need to rearrange the order, which is likely to happen in line with two principles. First, I predict that, regardless of the order of presentation of images, participants will mainly generate sentences following the canonical

word order of their native language, namely SVO for Italian participants. Thus, once the semantics of the three images are understood, people will most likely report their interpretation in sentences in which the Agent is mentioned first, followed by the Action (verb) and subsequently by the Patient (e.g., the thief stole the bag from an old women).

However, there are at least two main cases in which the order of the image sequence can be maintained without violating grammar. The first, most obvious case is when the Agent is shown first and the Patient last, which naturally leads to SVO sentences. More interesting is the second case, namely, when images are presented in Patient-Action-Agent or Patient-Agent-Action sequences. In these cases, the use of passive verbal forms would allow participants to reproduce the sequence in which the elements were shown visually, by placing the Patient in the subject role, followed by a passive verb (e.g., An old woman was robbed by a thief). Thus, the second hypothesis is that when the patient of the action will occur as first element, people will be more likely to generate sentences using the passive voice.

Briefly, the two main hypotheses refer to the adoption of two linguistic strategies a) *the choice of order in sentence production* where we assume that canonical order (Actor, Action, Recipient ordering in SVO sentence), being such a strong and embedded feature, will outnumber any other order, reflecting the participants' intention to generate a grammatically correct sentence and b) *the use of strategies that contravene the canonical order but maintain the SVO structure.* Specifically when order of presentation is such that the first element is the recipient of the action, participants are more likely to generate sentences using the passive form of the verb.

Method

Participants

Italian speakers were invited to participate in a study of social cognitive psychology approved by the Ethics Board of the Department of Developmental Psychology and Socialization. One hundred and twenty participants took part in the study (N_{men}= 60, Age_{mean}= 29,5). Participants were

recruited in public spaces and at the University of Padua. They were all native Italian speakers and none reported to know any languages with different canonical word order.

Material

In this study, participants were shown six different crime situations. Each situation was represented by three images (taken from the web) corresponding to an Agent, a Patient and the Action (see Figure 1.2. and Figure 1.3). The six different situations were represented by the following images (here reported in Agent-Patient-Action order): a robber, an old woman and a bag being stolen; a guy, a bicycle and pliers with broken chain; a man's face, a woman's face and a bloody knife; an angry male face, the face of a man wearing glasses and the image of a fist; a running thief, a bank and a bag of money; a car, a motorcycle and a "boom" cartoon. Sizes were the same across all images. Each participant saw each sequence in a different order and sentence-order combinations were counterbalanced with a Latin-Squared design between participants such that the same sequence (e.g. robber, old woman, bag being stolen) appeared in all possible orders.

Participants received of a 7-pages questionnaire, in which blank spaces were provided for writing the sentences.

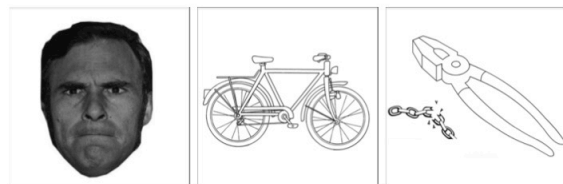
Figure 1.2. *Thief, old woman, bag being stolen.*   Figure 1.3. *Man, Bicycle, Pliers.*

Design and Procedure

The order of presentation of each sequence of images varied between participants presenting all the possible combinations (AgPA, AgAP, PAgA, PAAg, AAgP, APAg). I constructed six different conditions in which we counterbalanced the order of presentation so that each participant was shown six different sequences with the six possible orders. The experimenter showed the series of three images, one at a time for approximately 1 second for image. After presenting each sequence, participants were asked to generate a sentence in which all three elements were to appear. At the end of each sentence, participants were asked to provide personal information such as age, gender, handedness and native language.

Coding

In order to control whether participants followed the exact order of sequence presentation while producing sentences, each element of the generated sentence was coded according to its original role. This coding process was the same across all the studies of this chapter. For instance, by presenting a sequence in Patient-Action-Agent order (e.g., the dog, the hairbrush, the boy), participants could generate sentence such as "A boy brushed his dog" or "A dog is brushed by its owner". In the first case, we coded the sentence as Agent-Action-Patient (AgActPt), whereas in the latter case, we coded the sentence as Patient-Action-Agent (PtActAg). Although both of the sentences followed the canonical order SVO (the passive voice provides a sentence in the canonical order switching the position of the agent and the patient), this coding allowed to control whether the participants followed the actual order of presentation. By the same logic, sentences coded as Action-Agent-Patient or Action-Patient-Agent corresponded to grammatically correct sentences. For instance, in cases in which participants generated a sentence such as "Scissor and comb are used by a hairstylist to work on a woman's hair", the utterance has been coded as Action-Agent-Patient since the original roles of each element were respectively Action for the image of scissors and comb, Agent for the images of a hairstylist and Patient for the image of a woman (See Table 1.1

for all the possible combinations[1]). In addition, if participants provided sentences in which one or more elements were missing (e.g. "An incident took place") or if they described the episode by a single noun (e.g., "theft at the bank" or "Homicide"), in which either did not appear at least one of the images elements or participants did report only a noun, I coded sentences as "other".

Verbs such as "venire" in Italian and "get" in English, when followed by past participle (e.g., Italian, "un ladro *viene* arrestato dalla polizia" and English "a thief got arrested by the police"), were coded as passive verbs since they correspond to the "to be" form.

Given that sentences coded as "other" were only 2% of the produced sentences and that they were distributed equally across conditions, I run Chi-Squared test only on the frequencies of sentences generated following the six possible orders. Furthermore, to facilitate comparisons across studies, I report percentages rather than frequencies in the Tables, although data were analyzed as frequencies.

When reporting the findings, the term "Order of presentation" refers to the order in which images appeared within each presented sequence (the six possible orders combining Agent, Patient and Act). By "Order of Production" I mean the order in which participants mentioned Agent, Patient and Act in the produced sentence. For this reason, although each sentence was reproduced with a correct grammatical order, we can find sentences coded as ActPtAg because, as specified above, they mirror the order in which each element has been mentioned with respect to its original role (e.g., "Candy was given to children by their grandma").

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[1] Stimulus sentences reported in Table 1.1 were used in Study 1b and 1c.

Code	Example of Produced Sentences
AgActPt	A boy brushed his dog
AgPtAct	The surgeon operated on the patient with the scalpel and syringe
PActAg	The boy got bitten by a fox (Passive)
PAgAct	The children love grandma because she always has candy. (Active)
ActAgPt	A bite involving a dog and child
ActPtAg	Candy was given to 2 boys by their grandmother

Table 1.1. *Example of coding for produced sentences*.

Results

In support of the first hypothesis, results demonstrate that participants transformed images mostly into AgActPt sentences regardless of the order in which image sequences had been presented. In fact, 62% of all sentences had the AgActPt order which greatly exceeds the chance level (i.e., 17%), SVO, χ^2 (1, N= 44 1) = 1151,06, *p*< .001 (see Table 1.2 and Figure 1.4).

Order of Presentation	AgActPt	AgPtAct	PtActAg	PtAgAct	ActAgPt	ActPtAg	Other	Total
			Order of Reproduction					
AgActPt	12,92	1,25	0,69	0	1,11	0	0,69	16,67
AgPtAct	10	1,67	2,08	0,28	1,11	0,42	1,11	16,67
PtActAg	9,17	1,81	3,75*	0,14	0,28	0,69	0,83	16,67
PtAgAct	8,61	1,25	3,75*	0,56	0,56	0,83	1,11	16,67
ActAgPt	11,39	0,83	1,53	0	1,53	0,42	0,97	16,67
ActPtAg	9,17	1,53	1,81	0,14	0,69	1,81	1,53	16,67
Total	61,25***	8,34	13,61	1,12	5,28	4,17	6,24	100

Table 1.2. *Percentages of built sentences in the six possible orders*.

Above Chance Level: *** p< .001, ** p< .01, * p< .05

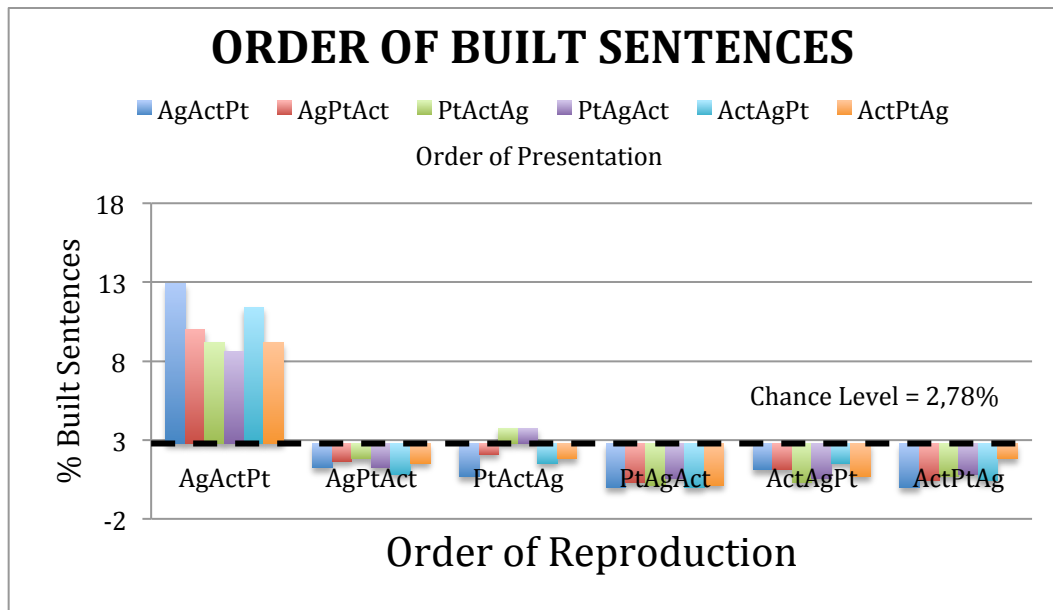Below Chance Level: ^^^ p< .001, ^^ p< .01, ^ p< .05

Fig 1.4. *The distribution of the built sentences in function of order presentation.*

In line with the second hypothesis, results also show that participants generated a relatively high number of sentences following the PtActAg order (13%) although this did not exceed chance, except in the cases in which the Patient was presented first, χ^2 (1, N=27) = 4,47, p< .05. By focusing on the use of the active and passive form of the verbs, we can observe that in those cases in which the Patient is the first element to be shown, (PtActAg or PtAgAct), participants are more likely to transform images into passive sentences stating for example "a women was killed by a man". Table 1.3 and Figure 1.5 below show that, while the total number of active sentences is higher than that of passive sentences (χ^2 (1, N= 615) =456,33, p< .001), the use of passive forms increases only in those cases in which the Patient (Pt) is presented in the first position (PtActAg), even if the frequencies did not exceed chance level.

Order of Presentation	Active vs. Passive			
	Active	Passive	Other	Total
AgActPt	15,56	0,42	0,69	**16,67**
AgPtAct	13,47	2,08	1,11	**16,67**
PtActAg	14,31	1,53^^^	0,83	**16,67**
PtAgAct	13,19	2,36^^^	1,11	**16,67**
ActAgPt	14,86	0,83	0,97	**16,67**
ActPtAg	14,03	1,11	1,53	**16,67**
Total	85,42***	8,33^^^	6,24	**100**

Table 1.3 *Percentages of Built sentences in Active or Passive voice.*

Above Chance Level: *** p< .001, ** p< .01, * p< .05

Below Chance Level: ^^^ p< .001, ^^ p< .01, ^ p< .05
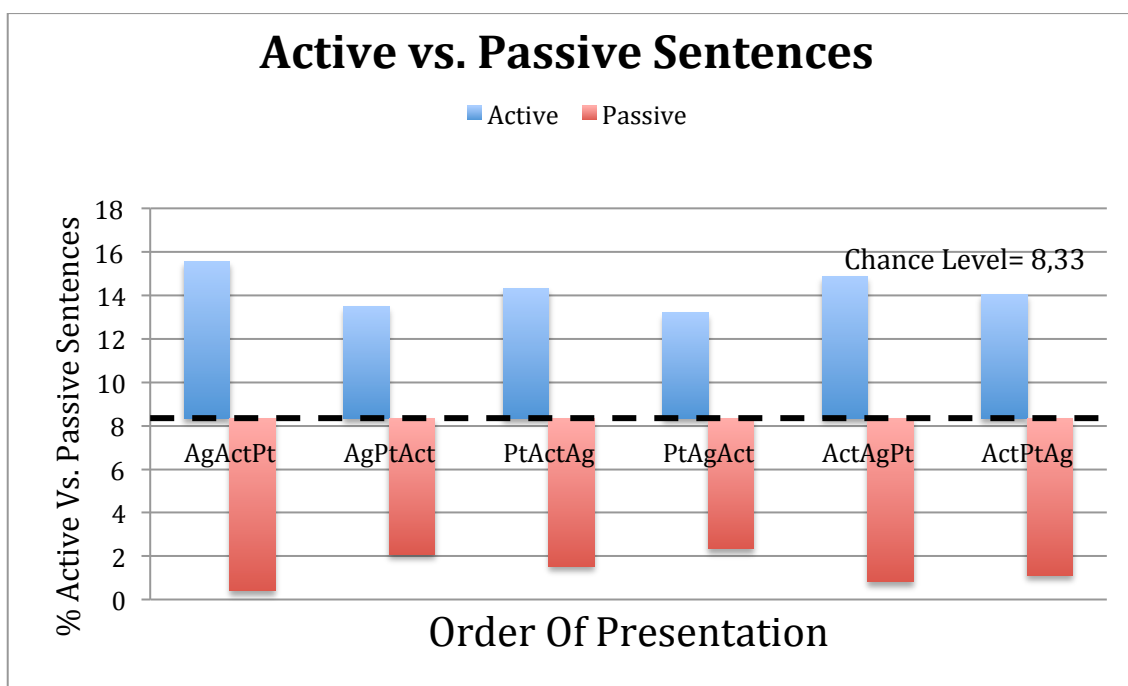
Fig 1.5 *Distribution of Sentences built in Active or Passive voice.*

Discussion

To summarize, I found that people prefer to use their native language order, even in those cases in which they are given a certain degree of freedom in constructing sentences. Results show that, regardless of the order of image presentation, after extrapolating semantic information from images, participants favored the canonical word order (SVO) over others when transforming them

into sentences. This is not surprising if one assumes that experienced speakers are unlikely to use ungrammatical or highly unusual expressions. More interesting is the fact that, only in those cases in which the order of presentation involves the Patient in the first position (PtActAg or PtAgAct), people tended to make use of a different linguistic strategy, namely, recurring to the use of the passive form of the verb. Participants could have reproduced sentences with their canonical word order (AgActPt), but the use of the passive voice allowed them to keep the order of image sequences unchanged.

The present study was a preliminary attempt and several limits should be acknowledged: First, this pilot study included images of different in style and colors (see Fig. 1.2 and Fig. 1.3). Moreover, agents and patients in this pilot study varied in terms of animacy (e.g., Old woman is animate but bicycle is inanimate). In addition, several image sequences were ambiguous as to who was the Agent or the Patient (e.g., man, woman, bloody knife; car, motorcycle, "boom" cartoon). In the next two studies I will further investigate the role of presentation order in sentence building, overcoming with methodological adjustments the limits described above. More importantly, the studies will further enlarge the scope of investigation by comparing the linguistic strategies in sentence building and their relation with order in Italian and English speakers.

Study 1a and b: Strategies in Linguistic Production

Italian vs. English Participants

Aim and Hypothesis of the studies

After exploring the underline mechanisms of sentence production through the pilot study and identifying the limits in the material, I carried out two additional experimental studies. Studies 1a and 1b follow the same logic of the pilot study but in this case the transformation of visual elements into sentences is investigated in two different languages, Italian and English, using identical materials. The particularity of this cross-linguistic study lays in the differences between these two languages with respect to word order, even though they share the same structural order, namely, SVO. On one hand, Italian is a language that allows greater variations in word order in line with the speakers' communicative intentions. The gender and numerical agreement across noun, adjectives and verbs (only partially present in English, i.e., adjectives do not respect the gender and the numerical features of nouns) provide information about the relation across elements so that Italian speakers do not need to rely on word order in interpreting a sentence and identifying the thematic role (who does what to whom). On the other hand, English speakers use the passive voice of the verb less frequently with respect to other languages including Italian (Hopper & Thompson, 1980). English speakers, however, have another way to place the patient in the first (subject) position, namely by generating active sentences in which the patient is placed in first position before the agent and the spatial representation of the described action flows from the agent to the patient following a leftward trajectory (see Chatterjee et al., 1999). As we briefly explained in the introduction, there are verbs that lead to contrasting directions: on one hand, actions that move away from the agent ("give", rightward direction) and on the other hand, actions that move toward the patient ("receive", leftward direction) (Chatterjee et al., 1999). In these cases, although sentences are not generated in passive form, the spatial direction of the described action takes two different trajectories.

Study 1a: Strategies in Linguistic Production

Italian Participants

Hypotheses

In line with the previous study, I expected:

1) Regardless of order of presentation, participants will more likely transform images into Agent-Action-Patient (AgAP) than into any other type of sentence;

2) In the case of Patient-first sentences, participants will show an above-chance tendency to mention the Patient as the first element, placing it in the role of sentence subject.

The above ordering (Hyp. 2) can be obtained in one of two ways, either a) by using the passive form (e.g., *The children were given candies by grandma*) or b) by choosing verbs whose action is directed towards the Patient, hence leftward (e.g., *The children received candies from their grandma*). I therefore advanced the following prediction:

3) Compared to any other presentation order, we should observe an increase of both passive verb forms and Patient-directed verbs (in Pt-first sentences) in the two conditions in which the Patient was seen first.

Method

Participants

Italian speakers were invited to participate in a study in social cognitive psychology approved by the Ethics Board of the Department of Developmental Psychology and Socialization. Ninety participants took part to the study (N_{men}= 49, Age_{mean}= 25,7). Participants were recruited in public spaces (such as parks and libraries) and at the University of Padua (such as study rooms). They were all native Italian speakers and no one reported to know languages with a canonical word order different from Italian (SVO).

Material

Similarly to the previous study, six different situations were represented by 3 images each, involving an Agent and a Patient of a certain Action (see Figures 1.6 and 1.7 for images examples and Appendix A for an entire questionnaire example). In order to obtain images of similar style and dimension, we used images drawn by Riccardo Busato, an undergraduate student belonging to our lab. We tested the comprehension of each image with a pretest asking a small sample (N=15) to describe the picture. To avoid any kind of ambiguity, we only selected sequences that were uniformly interpreted in line with the experimenter's intentions. Each sequence of images could be described by transitive sentences both in active and in passive form. The six different situations were represented by the following images here reported in Agent, Patient and Action order: a doctor, an injured patient and medical tools; a German shepherd, a scared kid and a hand being bitten by a dog's mouth; an old woman, two children and some candy; a police officer, a thief and a pair of handcuffs; a kid, a long-haired dog and a brush; a hairdresser, a woman with long hair and a pair of scissors and comb.

As in the previous study, participants were provided with a 6-page questionnaire containing blank spaces to write the sentences. An additional page was included in order to collect participants' personal data (gender, age and native language).

Figure 1.6. *Doctor, Patient, Surgery Tools*   Figure 1.7. *Child, Dog, Brush*

Design and Procedure

The same design and procedure of pilot study was used for this study. The main differences were (a) the visual materials, drawn by a student. that allowed to keep the style constant, (b) the exclusive use of animate agents and patients , (c) the avoidance of reversible situations (such as the car, motorcycle, "boom" cartoon used in the pilot study)., Participants were asked to pay attention to the sequence of three images shown by the experimenter and after each sequence they were asked to generate a short and simple sentence representing the relation between the three images trying to mention all the three images.

Results

As for pilot study, we will report below tables and graphs in percentages whereas the statistical analyses were run on the frequencies of the word order in which participants generated sentences.

In line with the first hypothesis, participants transformed images mostly into AgActPt sentences (see Table 1.4 and Figure 1.8). In close to 70% of the sentences the Agent appeared as the sentence subject, followed by the verb, followed by the Patient in the position of object, and this greatly exceeded chance (17%), χ^2 (1, N= 368) =1065,5, *p*<. 001. Thus, regardless the order of presentation, participants chose to reproduce the three images following their native language order.

Order of Presentation	Order of Reproduction							Total
	AgActPt	AgPtAct	PtActAg	PtAgAct	ActAgPt	ActPtAg	Other	
AgActPt	13,52	0,19	2,04	0,37	0	0	0,56	16,7
AgPtAct	12,78	0,56	1,67	1,48	0	0	0,19	16,7
PtActAg	8,52	0,19	7,41***	0,19	0	0	0,37	16,7
PtAgAct	8,52	0	7,04***	0,74	0,19	0	0,19	16,7
ActAgPt	12,96	0	2,04	0,19	0,74	0,37	0,37	16,7
ActPtAg	11,85	0,19	3,89	0	0,37	0	0,37	16,7
Total	68,15***	1,13	24,09 ***	2,97	1,3	0,37	2,05	100

Table 1.4. *Percentages of built sentences in the six possible orders.*

Above Chance Level: *** p< .001, ** p< .01, * p< .05

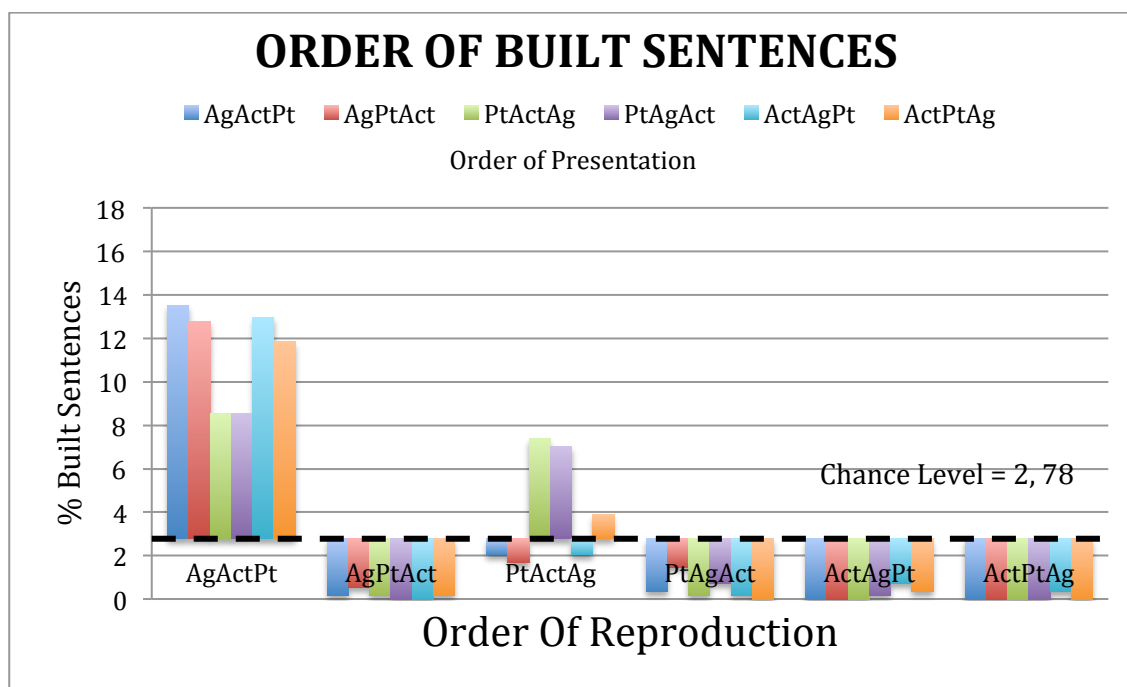Below Chance Level: ^^^ p< .001, ^^ p< .01, ^ p< .05

Fig. 1.8. *The distribution of the built sentences in function of order presentation.*

In line with the second hypothesis, and replicating the pilot study pattern, there was an above chance likelihood to produce Patient-Action-Agent sentences (24%), placing the patient in the subject position, χ^2 (1, N= 130) =23,81 $p<$ .001. This occurred uniquely for those visual representations in which the Patient was shown first. Both of these percentages (7,4% and 7%) exceeded chance reliably (2,78%), PtAgAct, χ^2 (1, N= 38) =43,43, $p<$ .001, and PtActAg, χ^2 (1, N=40) =51,26, $p<$ .001, but only in the two conditions in which the Patient was encountered first.

In hypothesis 3a I predicted that this would in part result from the greater use of passive voice in these two presentation orders. Since I hypothesized that participants are more likely to generate sentence in passive form when the Patient was presented in the first image, I calculated the percentage of active and passive sentences related to the order in which elements were presented. Thus I predicted a greater use of passive voice when the recipient of the described action was presented first in the sequence of images than in any other presentation orders. Although it did not exceed chance (19% compared to a 50% chance level) if considering all presentation orders

together, from the Table 1.5 and Figure 1.9 below we can observe that when the patient is presented as first element (PtActAg and PtAgAct), participants were more likely to transform images into passive sentences. Whereas in all other presentation orders the active form greatly outnumbered the passive one, χ^2(1, N=427) =199,6, *p*< .001, this was not the case for those presentations in which the Patient was the first element to be presented (PtAgAct and PtActAg), χ^2(1, 55)= 25,36, *p*= .48, even if they did not exceed chance (8%).

Order of Presentation	Active vs. Passive			
	Active	Passive	Other	Total
AgActPt	14,63	1,48	0,56	16,7
AgPtAct	14,63	1,85	0,19	16,7
PtActAg	10,37	5,93^	0,37	16,7
PtAgAct	10,37	6,11	0,19	16,7
ActAgPt	13,89	2,41	0,37	16,7
ActPtAg	15,19	1,11	0,37	16,7
Total	**79,98*****	**18,89^^^**	**2,05**	**100**

Table 1.5. *Percentages of Built sentences in Active or Passive voice*
Above Chance Level: *** p< .001, ** p< .01, * p< .05
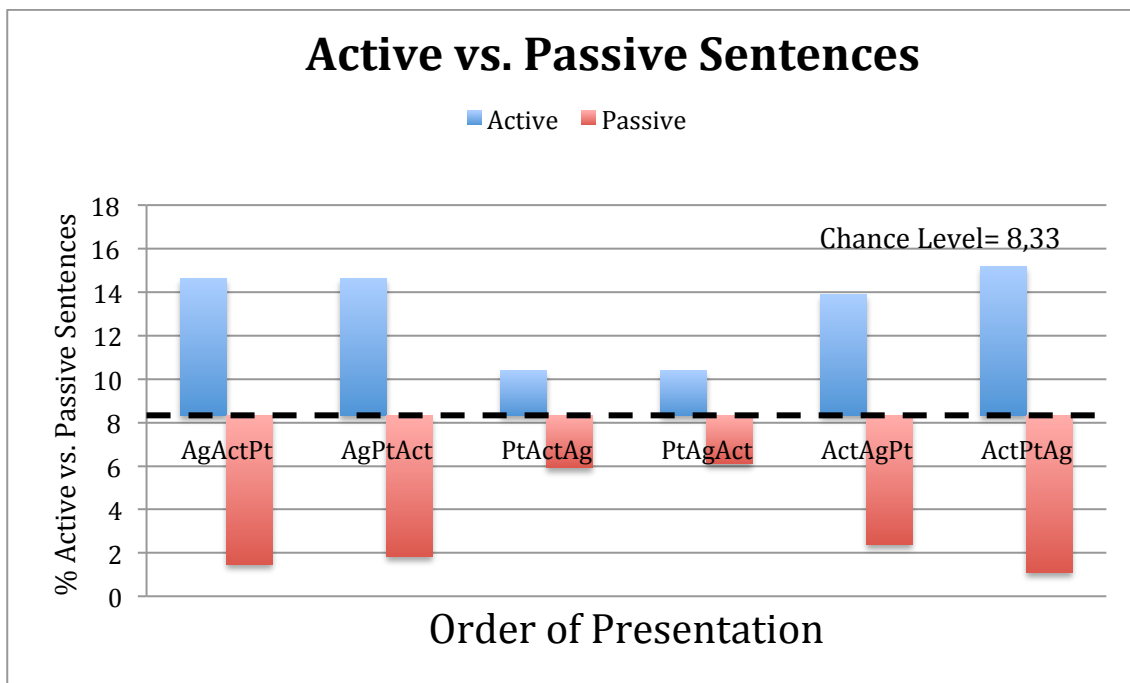Below Chance Level: ^^^ p< .001, ^^ p< .01, ^ p< .05

Fig. 1.9 *Distribution of Sentences built in Active or Passive voice*

Supporting the third hypothesis, results of Study 1a also show that the direction of the described action depends on the type of sentence: evolving from agent to patient (rightward trajectory) with active sentences and from agent to patient (leftward trajectory) with passive sentences. When generating active sentences following the AgActPt order (that is positioning the agent before the patient), participants recurred to agent-directed verbs (e.g., *The grandma gives candy to children*), to the contrary, when following the Patient-Action-Agent order, they used Patient-directed verbs, they either produced passive sentences or they chose verbs with action moving from right to left (e.g., Children received candy from the grandma). The Table 1.6 and Figure 1.10 below represent the directions of the described actions in the sentences with respect to the order in which images were generated. Unsurprisingly, participants generated a higher number of sentences with Agent to Patient (rightward) trajectory, resulting in a high number of AgActPt sentences, $\chi^2(1, N= 427) =199,6, p< .001$. In addition, we can observe that when the patient comes first, participants generated sentences with a spatial direction that moves from the agent to the patient following a leftward trajectory, given that the patient took the place of the agent in first position, $\chi^2(1, N= 94) =85,53, p< .001$.

Order of Reproduction	Rightward vs. Leftward			
	R	L	Other	Total
AgActPt	67,96	0,19	0	68,15
AgPtAct	1,11	0	0	1,11
PtActAg	6,67	17,41***	0	6,67
PtAgAct	1,67	1,3	0	2,97
ActAgPt	1,3	0	0	1,3
ActPtAg	0,37	0	0	0,37
Other	0	0	2,04	2,04
Total	79,08***	18,89^^^	2,04	100

Tab. 1.6. *Percentages of Agent vs. Patient-directed Verbs*
Over the Chance Level: *** p< .001, ** p< .01, * p< .05
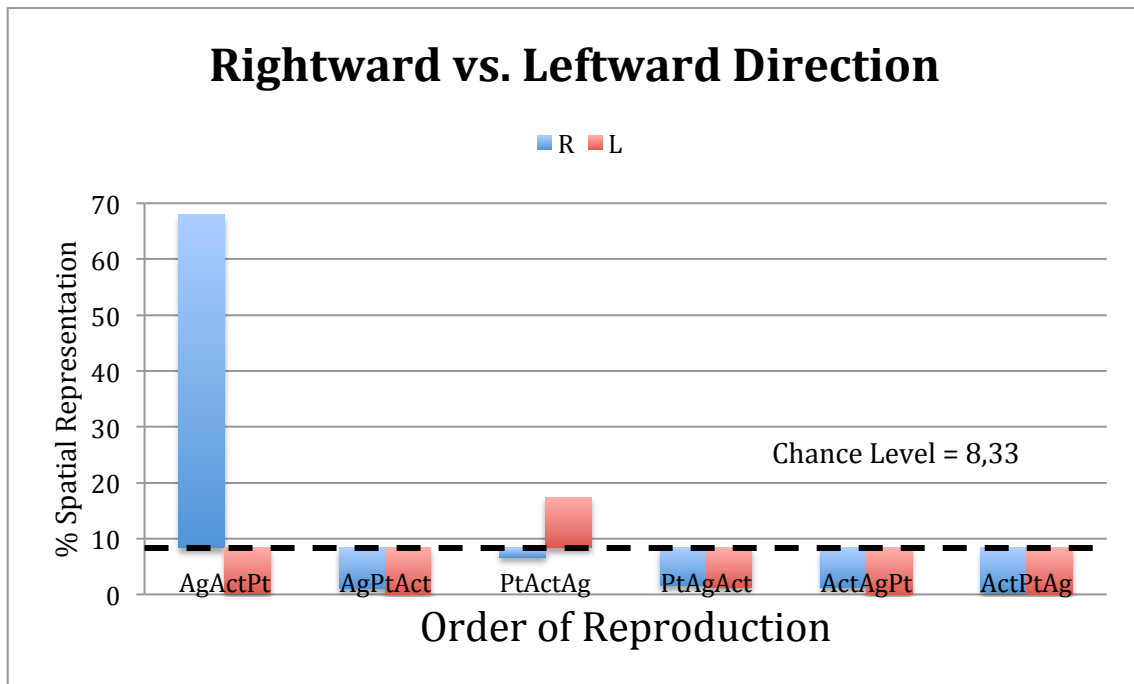Under the Chance Level: ^^^ p< .001, ^^ p< .01, ^ p< .05

Fig 1.10. *Distribution of Agent vs. Patient-directed Verbs*

Discussion

Study 1a shows a similar result pattern to the Pilot Study as far as the first two hypotheses are concerned: participants tend to generate sentences following the canonical word order of their language, regardless of the order of presentation. Also, when the Patient comes before the Agent they often apply the passive form strategy, positioning the Patient in the subject role followed by a passive verb (e.g., *the dog is being brushed by the child*). In this study, we added a further hypothesis that consists in investigating the spatial representation involved in the direction of the described action. Results demonstrate that Italian participants change the spatial direction of the action depending on the type of sentence: rightward in active and leftward in passive sentences In line with the literature regarding the Spatial Agency Bias (SAB, Suitner and Maass, 2016), this result reveals that thinking about an action that involves an agent and a patient leads people to place the agent to the left of the patient so that the action follows a left-to-right direction (in line with writing direction). To the contrary, by positioning the patient before the agent, as in the case of passive sentences, the spatial representation follows a leftward direction because the agent of that action is placed on the right of the space. As we will see in the English study, there are some cases

in which the spatial direction does not depend only on the sentence type (active vs. passive) but also on the kind of verb. As we briefly explained in the introduction, there are verbs that lead to contrasting directions: on one hand, actions that move away from the agent ("give", rightward direction) and on the other hand, actions that moves toward the patient ("receive", leftward direction) (Chatterjee et al., 1999). In these cases, although sentences are not generated in passive form, the spatial direction of the described action takes the trajectory from agent to patient. Given that this aspect emerged consistently among English speakers, we will discuss it in the next section.

Study 1b: Strategies in Linguistic Production

English Participants

Aims and Hypotheses of the study

Study 1b had the same materials, procedure and hypotheses of Study 1a, with exception of the language (English). In this case, the main purpose consists in exploring and investigating the potential differences in sentence processing between two languages that share the same word order but differ in other respects, namely in the flexibility of word order and the frequency of passive verb forms. Previous literature reports that English has a less flexible word order with respect to other languages (including Italian) and one reason is that the thematic role of a sentence (*who does what to whom*) in mainly defined by word order (see Bates & MacWhinney, 1982). As mentioned in the brief introduction, studies have demonstrated that English adult speakers mainly rely on word order while interpreting and processing sentences (MacWhinney et al. 1984). Furthermore, the use of the passive forms of the verb is less frequent in English compared to the Italian language (see Svartivik, 1966; Hopper and Thompson, 1980). In alternative, verb constructions such as "to get" or "to receive" allow English speakers to generate active sentences that, at the same time, imply that the action went from Agent/Object to Patient/Subject, (i.e., "The kids received candies from grandma", see also Chatterjee et al., 1999). The main focus here is on the differences between Italian and English speakers with regard to the second and the third hypotheses. Although Italian and English speakers share the canonical word order, which is SVO, I expected the use of passive forms to be less common among English participants than Italians. English speakers were expected to be more likely to rely on verbal constructions that are formally active but that suggest a leftward spatial representation (evolving from Agent to Patient with the Patient positioned first, in the role of sentence subject, "the kids received candy from grandma").

Hypotheses

For Study 1b, conducted in English language, we formulated the following hypotheses that are in line with those of our previous studies but differ slightly with respect to Hypothesis 3 due to the different language (English) in which passive voice is comparable rare.

1) As for Italian participants, regardless of order of presentation, English participants will be more likely to transform images into canonical Agent-Action-Patient (AgActPt) sentences than into any other type of sentence;

2) As in the previous study, in the case of Patient-first sequence presentations, participants will show an above-chance tendency to mention the Patient as the first element, placing it in the role of sentence subject.

3) As explained earlier, this may be achieved either by using passive voice (e.g., The children were given candies by grandma) or by choosing verbs whose action is directed toward the Patient, with the action flowing in a right-to-left direction (e.g., *The children received candies from their grandma*). Compared to other presentation orders, we hypothesized an increase of both passive verb forms and Patient-directed (from agent to patient) active verbs in the two conditions in which the Patient was seen first. However, in the case of English speakers we expected the latter strategy to be chosen more frequently than the former (passive verb form).

Method

Participants

English speakers were invited to participate in a study of social cognitive psychology approved by the Ethics Board of the Human Research Protections Program of University of California, San Diego (UCSD). Sixty participants took part to the study (N_{men}= 19; Age_{mean}= 20,5). Participants were recruited through the SONA System, a cloud-based participants management

software that includes participants from Cognitive Science and Linguistics at UCSD. Participants were accredited 1 credit for their courses. Although all participants were native English speakers, some of them reported to know other language different from SVO order such as Korean (4 pp., SOV), Tagalog (1 pp., VSO), Punjabi (1 pp., SOV), Hindi (1 pp., SOV), Farsi (1 pp., SOV), Hawaiian (1 pp., VSO). We included their responses in the analysis given that these participants also reported that a) they used these other languages in their daily life never or infrequently and b) that their knowledge of these languages was very limited.

Materials

For this study we used the same materials of Study 1b translated in English.

Design and procedure

The design and procedure was the same of Study 1a with the exception of the fact that participants were recruited through a cloud-based software that they were accredited with 1 credit and they were tested in English language.

Results

As for the previous two studies, I will report tables and graphs in percentages whereas analyses were conducted on the frequencies of the word order in which participants generated sentences.

In line with Study 1a and with the first hypothesis, participants transformed images mostly into AgActPt sentences. In fact, in more than half of the sentences (55%) the Agent appeared as the sentence subject, followed by the Action, followed by the Patient, and this greatly exceeded chance (17%), $\chi^2(1, N=201) =418,3, p< .001$. Thus, regardless the order of presentation, participants chose to reproduce the three images following their native language order in a grammatically correct sentence.

Order of Presentation	Order of Reproduction							
	AgActPt	AgPtAct	PtActAg	PtAgAct	ActAgPt	ActPtAg	Other	Total
AgActPt	14,44	0,83	0,56	0,56	0	0	0,28	**16,67**
AgPtAct	8,61	4,44*	1,67	1,67	0	0	0,28	**16,67**
PtActAg	5,83	1,11	6,67***	2,5	0	0,28	0,28	**16,67**
PtAgAct	7,78	0,83	2,22	5,56***	0	0	0,28	**16,67**
ActAgPt	11,67	1,11	0,83	1,67	1,11	0	0,28	**16,67**
ActPtAg	7,5	1,11	5,28***	1,67	0,28	0,28	0,56	**16,67**
Total	**55,83***	**9,43**	**17,23**	**13,63**	**1,39**	**0,56**	**1,96**	**100**

Fig. 1.7 *Percentages of built sentences in the six possible orders*

Above Chance Level: *** p< .001, ** p< .01, * p< .05

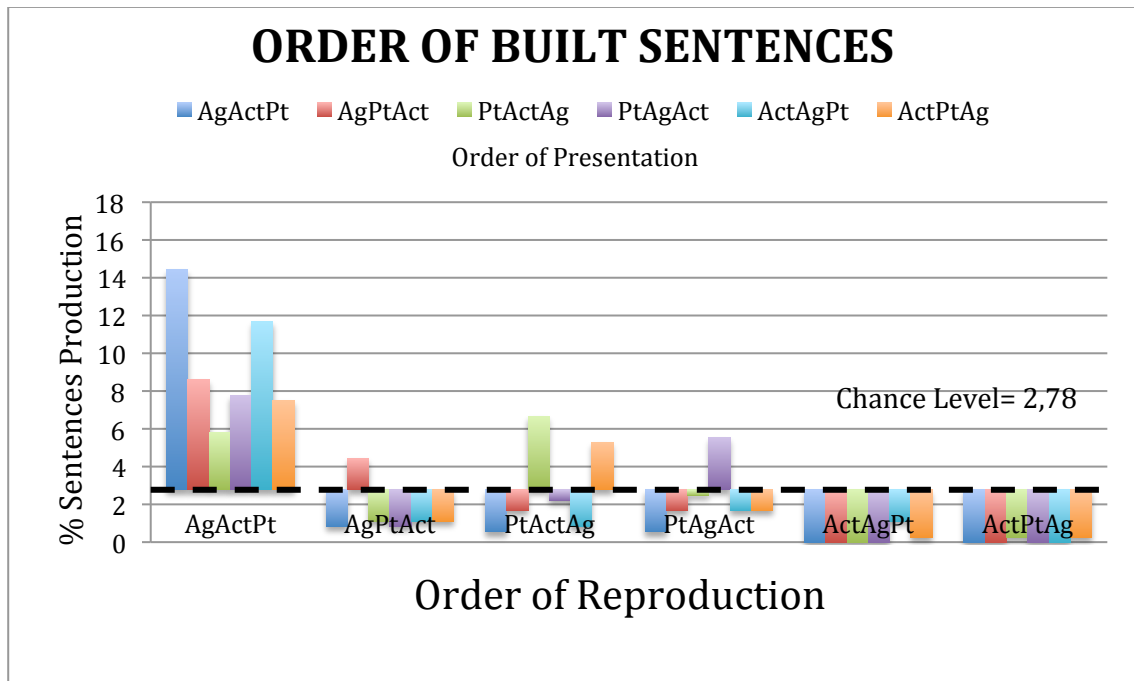Below Chance Level: ^^^ p< .001, ^^ p< .01, ^ p< .05

Fig 1.11. *The distribution of the built sentences in function of order presentation*

The second most frequent sentences were those with PtActAg order (17%, "He is sick and he needs surgery performed by the doctor"), although the frequency of these sentences did not significantly differ from chance. Also PtAgAct order was widely used (13%, "The person in the hospital bed was injured, and the doctor tried to save him.") even if, again, it is not above chance (17%). In line with Hypothesis 2, both of these orders occurred particularly for those visual representations in which the Patient was shown first (PtActAg and PtAgAct). However, different

from the Italian sample, English speakers tended to reproduce the original order to a greater degree. producing PtActAg order after seeing a PtActAg sequence (6,6%, χ^2(1, N= 24) =24,5, *p*< .001) and producing a PtAgAct order after seeing a PtAgAct sequence (5,6%, χ^2(1, N= 20) =12,62, *p*< .001). Interestingly, also the Action-Patient-Agent sequence was transformed into a PtActAg sentence (5,2%, "A person is about to get a surgery by a doctor") more than would be expected by chance, χ^2(1, N= 19) =10,83, *p*< .001, and even after a AgPtAct sequence, English participants reproduced a significantly higher number of AgPtAct sentences than would be expected by chance (4%, "The surgeon had prepared the patient to go under the scalpel"), χ^2(1, N=16) =4,6, *p*< .05.

In hypothesis 3a we predicted that this would in part result from an increment of the use of passive voice in these two presentation orders. Thus we had predicted the use of passive voice particularly when the recipient of the described action was presented first in the sequence of images. Although this did not exceed chance (8%), from the Table 1.8 and Figure 1.12 reported below we can observe that when the patient is presented as the first element (PtActAg and PtAgAct), participants are more likely to transform images into passive sentences (PtActAg, 3,3%, e.g. "The boy was bitten by the dog" and PtAgAct, 2,2%, e.g. "Two brothers are told by their grandma to exercise and no to eat candy"). Surprisingly, English participants showed a similar trend also after an Action-Patient-Agent order presentation (ActPtAg, 2,78%, e.g., "a boy was bitten by the dog"). In all other presentation orders the most common strategy consisted in producing active sentences, χ^2(1, N= 319) =230,09, *p*< .001.

Order of Presentation	Active vs. Passive			
	Active	Passive	Other	Total
AgActPt	16,11	0,28	0,28	16,67
AgPtAct	16,11	0,28	0,28	16,67
PtActAg	13,06	3,33^^^	0,28	16,67
PtAgAct	14,17	2,22^^^	0,28	16,67
ActAgPt	15,83	0,56	0,28	16,67
ActPtAg	13,33	2,78	0,56	16,67
Total	88,61***	9,45^^^	1,96	100

Fig 1.8. *Percentages of Built sentences in Active or Passive voice*
Above Chance Level: *** p< .001, ** p< .01, * p< .05
Below Chance Level: ^^^ p< .001, ^^ p< .01, ^ p< .05
Note: Means with colors refer to specific hypotheses (green = Hypothesis 1 and red = Hypothesis 2)
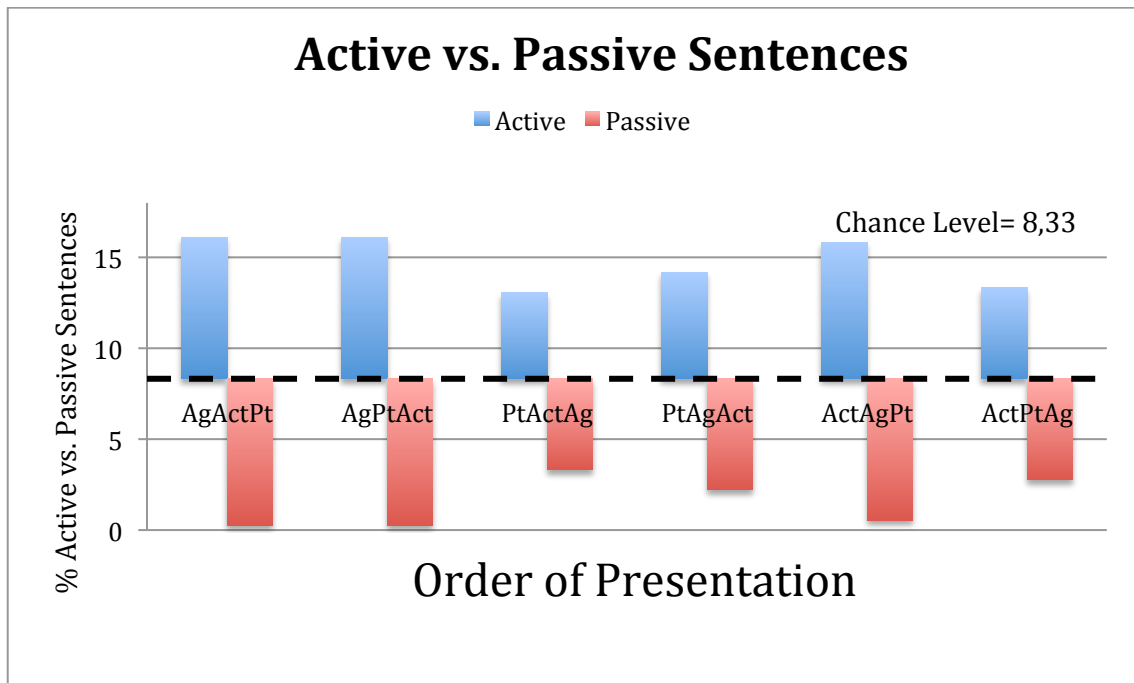
Fig 1.12. *Distribution of Sentences built in Active or Passive voice*

With regard to the third hypothesis (3b), results of Study 1b, besides revealing an overall tendency to reproduce sentences with a rightward (from agent to patient) trajectory, $\chi^2(1, N= 291)$ $=148,5$ *p*< .01, show a different pattern from those of Study 1a and the Pilot. In particular, results demonstrate that English speakers followed a spatial representation that moves from agent (on the right) to patient (on the left, in first position) not only when they recurred to the use of the passive form of the verb, but also when they generated active sentences. From the frequency table below

(Table 1.9), in contrast with the Italian results, we can see that the number of *leftward-directed* (when patient is placed before the agent, PtActAg) sentences (17,2%) does not correspond solely to the passive sentences (9,4%) but it includes also sentences generated in active form, even if this result did not exceed the chance level. Interestingly, sentences with a leftward trajectory were significantly reproduced placing the patient in first position in a PtActAg order, (13%), χ^2 (1, N= 46) =10,2 $p< .01$.

Order of Reproduction	Rightward vs. Leftward			
	R	L	Other	Total
AgActPt	55,56	0,28	0	55,84
AgPtAct	8,89	0,56	0	9,45
PtActAg	4,44	12,78**	0	17,22
PtAgAct	10,56	3,06	0	13,62
ActAgPt	1,11	0,28	0	1,39
ActPtAg	0,28	0,28	0	0,56
Other	0	0	1,96	1,96
Total	80,84***	17,24^^^	1,96	100

Fig 1.9. *Percentages of Agent vs. Patient-directed Verbs*
Over the Chance Level: *** p< .001, ** p< .01, * p< .05
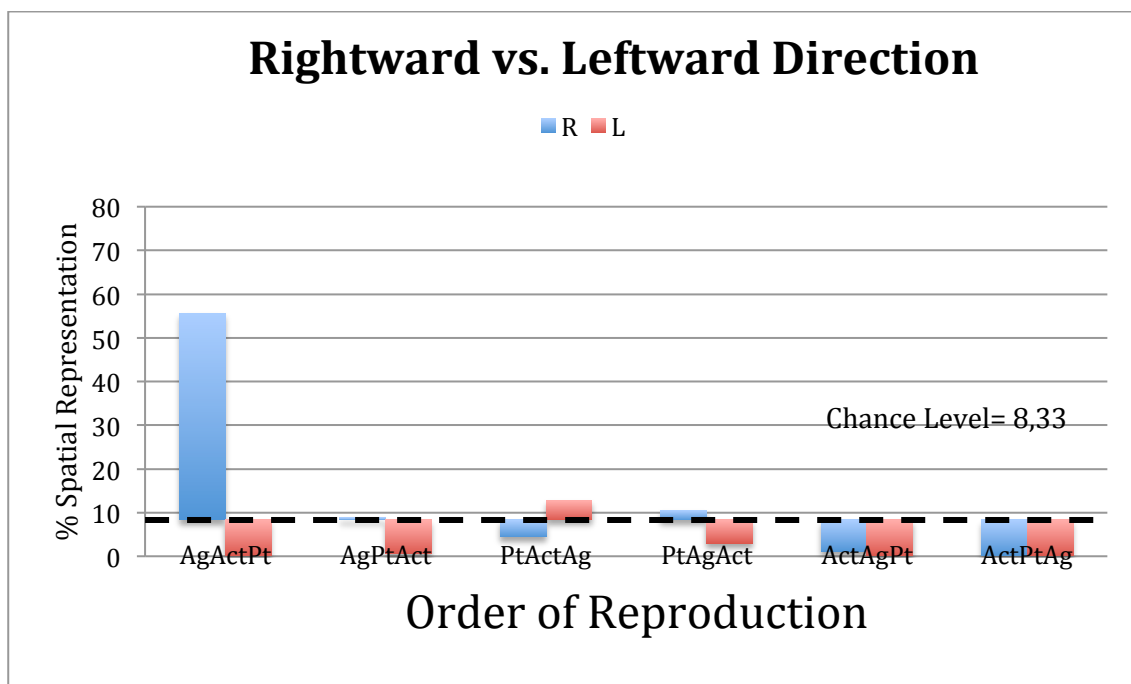Under the Chance Level: ^^^ p< .001, ^^ p< .01, ^ p< .05

Fig 1.13. *Distribution of Agent vs. Patient-directed Verb*

Comparing Italian and English speakers

Finally, a direct comparison between Italian and English participants may be of interest. As we can notice in the Table 1.10 below, both participant groups transformed images mainly in the canonical order (AgActPt, 68% Italian and 56% English). However, whereas Italian participants showed a strong preference for AgActPt (68%) and PtActAg (24%) sentences, English participants showed a greater tendency to maintain the order of presentation (33%, except in those cases in which the Action comes first, ActAgPt and ActPtAg).

Participants	AgActPT	PtActAg	Maintaining same order
Italian	**68%*** χ^2(1, N= 368) =1065,7 $p<$ .01	**24%*** χ^2(1, N= 130) =23,81 $p<$ .01	**13%^^^** χ^2(1, N= 291) =44,5 $p<$ .01
English	**56%*** χ^2(1, N= 201) =418,3 $p<$ .01	**17%^^^** χ^2(1, N= 62) =.02 p=.6	**33%*** χ^2(1, N= 90) =19,8 $p<$ .01

Table 1.10. *Italian vs. English comparison in reproduced Orders*.

Participant	Patient-first sentences in which action evolves leftward (towards the patient) ←	Passive Voice (Hyp. 3a)	Active voice (Hyp. 3b)
Italian	**18.89%**	**18.89%**	**0%**
English	**17.24%**	**9.45%**	**7.79%**

Table 1.11. *Patient-first sentences: Direction and the use of passive vs. active voice*

Discussion

Results of Study 1b fully confirmed the first two hypotheses replicating the same pattern of the previous Italian study. As expected, we also found a difference between Italian and English speakers related to the third (3a and 3b) hypotheses. As reported above, English speakers are less likely to use the passive form of the verb even when the patient occurs in first position in the presentation order. In contrast, and different from the Italian sample, the spatial direction of the described action does not correspond solely to the type of syntax (passive voice) they generated. Specifically, the use of verbs such as "get from" or "receive" allows English participants to compose active sentences keeping the spatial direction according to the sequence presentation order: when the patient comes before the agent (PtActAg or PtAgAct, i.e., "children", "candy", "grandma"), they are able to generate active sentence that follows the same order without needing to use the passive form of the verb ("children got candy from grandma"). These typical English

verbal constructions are more infrequent in Italian language that, from these results, seems to favor the use of the passive form.

This result sheds light on an interesting aspect regarding the presence of linguistic strategies across languages. Given the importance for the first term in interpreting a sequence or a sentence, English and Italian participants implemented two different strategies in order to maintain the patient in first position: on one hand, English people principally apply a *sequential representation* strategy maintaining, where possible, a given order of elements and resorting to verbs that best represent the relation between agent and patient. The choice of verbs in this case is mainly driven by semantic considerations. On the other hand, Italian speakers rely on a syntactical strategy, namely, the use of the passive voice. Both of these strategies allow speakers to place the patient before the agent maintaining the order of presentation and giving it the most prominent place in the sentence without violating grammatical rules. As previous literature has shown, strategies in interpretation vary across even closely related languages. For instance MacWhineey et al. (1984) found that English speakers relied primarily on word order, whereas Italian speakers showed an extreme reliance on agreement. The present studies have produced conceptually similar findings, given that English speakers tended to stick more closely to a given sequence when transforming images into sentences and that Italians, in order to maintain a given order, resorted more to syntactic strategies (use of passive voice) than English speakers did. With regard to the competition model, these findings imply that both word order and grammar have a different weight in different languages in terms of linguistic strategies sentence production.

Conclusions

Together the three studies suggest that word order plays a critical role in image sequence processing and its effect is clearly visible in terms of sentence production. The crucial aspect of this series of studies investigating how the presentation order can affect language production lays in the fact that we based our experimental manipulation on the systematic variation of order among the elements by presenting images sequentially on at a time combining all possible orders (AgActPt, AgPtAct, PtAgAct, PtActAg, ActAgPt, ActPtAg). Previous literature concerning language production made use of images in which the elements appeared simultaneously (see Langus & Nespor, 2010). In the interest of the actual role of order, we varied the order of presentation of images to test whether participants' production were affected by order of presentation.

Our findings highlight that Italian and English speakers spontaneously transform image sequences with different orders of presentation into sentences in their canonical word order. This is in line with previous evidence showing that when participants were required to comprehend strings of prosodically flat sequences of words (words pronounced without accent and semantic inflections) in their native languages, they were fastest in choosing the corresponding vignette after hearing sequences in which the words appeared in the order of their respective native language (Langus & Nespor, 2010). The grammatical aspect of word order is so ingrained in our reasoning scheme that regardless of the order in which we encounter visual elements, we are able to instantly identify the semantics (i.e., identifying the thematic role) and to construct a sentence that follows the basic grammatical rules. People may show an overwhelming preference for the canonical order either because it requires lesser cognitive effort or because it represents the simplest and most efficient way to transmit information. These two motivational processes should be specifically tested in future studies.

Besides confirming the preference for the native language canonical order and the spontaneous tendency to avoid a-grammatical constructions, these three studies shed light also on other two interesting aspects regarding the use of linguistic strategies during linguistic production.

On one hand, presenting the patient of a certain action before the agent leads people in a partially systematic way to a) follow the presentation order while arranging the three images into a sentence and b) generate a sentence in passive form. The most obvious reason for this choice is that passive sentences imply the inversion of agent and patient (AgPt → PtAg) in order of mentioning. This inversion allows to maintain the same order of presentation and, given the importance of the first term in interpretation and integration of information, to keep the prominent position of the first element constant. Placing the patient in first position confers it a particular importance within the sentence.   In fact, previous social-psychological literature has shown that the use of the passive voice reflects a way to partially redistribute the responsibility for an action from agent to patient a (Bohner, 2001).

On the other hand, these studies shed light on another crucial aspect of sequence processing. Directly connected with the use of passive form and clearly related to the concept of word order, we noticed that the sentences processing depend also on an active construction of a spatial representation regarding the described situation. While observing image sequences and consequently generating active declarative sentences, we map the content onto a spatial representation following a given direction: from the agent to the patient. From previous literature, we know that depending on either cognitive (Chatterjee, 2002) or cultural (SAB) cues we systematically place the agent of an action to the left of the patient so that the direction of the action moves from left to right (i.e., in Western writing systems, Maass, Suitner and Deconchy, 2014). To the contrary, in passive voice, where the patient comes before the agent, the spatial direction of the action moves from the agent to the patient following a right-to-left direction. The last two studies confirm this phenomenon with the exception of some particular verbal forms present in English language only. In fact, in line with the literature, not only the passive voice implies a leftward trajectory in terms of spatial representation (from agent in last position to patient in first position), but also certain active verbs reveal this trajectory (e.g., "receive", "get from", "children received candy from grandma", "a woman got a haircut from the hairstylist").

Taking together these studies contribute to confirm the importance of the word order as a crucial feature of language. Word order not only drives speakers to individuate the thematic role of an event, but it is intrinsically connected with our mental representations of events that, in turn, reveal the degree to which we attribute importance to a given element. Since Italian and English share the same canonical order, as future lines, we propose to carry out studies involving different order language speakers to investigate whether and how images and sentences processing may vary as a function of the canonical word order.

In the next chapters, we will notice that in inducing people to focus on a given word order may have an impact on different cognitive processes.

Chapter 2: Word Order and Causal Attribution

General introduction to studies

Human beings have a natural tendency to search for causes when observing, hearing or reading about events. For instance, when learning about a terroristic attack, we are not satisfied with knowing the place, the nationality and number of victims, but our foremost interest lays in why it happened. Here we hypothesized that the causal inferences people draw about everyday events depend on the order in which those events are conveyed.

The use of language and its canonical order is quite arbitrary as evidenced by the fact that different languages require (or at least predispose) speakers to use different orders (Dryer, 2011). For instance, the English sentence *Charlie does not like Eminem* reads *Charlie Eminem does not like* in Japanese, *Does not like Charlie Eminem* in Maori and *Does not like Eminem Charlie* in Malagasy. In this chapter we focus on the question whether such differences in word order influence our general interpretation of the described event and, in particular, our causal attributions. We believe that the explanatory value of a given element increases when it is positioned in the first (vs. later) position. For instance, in the above sentence, the attitude may be more likely attributed to a particular characteristic of the singer when Eminem is mentioned first (vs. later), whereas personal taste may be taken into account when Charlie is mentioned first.

When people read or listen to sentences, they attempt to establish connections between the events: broadly speaking, they make causal inferences about *why* an event occurred and *who* caused it. This process, known as causal attribution, deals with the social judgments involved in the explanation of behaviors: who is to praise and who is to blame for a certain event (Kelley, 1973). Individuals tend to explain behaviors in terms of dispositional traits (*internal attribution*) or situational factors (*external attribution*) (Kelley, 1973), and language cues may promote different

pattern of causal attribution. Semin and Fiedler (1991), for instance, identified four classes of words according to their level of linguistic abstractedness, arguing that high language abstraction may suggest internal causal attribution (Semin & Fiedler, 1991). The Linguistic Category Model (LCM) predicts that adjectives (e.g, *clever*) prompt dispositional attributions to a greater extent, followed by state verbs (*love*), interpretative action verbs (*help*) and descriptive action verbs (*speak*). Interestingly, they noted that different type verbs evoke different patterns of attribution: behaviors described with interpretative and descriptive action verbs are more likely to be attributed to the sentence's subject/agent, whereas behaviors introduced with state verbs are generally attributed to the object/patient (Semin & Fiedler, 1991).

The role of word order in shaping causal attribution has been emphasized by authors focusing on narratives of violent acts (Bohner, 2001; Frazer & Miller, 2008; Henley, Miller, & Beazley, 1995). Indeed, a large body of research has showed that the use of different grammatical forms (i.e., active or passive voice) in reporting violence against women (e.g., a rape) influence causal attribution and perception of responsibility. In switching from active to passive forms, the semantic roles of agent and patient switch their places in the sentence, with the patient of the action taking the place of the subject and becoming the starting point of the sentence. By placing the agent in the background more attention is given to the patient (Johnson-Laird, 1968), who acquires a slice of responsibility for the described action. In the case of violent acts against women, such as a rape, the use of passive forms in narratives increases women's co-responsibility: even though they are the victims, they are seen as having induced the event to some degree (Bohner, 2001; Frazer & Miller, 2008). Although this set of studies confounded whether the effect is due to the order or to the type of verbal forms, the fact that objects/patients are considered co-responsible when actions are described through passive forms suggests that word order plays a role in shaping the perception of causality. In fact, the position of the words changes in passive sentences: the patient, usually positioned after the agent, is placed at the head of the sentence construction. Following Hopper's logic (1979), according to which individuals assume that the causes will be narrated before their

effects, people reading sentences describing transitive events may perceive the first term as the more likely cause of the described event.

Additional evidence for the role of word order in creating meaning comes from different lines of research that speak about the cognitive implications of word order at a more general level. The strongest evidence for the link between word order and semantics comes from research on binomials (Mollin, 2012). Both linguistic and social-psychological works suggest that binomial word order is not random, and that the first element has a relative advantage in terms of agency, power, status and masculinity (Mollin, 2012; Hegarty, Watson, Flechter and McQueen, 2011). Word order plays also a critical role in the interpretation and integration of information, because the first term seems to influence all the subsequent information. Particularly relevant to our research is the question whether and how word order affects causal reasoning. Research on binomials and research on situational models (the process through which people mentally represent events following the order in which elements appear, Zwaan & Radvansky, 1998) concur that the order in which words are arranged in a sentence provides information about both the temporal and the causal link between events. A further line of research confirms that sentence processing depends on an active construction of a perspective, which usually matches the starting point of a sentence. According to this viewpoint, the reader/listener will take the writer/speaker's perspective that corresponds to the starting point of the sentence (MacWhinney, 1977).

Because of the relevance of the first term in cognition and given that the first term signals greater agency (Gernsbacher & Hargreaves, 1988; Hegarty et.al, 2011), as well as temporal and causal precedence (Zwaan & Radvansky, 1977; Segal, 1995), in two studies I decided to investigate whether causal attributions change according to the position of the elements in a sentence.

Aim and Hypothesis of the studies

Starting from the above lines of research, the main hypothesis proposes that the degree to which participants attribute an event to a specific cause depends on the position of the elements in the sentence. In particular, causal attribution will be greater when the element occurs in the first rather than in a later (2nd or 3rd) position. I consider here only 3 grammatical elements (S, O, V) as they appear in short active sentences such as *The teacher criticized the students*, while not including further elements (e.g., adverbial modifiers) or secondary clauses. I focus on the causal attribution to the three basic elements, namely to the agent (S in active sentences), the patient (O in active sentences) and the situation in which the described action takes place. Of course, causal attribution is expected to be stronger toward agents and I am not expecting that patient or situation will receive greater attributions than agents only because O or V are placed in first position. Rather I argue that, anything else being equal, their causal role will increase <u>relatively</u> when positioned first.

Study 2a: Word Order and Causal Inferences

Italian Study

I developed a translation paradigm in which each sentence can be presented with different word orders without needing to respect syntax rules. To justify the unorthodox order in which words appeared in the sentences, I pretended to have translated them from Chinese, presenting above each Italian phrase the original Chinese ideograms (see Table 2.1). I created six sentences in which the three main elements (S, O, V) appeared in all possible combinations (SVO, SOV, OVS, OSV, VSO, VOS), while keeping the content of each phrase constant across conditions (see Appendix B).

Study 4a	領著兩個幼兒園吉利媽媽 (Original Chinese Sentence) Ha portato al concerto i due figli la mamma. (Translated Italian Sentence) [English translation: Has taken to the concert the two children the mom]
Study 4b	۔ہے کیا مدعو کو دادا پر کھانے کے رات پوتے چھوٹے کے اس (Original Urdu Sentence) His little grandchildren has invited to dinner the Grandpa. (Translated Sentence)

Table 2.1. *Sentence examples of translation paradigm*

Method

Participants

Sixty adult volunteering participants, all of whom were native Italian speakers with no knowledge of Chinese, were recruited in public places in Northern Italian cities, Padova.

Material

Participants read 6 sentences (one for each order). The position of the three elements (S, O and V) was counterbalanced with a Latin-square procedure, resulting in six versions of the questionnaire. Thus, each sentence (e.g., *the teacher criticized the children*) was varied across versions so that the three elements (S, O, V) appeared in all possible combinations (SVO, SOV, OVS, OSV, VSO, VOS). In order to avoid biases due to particular order-by-content combinations, we assigned 10 participants to each questionnaire version. Action verbs (V) used in these current studies tend to communicate the meaning of the situation (Semin & Fiedler, 1988).

Design and Procedure

Participants read 6 sentences. After each sentence, they were asked to answer 6 questions (two for each kind of attribution) that constituted our main dependent measures: agent attribution (*to what degree do you think this is due to [S]?*; *to what degree do you think this reflects [S's] personality?*, $r=.33$, $p<.001$); patient attribution (*to what degree do you think this is due to [O]*; *to what degree do you think this reflects [O's] personality?*, $r=.56$, $p<.001$); and situational attribution (*to what degree do you think this is due to the situation?*; *to what degree do you think this is a reaction to this particular moment?*, $r=.68$, $p<.001$). Responses were provided on 7-point scales (1=not at all, 7=completely). The items were chosen taking into account the following considerations: First, in keeping with classical attribution research, we distinguished between dispositional and situational attributions (Chiu & Hong, 1992). Dispositional attributions to the two protagonists of each sentence were assessed through items that tapped both the locus (actor or

patient) and the stability dimension (personality). Also, items were formulated so as to be equally applicable to the agent/subject and the patient/object. Turning to the situational attribution, the items were selected so as to reflect both the situational and the temporal dimension. Attributions were considered to be situational when the event was attributed either to the specific circumstances or to the specific moment. Finally, the general formulations of our items also allowed us to apply the same, simple questions to all stimulus sentences.

Because I was interested in the role of the first vs. later position, I averaged the attributions to the agent when S appeared in the first position (SVO and SOV), and when it appeared in the second or third position (VSO, OSV, VOS, OVS). I proceeded in the same way for patient and situational attributions.

Results

A 3(attribution: agent vs. patient vs. situation) x 2(first vs. later position) repeated measures ANOVA revealed, unsurprisingly, that participants attributed the event more to the agent ($M = 5.37$, $SD = .92$) than to the patient ($M = 4.27$, $SD = 1.00$), with situational attributions occupying an intermediate position ($M = 5.05$, $SD = .69$), $F(2, 58) = 28.23$, $p. < .001$, $\eta^2_p = .32$. More relevant to our hypothesis, causal attributions were greater when an element appeared in the first ($M = 5.17$, $SD = .75$) rather than in a later position ($M = 4.63$, $SD = .61$), $F(1, 58) = 28.48$, $p < .001$, $\eta^2_p = .33$. Unexpectedly, the interaction between attribution and position was also significant, $F(2, 58) = 6.66$, $p < .002$, $\eta^2_p = .10$ (see Fig. 2.1). Separate paired t-tests showed that causal attribution to the agent was greater when S appeared in the first (vs. later) position, $t(58) = 3.75$, $p < .001$, and that the causal attribution to the situation was greater when V appeared in the first (vs. later) position, $t(58) = 6.52$, $p < .001$. For patient attributions, which were overall lower, the difference was not significant.
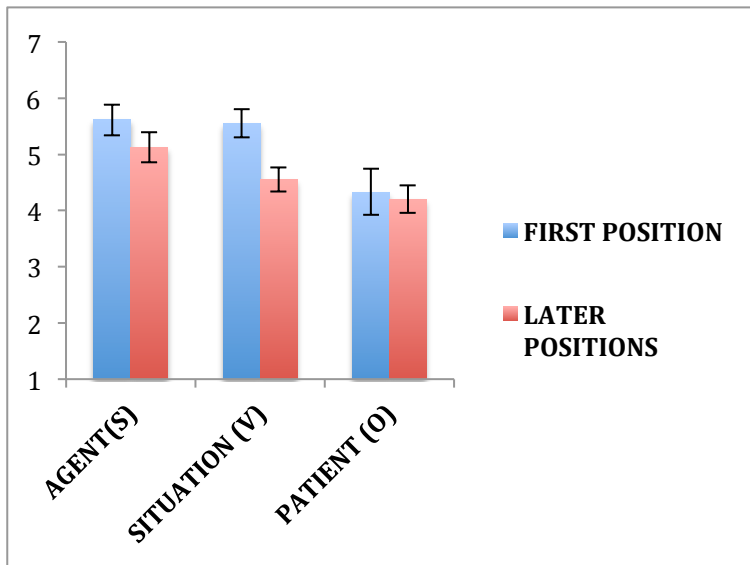
Figure 2.1. *Study 2 a. Causal Attribution Italian sample*

Discussion

In line with the hypotheses, participants made stronger causal attributions to a given element when it appeared first rather than later in the sentence. Only patient attributions were not reliably affected by order, although means were in the predicted direction. It is conceivable that the order effect was weaker for O because the patient is, almost by definition, a passive recipient of the action. In sum, we observed that the co-responsibility of an action depends on the position of the elements that are involved in a certain event. The relevance of the first term, as we learn from previous literature, plays a crucial role in the process of inferring and distributing causal attribution among actors of a given situation.

Although Italian is classified as an SVO language (Dryer, 2011), it allows order inversions to a greater degree than other SVO languages, including English (Bates, McNew, MacWhinney, Devescovi & Smith, 1982). The gender and numerical agreement between adjective, noun and verb may drive individuals to individuate the thematic role of each element even when the canonical SVO order is not strictly respected. This allows writers/speakers some freedom to position the elements in a pragmatic order that deviates from the grammatical canonical one, for instance by starting a sentence from what they consider to be the most important or relevant element. To

understand the generality of this attribution bias, it was therefore important to investigate the phenomenon also in a language in which thematic-role comprehension (*who does what to whom*) is more strictly defined by word order.

Study 2b: Word Order and Causal Inferences

English Study

I replicated the above study with similar materials and procedure to test whether this temporal attribution bias would be observable also in English with a strict canonical word order (Givòn, 1993; Dryer, 1995). I did not compare Italian and English language, simply the purpose was to test whether this kind of attribution process would be applicable in several languages, even in those that are more grammatically rigid such as English language. Before investigating languages with order different from SVO, my choice was English because it has a strict canonical order, also due to the absence of gender and numerical agreement between adjective, nouns and verbs. The lack of these features in English language probably confers to the word order a more informative role for English speakers and readers. As demonstrated by MacWhinney et al. (1984) study, strategies in interpretation of sentences vary across even closely related languages such as English Italian and German that share the same canonical order, namely, SVO. In particular, when asked which of two nouns was the actor, English speakers relied primarily on word order assigning the actor role in transitive sentences to the first noun, Germans relied on both agreement and animacy, and Italians showed an extreme reliance on agreement. With regard to the competition model, these findings imply that the word order has a different weight in sentence processing and comprehension across the three languages. Results of MacWhinney et al. (1984), suggested that word order is much more important in languages that do not have declination and that, more in general, do not express grammar through suffix or prefix.

I decided to label this bias Temporal Attribution Bias (TAB) because I believe that causal attribution varies together with a chronological order. Although temporal ordering (i.e., *before-after*) does not necessarily imply causal relation (i.e., *cause-effect*), it is a precondition for causal reasoning, which may explain why temporal and causal inferences often go hand in hand. When no

linguistic markers are present (i.e., *tomorrow*, *for this reason*), readers/listeners are used to construct temporal and causal relations in function of the order in which element are conveyed and it turns in assigning earlier elements temporal and causal relevance over later ones.

Method

Participants

One hundred and twenty participants (60 males, 58 females, 2 unidentified; average age 36.7) were recruited, including 114 native English speakers and 6 native speakers of other languages. None had knowledge of Urdu, which is relevant given that the sentences were presented in Urdu (see below). Participants were recruited through Amazon MTurk and paid 1USD for completing the questionnaire.

Material and Procedure

Materials and procedure were identical to Study 2a, with three exceptions. First, sentences and instructions were provided in English language. Second, participants were recruited through MTurk and the questionnaire was accompanied by a brief introduction and a written debriefing at the end. Third, because of the possible presence of Chinese Americans among American MTurk users, the allegedly "original sentences" were presented in Urdu rather than Chinese (Table 2.1).

Results

In support of the hypothesis, a 3 (attribution: agent vs. patient vs. situation) x 2 (first vs. later position) repeated measures ANOVA revealed that the causal attribution for the described action changed according to the position of the S, O, V (Fig. 2.2). The events were attributed more to a given cause when the element appeared in the first position (M=4.95, SD= .86) than when it appeared in a later position (*M*= 4.49, *SD*= .78), $F(1, 119) = 26.1$, $p < .001$, $\eta^2_p = .18$. Also,

unsurprisingly, the events were attributed more to the agent (M = 5.33, SD = .86) than to the situation (M = 4.67, SD = 1.03) or to the patient (M = 4.14, SD = 1.04), $F(2, 119)$ = 53.43, , $p <$ .001, η^2_p = .31. There was no interaction effect. Thus, findings perfectly confirmed the predicted effect of order on causal attributions.

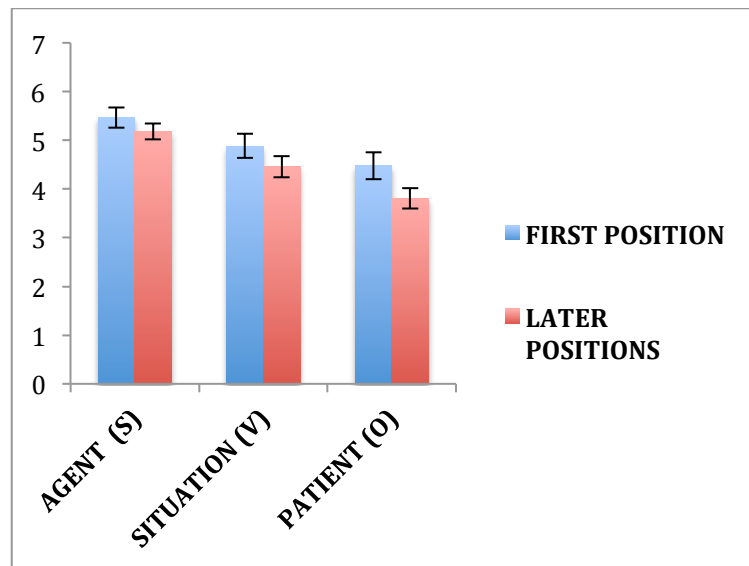

Figure 2.2. Study 2b. *Causal Attribution English sample*

Discussion

Study 2b replicated the same pattern of results of Study 2a. In line with hypothesis, causal inferences are influenced by the order in which the elements are disposed within a sentence. Results also confirmed the relevance of the first term in inferring and distributing the responsibility among actors. It was therefore important to have investigated the phenomenon also in a language, such as English, in which sentence comprehension is more strictly defined by word order (MacWhinney et al., 1984). Study 2b, in line with literature, strengthens the importance of word order as a cue on which English speakers mainly rely in sentence comprehension and interpretation. Although it remains to be seen what process drives the increased attribution to the first term, these findings encourage further studies investigating the potential link between word order and causal attribution in languages with canonical order different from SVO.

Conclusions

Through two studies I have been able to add a piece to the already long tradition of research on causal inferences. Here I hypothesized that the causal inferences people draw about everyday events is affected by the order in which S, O and V occur in transitive active sentences. Our *translation paradigm* allowed us to test this hypothesis in a within-participants design while keeping other variables (culture, native language, sentence content) constant. Both studies provide clear support for the Temporal Attribution Bias, although effect sizes may appear small at first sight. This is quite common for language effects that tend to be of small magnitude when considered as single instances, but that may gain considerable weight when the same linguistic features are used consistently in discourse. Importantly and conferring robustness to the effect, the hypothesis was confirmed in two languages (Italian, English) that vary somewhat in the degree to which order inversions are admissible.

These findings raise a number of interesting questions for future research. First of all, it remains to be seen what processes drive the increased attribution to the first element. We see at least three possibilities: First, readers/listeners may pay greater attention to the first element and hence use it more when asked to explain the event. Second, readers/listeners may infer the writer's/speaker's intention, that is, they may assume that the element was strategically placed first because considered most relevant. This process is particularly likely for language communities (e.g., Italian) where order inversions are relatively common. Third, readers/listeners may construct situation models in which the first element occupies the most prominent place in the model.

If confirmed by future studies, the temporal attribution bias seems to offer a parsimonious explanation for related phenomena, such as the tendency to blame the victims more for their fate when the event is described in passive voice (with the victim appearing in the first position) rather than in the active voice (with the perpetrator appearing in the first position, Bohner, 2001; Henley, Miller, & Beazley, 1995).

As a possible explanation of the Temporal Attribution Bias, I could propose two hypothetical overlapping systems belonging to human beings: a *universal cognitive mechanism* and a *cultural language system*. With the first mechanism I refer to a system whereby all people are able to construct a mental representation in the same way. People construct a mental representation of the sentence that follows the order of the elements encountered. For instance, in a mental blank space, if the first element encountered in a sentence is the verb, people are likely to imagine the described situation (through the verb) even before imagining the subject that performs the action or the recipient that receives it. This cognitive mechanism is supposed to be a universal common feature of all people: imagine a situation following the sequential order in which the elements are mentioned. With *cultural order system* I mean a system that is grounded in culture. Regarding the word order of subject, object and verb, we know that there are six possible combinations of word order (SVO, SOV, VSO, VOS, OVS, OSV). By sharing a common canonical word order the cultural order system enables a community to facilitate communication by increasing the predictability and collectively guiding interpretation.

The overlap between these two processes, the universal and the cultural one, leads people to think about the first element encountered as the most important: the first element is the one that creates the frame in which the other elements will be included. This, in turn, will affect the causal attribution of the entire event. Through the universal cognitive mechanism speakers of different-order languages share the same way to construct a mental representation, but regarding their different cultural order systems they imagine the same elements in a different sequence attributing different levels of importance and of responsibility to the subject, the verb and the object, accordingly.

Findings suggest the possibility that speakers of different-order languages routinely favor some causal attributions over others. For instance, speakers of OSV languages may, on average, perceive the patient as more co-responsible for an event than those of SOV languages, and both may be more likely to overlook situational causes or constraints than speakers of verb-first

languages. Cross-linguistic comparisons and research on bilinguals (e.g., Welsh-English or Garifuna-Spanish bilinguals) provide a promising route for investigating habitual attribution patterns driven by word order.

Chapter 3:Word Order and Causal Reasoning

General introduction to studies

Daily reasoning is permeated by the search for causes and effects of life events. For example, we constantly wonder about the reasons and the consequences of other's behavior. Tversky and Kahneman (1974) demonstrated that people generally use their knowledge and experience to make both predictive and diagnostic inferences. Predictive reasoning is the process through which people infer the likelihood of effects starting from the cause. By contrast, diagnostic reasoning is the process through which the likelihood of causes are inferred starting from the effect. For example, while reading about tax increases, people are likely to make predictive inferences about the effects on their economic situation; while reading about suicide cases, people usually make diagnostic inferences about possible causes behind such extreme acts. Finally, while reading that "olive trees are attacked by a fungus", people may look either for causes (e.g., climate change, pesticides use) or for consequences (e.g., reduced oil production, contagion of other trees). In the latter example, it is critical to understand what is driving the reader to one or the other process.

Research on the distinction between predictive and diagnostic reasoning shows that predictive, in contrast to diagnostic, reasoning is easier because it follows the natural order of causes preceding effects. For this reason, people judge causal links stronger in predictive than in diagnostic inferences (Tversky & Kahneman, 1974). For instance, Fernbach, Darlow, and Sloman (2010), across three experiments, they demonstrated that people tend to underestimate the potential role of alternative causes when making predictive, but not when making diagnostic inferences. For instance, clinicians read a statement about a patient who was diagnosed with depression (predictive frame) or presented a symptom of lethargy (diagnostic frame). Then, they were asked to judge the patient's likelihood of presenting lethargy (predictive frame) or suffering from depression (diagnostic frame). Results show that the judgment of a causal relation between disease and symptom was influenced by the type of induced causal inference: the patient was judged more

likely to present lethargy given the depression diagnosis, rather than suffering from depression given the lethargy symptom. Thus, the relation between depression and lethargy was evaluated stronger when a predictive frame was adopted. The authors stressed that, when asked to make predictive inferences, individuals may consider the cause as the sole explanation of the effect and hence perceive the link as stronger; to the contrary, by generating diagnostic inferences, they may engage in a reasoning process in which a greater number of possible causes is considered (Fernbach, et al., 2010). However, this research is confounded with respect to the order in which causes and effects were presented. When investigating the processes underlying predictive and diagnostic reasoning, Fernbach et al (2010) also changed the order in which cause and effect appeared in the experimental material without considering the order as a potential independent variable able to favor one direction (e.g., predictive, from causes to effects) over the other (e.g., diagnostic, from effects to causes). Hence, it is not clear whether frame or word order drove the observed effects, or both. Thus it remains to be understood whether the result pattern depended exclusively on the induced frame (predictive vs. diagnostic) or on the order in which causes and effects were to appear (Cause-Effect vs. Effect-Cause). It is well possible that word order in and by itself induces predictive vs. diagnostic reasoning which in turn affects the perceived strength of the link between cause and effect.

Within the normative framework of Bayes nets in which a causal structure is used to define a probability (Spirtes, Glymour, & Scheines, 1993), Meder, Mayrhofer, and Waldmann (2014) showed that in case of uncertainty regarding the underlying causal link, the structure of test questions helps people to distinguish between the two processes. Questions used to explore predictive and diagnostic causal inferences were created in order to mirror both the Cause - Effect and the Effect – Cause direction: in the former case the word related to the cause was placed before the one related to the effect. Again, the order of causes and effect within the questions (Cause-Effect vs. Effect-Cause) and type of reasoning (predictive vs. diagnostic frame) were confounded and it is not clear which of the two variables (word order or framing) is responsible for the type of

adopted reasoning. The authors suggested that the process of diagnostic reasoning is affected by both the belief about the existence of a causal relation between a given cause and an effect, and the probability that the effect has been produced by alternative causal by alternative causes. The authors asked participants to make two judgments about the relation between a disease and a substance present in the blood of a patient. They were presented with two different questions: one invited them to make a predictive inference from cause (the disease) to effect (the substance) (e.g., "How certain are you that a novel patient who has been infected with Midosis has the substance Rothan in his blood?"), while the other prompted the causal inference in the opposite direction, from effect to cause (diagnostic) (e.g. "How certain are you that a novel patient who has the substance Rothan in his blood has been infected with Midosis?", Meder, et al., 2014). In addition to the experimental questions, participants were given a learning data set in which levels of diagnostic and predictive probabilities were combined. Results showed that diagnostic judgments were affected by higher levels of diagnostic probability in the learning data set. Of particular interest, individuals were also more likely to judge the presence of a substance (effect) as being causally related to the disease (cause) when the learning matrix showed higher predictive probabilities. Therefore, a stronger causal link between the two components led participants to judge the effect as being produced by the given cause (Meder, et al., 2014).

The previous literature supports the importance of both processes during the elaboration of a causal event. However, in previous studies the order of cause-effect vs. effect-cause was confounded with the inference frame, with cause-effect order being systematically associated with the induction of predictive reasoning (such as in Meder et al., 2014), and effect-cause ordering being associated with a diagnostic frame. The main purpose of my studies is to investigate whether the order in which Causes and Effects are disposed within sentences affects the strength of causal inferences.

Given the relevance of the first term in cognition and, in particular, the fact that the first element signals greater agency as well as temporal and causal precedence (see Mollin, 2012;

Hegarty et al., 2011), in this research project I propose a novel approach to Word Order according to which the focus on the first term influences the strength perception of causal relations between elements. By switching the order in which causes and effects appear (Cause-Effect vs. Effect-Cause) individuals will be induced to either focus on the cause (in Cause-Effect order) or on the effect (in Effect-Cause order). I predict that cause-effect order will lead people to perceive a stronger link between cause and effect and that this may, in turn, influence subsequent intentions of changing current habits.

Despite a substantial literature focusing on causal reasoning and a growing literature focusing on the role of language in cognitive processes, the role of word order in the perception of causal relations has not yet received attention. Given the consistent confounding of framing and word order in prior research (see Meder et al., 2014; Fernbach et al., 2010), the separate effects of framing and word order on causal reasoning remain to be investigated. The studies reported below aim at exploring the impact of order on the perceived strength of the relation between two variables (cause and effect) Specifically, I predict that by manipulating only the order of presentation of cause and effect in the health domain, will induce participants to focus either on the cause (in cause-effect order) or on the effect (in effect-cause). This, in turn, will affect the perceived causal link, the perceived health risk and the perception of personal relevance as will be explained in greater detail below.

The potential relation between word order and causal reasoning will be tested in three distinct studies (Studies 3a, 3b and 3c). In all three studies I will present a series of health related binomials that are causally related (Cause-Effect, e.g., *smoking-cancer*; *sodium-blood pressure*). Sentences will be presented in the same form across all the three studies and the main independent variable will be the order in which the two terms of the binomials are arranged. In one case, the cause will precede the effect (e.g., *Smoking has a link with lung cancer*) and in the other, the effect will precede the cause (e.g., *Lung cancer has a link with smoking*). The linguistic frame of the causal relation as "a link" allows to investigate Cause-Effect order while keeping the remaining

information constant, and without imposing a specific causal reasoning (diagnostic vs. predictive) which may confound the effect of ordering.

The three studies differed with respect to the dependent variables. In Study 3a, participants reported the perceived correlation between the two health-related elements, in Study 3b they evaluated the degree of risk for themselves and for others, whereas in Study 3c they rated the personal relevance. Also, the intention to change risk behaviors was assessed in both Study 3a and Study 3c. . I predicted that the perceived relation (investigated in Study 3a) and the risk for self and others (investigated in Study 3b) will be stronger when participants are faced with cause-effect ordering of binomials because this order reflects the natural order of causes preceding the effects. Specifically, by focusing first on the cause (Study 2b), participants will think about that cause (smoking) as the most likely reason behind a certain effect (lung cancer). By contrast, by focusing on the effect (lung cancer), participants may think of different causes (smoking, pollution, genetics) than may have generated the effect. In study 3c, rating the personal relevance, I predicted that information in which effects precede the cause will be evaluated as more relevant than information where causes are presented first. The underlying mechanism responsible for this could lay in the fact that by placing in first position the effect, consequentially the focus of attention is primarily on the effect. My hypothesis consists in demonstrating that, in focusing on an issue of personal relevance such as health, the potential presence of a great number of causes behind a given effect may intensify the perception of the issue's personal relevance.

Study 3a: Word Order and Perceived Causal Relations

This study was conducted in collaboration with Alice Spollon and is part of her Master Degree Thesis untitled "*Presentation order of cause and effect and the perception of health risks*" (University of Padova, 2015).

Aim and Hypothesis

In order to test the effect of word order on conditional probability judgments, I implemented an on-line study in which participants were asked to estimate the strength of the relation between health-related elements such as smoking and cancer. The main purpose was to investigate whether the order in which Causes and Effects are presented (e.g. *Smoking has a relation with cancer* vs. *Cancer has a relation with smoking*) can influence the perceived strength relation in health-related situations. In fact, differently from previous studies, neither predictive nor diagnostic reasoning were induced, but only the order in which causes and effects were mentioned in the sentence, so as to avoid a confound between reasoning frames and word order.

Because attention is mainly caught by the first element, I expected that by asking participants to estimate the correlation between health-related elements they will perceive the two elements as more strongly related when presented in Cause-Effect (e.g., smoking – cancer) rather than Effect-Cause order (e.g., cancer – smoking). The underlying mechanism believed to be responsible for this effect is the following: As evidenced above, in Cause-Effect order people infer possible effects starting from given causes and, for this reason, they are unlikely to consider other causes besides the one given. In contrast, Effect-Cause order will lead people to underestimate the correlation, because focusing on the effect they are likely to generate several other causes that may explain and may have caused that effect.

The conditional probability, therefore, should be greater in Cause-Effect than in Effect-Cause order. As a consequence, a given health behavior should be perceived as highly connected with the corresponding health outcome. For instance, cardiovascular diseases (effect) will be perceived as a more likely consequence of obesity (cause), when presented in Cause-Effect order.

To the contrary, by presenting the same health related situation in Effect-Cause order, people are more likely to find multiple causes related to cardiovascular diseases besides obesity, such as, for example, smoking and drinking habits and reduced sport activity. In this latter case, the co-presence of multiple causes will lead people to consider the relation between cardiovascular diseases and obesity weaker and hence the health-related behavior is less likely to be perceived as the cause of cardiovascular disease.

The main hypothesis is therefore that the relation between a risk behavior and a health outcome will be perceived as stronger when the cause precedes the effect and this is believed to be a consequence of the fact that the Cause-Effect direction induces participants to adopt a predictive reasoning.

Method

Participants

In order to assure that participation was voluntary, participants were asked to read a consent form before starting the study and to indicate their consent. Two-hundred and thirty participants replied to the announcement. However, the sample was greatly reduced when taking into account only complete questionnaires. The final sample consisted of 120 participants equally divided among the two conditions, with exactly 30 males and 30 females per condition (Age_{mean}: 38.05, Age_{SD}: 14.7). This procedure was important in order to avoid any gender bias and any bias due to questionnaire version.

Material

For this study, we used a self-report measure. The questionnaire was composed of two sections. The first part included 12 health-related situations. We presented 6 sentences in CE order and the other 6 in EC order, half of them representing positive (e.g., "Pollution has a link with hypertension"), half negative (e.g., "Alcohol has a link with job performance") correlations. In order to test the influence of Causes and Effects order, we counterbalanced the order of presentation

between participants. For instance, in the first condition participants read a given sentence in CE order ("Alcohol *has a link* with short-term memory capacity") and in the second condition, participants read the same sentence in EC order ("Short-term memory *has a link* with alcohol"). The underlying logic consists in maintaining the same sentence structure and the same content of each sentence across conditions, by changing only the order in which elements (causes and effects) appear in the sentence. To assure that participants would understand the concept of correlation correctly, participants were first provided with a brief introduction regarding this concept in which we explained through several examples the meaning of positive vs. negative correlations and the way to express correlations through values from -1 to +1. it

In order to create several health-related situations, we started from elements such as smoking, alcohol consumption, physical activity and nutrient substances such as calcium, potassium, sodium and sugar. We associated each of these potential health-related risks or benefits to related effects; the effects were either observable (skin, asthma, erectile dysfunction, reflex velocity) or not directly observable (blood pressure, cholesterol, glycemia, metabolism, tumors, memory efficacy and job performance). (A copy of one version of the questionnaire can be found in Appendix C). Participants were asked to provide the estimated correlations on a 11-point correlation standard scale from -1 (perfect negative correlation) to +1 (perfect positive correlation).

The second part of the questionnaire assessed demographic information and alcohol and smoking habits, by asking participants to indicate the frequency with which they adopted these unhealthy behaviours. The frequency was rated on a 7-point Likert Scale, ranging from "Never" to "Every days". At the end we asked participants to evaluate their eating habits ("to what degree do you think your eating habits are healthy?"), behavioural intentions of changing their current habits ("to what degree are you intentioned to change your current eating habits?") and the time they spend in physical activities ("Do you practice physical activity? If yes, how often?"). Questions regarding eating habits and behaviour change intention were assessed on a 5-point Likert Scale, from "Not at all" to "Totally". For the last question regarding physical activity, participants could

choose from six different frequency rates, ranging from "Every days" to "I do not practice physical activity". Data collected in the second part of the questionnaire allowed us to investigate whether perceptions of cause-effect links are related to lifestyle habits on one side and to intentions to change health related behaviors on the other.

Design and Procedure

An online *between-subjects* study was carried out to investigate the effect of Word Order on the perception of risk-outcome correlations. We created two conditions in which we manipulated the order of presentation of causes and effects while keeping the content of the sentences constant across the conditions. The two versions were uploaded in Surveymonkey software that generates links to share across multiple platforms (social networks, e-mail, web-base pages).

Participants were invited to take part in a study entitled "Social Cognition and Well-Being" investigating the perception of health-related habits. After reading the consent form, participants were asked to agree to take part to the study. Participants who decided to take part to the study were asked to answer each question to proceed to the next question.

Each of the health-related situations was presented on a separate screen sequences. For each situation, participants were asked to express the degree of perceived correlation between two elements using a scale from -1 (completely negative correlation) to +1 (completely positive correlation) (See Figure 3.1).

Figure 3.1. *Example of health-related situation in experimental section.*

Results

Considering that I was not interested in the direction (negative vs. positive) of the correlation, but only in the strength of the perceived relation between elements depending on the position in which Causes and Effects appear, I converted correlation ratings into absolute values[2] and in order to facilitate the comprehension of the data we transformed the 0-to-1 values into 0-to-100. A paired (Cause-Effect vs. Effect-Cause orders) t-test revealed a main effect of the order, $F(1,118) = 6.07$, $p < .02$, $\eta^2 = .05$. As predicted, when the order of presentation was such that the Cause preceded the Effect, participants perceived the relation between the elements stronger (M = 58.17, = 19.54) than when the same elements appeared in Effect-Cause order (M = 54.14, SD = 20.12). (See Figure 3.2)

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[2] The same pattern was observed among positive and negative correlation, therefore they will be discussed in terms of absolute strength of the relation
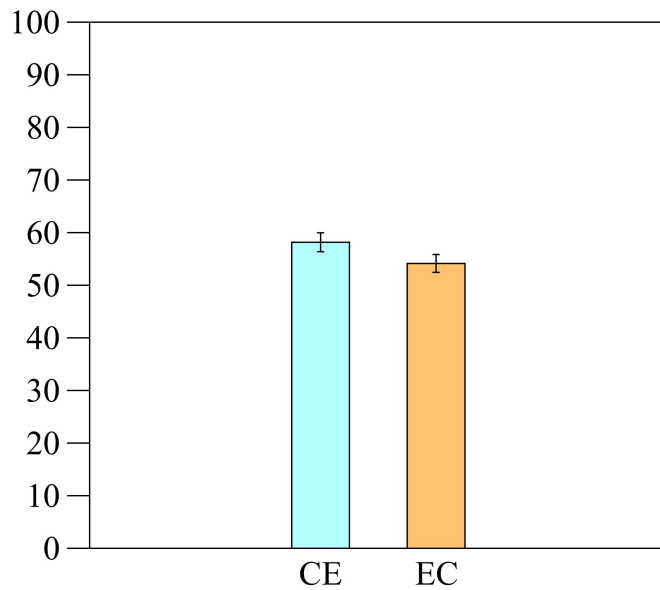
Figure 3.2. *Estimated Correlations between Causes and Effects (N=120)*

A correlation was run to test whether the participants' self-reported eating habits were related to the perceived link between cause and effect. Correlations revealed that participants who reported healthier eating habits tended to perceive a stronger relation between causes and effects, regardless of order, Cause- Effect order, $r(120) = .23$, $p = .011$ or Effect-Cause Order, $r(120) =. 19$, $p = .038$. No correlations were found between other habits related to life style (smoking, drinking, physical activity).

Furthermore, participants who reported unhealthy life styles revealed interesting result patterns. For each participant, I calculated the difference in perceived strength of the relation (in absolute values) between sentences presented in Cause-Effect order and those presented in Effect-Cause order. High ratings indicate that participants perceived a stronger correlation in Cause-Effect rather than in Effect-Cause order. I then correlated these ratings with participants' self-reported health-related behaviors. Interestingly, participants who reported unhealthier habits (smoking and

drinking) were more sensitive to the order of presentation of causes and effects. In particular, participants who declared to smoke more frequently, $r(120) =. 19$, $p=.034$, to drink hard liquor more frequently, $r(120) =. 32$, $p <. 001$, or to drink wine and beer more frequently, $r(120) = .27$, $p = .003$, perceived elements to be more closely related in Cause-Effect than in Effect-Cause order. Even more relevant, participants who were more sensitive to Word Order also reported to be more willing to change their current eating habits, $r (120) =. 24$, $p = .009$[3].

Discussion

The results of this study offer interesting insights into the role of Word Order in the perceived strength of relation between health risks and health outcomes. This study demonstrates that the order in which causes and effects are disposed within health-related statements may play a critical role in causal reasoning. This study shows that participants estimated the correlation between the elements stronger in the Cause-Effect (vs. Effect-Cause) order of the proposed health-related sentences. This provides support for the idea that when the focus of attention is on the cause (in Cause-Effect order) the estimated correlation increases, which translates into a stronger perceived relation between the health behavior and the health outcomes described in the sentence.

The main analyses revealed the word order effect regardless participants' gender, suggesting that men and women are equally sensitive to variations in word order. These findings also seem in line with Sloman and Lagnado's (2014) statement that causal reasoning is not correlational and that "causal relation is not merely an association but rather a representation of something more enduring in nature". If it were a mere assessment of correlation, order would not affect it, whereas our data clearly show that word order does play a role.

Interestingly, the effect of order seems to affect mostly participants with particularly unhealthy habits, such as smoking and drinking. Participants with unhealthy habits reported higher correlation ratings in Cause-Effect than in the Effect-Cause order, compared to participants with

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[3] In addition, we run a similar analysis with a multilevel approach which revealed the same pattern of results.

healthy habits who showed the same pattern but to a lesser degree. Although the exact reasons remain to be investigated in future studies, one possible interpretation is that participants with unhealthy habits are more involved in described issues and hence pay greater attention to the exact formulation. Interestingly, participants with healthy eating habits have shown a stronger perceived relation between causes and effects <u>regardless</u> the order in which elements are provided. This may simply reflect the fact that who perceives a greater link between (un)healthy behaviors and health outcomes may have adopted healthier eating habits as a function of these beliefs.

The fact that participants with unhealthy habits are most sensitive to the Word Order effect has interesting implications for social communication. Given that people at risk (such as smokers) are generally considered the prime target of health information campaigns, word order should be carefully considered when designing such campaigns.

Finally, in line with the previous literature (Fishbein & Ajzen, 1975; Petty and Cacioppo, 1986; Ajzen, 1988), results also show that participants who are greatly affected by order also express a greater willingness to change their current behavior. If behavior intentions are a necessary condition for actual behavior change and are responsible in determining long-term behavior as suggested by Petty and Cacioppo (1986), then attention to word order may indeed be warranted.

If the purpose of health campaigns is to generate behavioral change by changing causal reasoning, then they should take the order in which words are placed within messages into account. To satisfactorily reach that part of population that is in greatest need of behavior change, health-related messages have to be able to lead individuals to adopt predictive rather than diagnostic reasoning. Because predictive reasoning follows the natural order of cause and effect and does not consider other causes besides the ones given, people are generally more sensitive to the risk communication, which, in turn, may translate into a greater intention to change current unhealthy behavior.

Study 3b: Word order and Risk Perception

Aim and Hypothesis

The second study investigated how the order of causes and effects can affect risk perception. In particular, I considered two additional processes that can modify the risk perception. First, as already demonstrated in Study 3a, the relation between elements (risk factor and health outcome) is expected to be greater when the cause is mentioned before the effect rather than vice versa. Secondly, the request to evaluate the risk should lead people to focus on the cause that represents the direct source of the risk to incur a given effect. The result of this additional process should reveal a greater risk perception in those cases in which the cause precedes the effect.

Starting from the fact that the structure of linguistic binomials such as "men and women" or "old and young" is by no means random (Hegarty, Watson, Flechter, & McQueen, 2011; McGuire & McGuire, 1982; Mollin, 2012), this study aims at exploring the role of causes and effects order in causal binomials. We present several health-related causal binomials (e.g., use of cannabis/memory loss) using the same structure of our previous study across conditions and changing the order in which causes and effects are mentioned ("Use of cannabis *has a link with* memory loss" vs. "Memory loss *has a link with* use of cannabis"). In addition, based on previous research on causal reasoning, I assume that cause-effect order should lead to adopt a predictive reasoning style and as a consequence people should give greater consideration to the cause as the major explanation of a certain effect. In contrast, the effect-cause order should elicit a diagnostic frame leading increasing the likelihood of considering several alternative causes beyond the one given. As a consequence, the experimentally provided cause should lose part of its explanatory power. As in the previous study, I expect that the order of causes and effects can play a role in influencing individuals' causal reasoning.

In this study participants were asked to evaluate the risk of a number of health-related sentences (e.g., "*To what degree do you think that this could be a risk for you/others?*"). By asking participants to evaluate the risk of a certain situation should motivate participants to focus on the cause, which should be further facilitated when the order of presentation follows the natural order of Cause and Effect. Thus, I expected that the risk will be perceived as greater in Cause-Effect than in Effect-Cause condition.

The risk perception was tested with regard to both, self and others. In line with the illusion of control literature (e.g., own vulnerability, Weinstein, 1987) that shows how people generally overestimate the control on their life, I expected participants to perceive the risk as greater for others rather than for themselves.

The main difference between the current and the prior study (Study 3a) consists in the dependent variable. In Study 3a, I simply asked participants to estimate the perceived correlation between two elements within a sentence, whereas in the current study, participants were explicitly asked to evaluate the degree of the risk that each sentence implied for themselves and for people in general. In both studies, I predict stronger effects in the Cause-Effect than in the Effect-Cause order, but, different from Study 3a, here participants evaluate the risk of health-related situations, which in and of itself should lead participants to focus mostly on the cause rather than on the effect. By paying more attention to the cause, especially in natural Cause-Effect order, participants will spontaneously adopt a predictive reasoning frame, which, in turn, will translate into a higher risk perception. To the contrary, Effect-Order will induce participants to underestimate the risk perception because the same effect could be caused by several other causes reducing the possibility that the one given is the single explanation.

Method

Participants

Italian speakers were invited to participate in a study of social cognitive psychology investigating the risk perception, approved by the Ethics Board of the Department of Developmental Psychology and Socialization of Padova University. One hundred and twenty participants took part in the study. They were recruited mainly either from the University of Padua or from public spaces such as libraries and coffee bars. In order to achieve the same number of participants within the experimental conditions, we randomly removed 20 participants and the final sample included one hundred participants ($N_{men} = 57$; Age: $M = 25.1$, s.d.$= 2.4$).

Material

For this study, we used a paper and pencil questionnaire composed by two sections. In the first part, we presented on a monitor six sentences followed by two questions for each sentence. Fours sentences represented health risk binomials (alcohol - loss in driving reflexes; cannabis use - memory loss; pollution - hypertension; passive smoking - asthma), linked through the statement "has a strong relation with". The remaining two sentences were considered as fillers and were intended to prevent participants from understanding the purpose of the study ("Italians drive speedy"; "The number of earthquakes has increased"). Each of the six sentences was followed by two questions regarding the perceived risk for self and for others ("to what degree do you think that this situation represents a risk for you/others?").

The second part of questionnaire assessed personal information such as the participant's gender, age, handedness, the estimated degree of pollution in the participants' environment and their life style (smoking, drinking alcohol and habitual use of cannabis in their circle of friends[4]). Given that participants' life-style habits did not affect any variables nor were influenced by word order, we will not discuss them further.

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[4] Given that Cannabis consumption is illegal (yet common) in Italy, we decided not to ask their personal use of cannabis but rather focused on the "norm" among their social network ("How many among your friend use cannabis?").

We constructed 4 experimental conditions consisting in a 2(Cause-Effect vs. Effect-Cause order) x 2 (Cognitive Load vs. No Cognitive Load) experimental design[5].

Design and Procedure

The video was composed of the six sentences appearing on the monitor for three seconds, followed by the respective questions about the perception of risk for self and others appearing on the monitor for 10 seconds (see Figure 3.3). The perceived risk for self and others for each sentence was recorded on an analogical 10 cm line on a paper questionnaire from "Not at all" to "Totally" (see Figure 3.4).
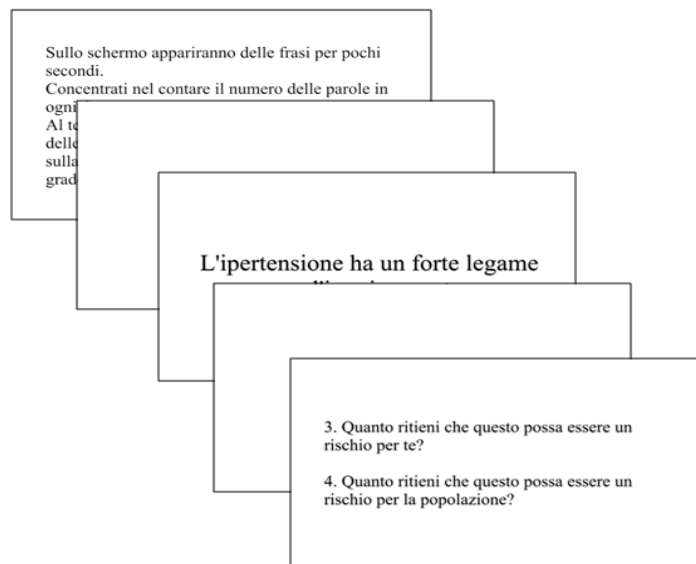
Figure 3.3. *Procedure of Study 3b.*

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[5] The design of this study originally included an additional cognitive load (vs. no load) manipulation. Participants in the cognitive load condition were asked to count the number of words presented in the sentences. We expected that a greater cognitive load would lead participants to be more susceptible to order effects.. This manipulation did not reveal any effect and hence I decided not to report this result in the main text.

1)
Per Nulla   Del Tutto

2)
Per Nulla   Del Tutto

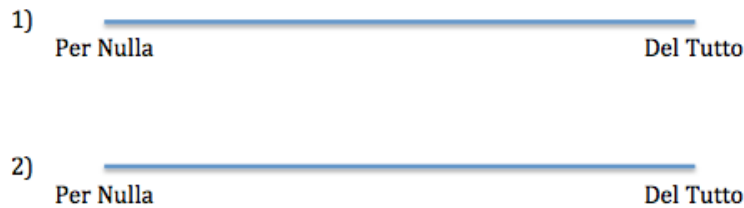Figure 3.4. *Analogical 10 cm line for coding answer about risk perception*

Results

Regarding the main hypothesis about the influence of cause and effect order on risk perception, a 2 (Cause-Effect vs. Effect-Cause) x 2 (Self vs. Others) repeated measures ANOVA revealed two main effects of risk perception; specifically participants tended to perceive higher risk in binomial sentences in which the cause was placed before the effect (M=6.2, SE=.19) rather than in effect-cause condition (M=5.03, SE= .20), F (1,119) = 25.86, p< .001, η^2_p = .178 and, in line with self vs. other hypothesis, participants estimated the risk to be greater for others (M=6.3, SE = .20) than for themselves (M=4.9, SE= .15), F (1,119) = 75.87, p< .001, η^2_p = .389. I ran also correlations between risk perception and participant life style, but there were no significant correlations for any of the variables.

Discussion

The present research extends the previous study by showing that not only the link between cause and effect but also the risk for oneself and for others is affected by word order. Thus, people not only perceive a stronger correlation between cause and effect (Study 3a), but also a greater risk for themselves and for others when the cause precedes the effect.

Furthermore, as predicted in the second hypothesis and in line with the previous literature (see Weinstein, 1987), participants tended to underestimate the risk for themselves compared to the

risk for others. Despite this mean difference, word order had comparable effects on risk perception for self and for others, as evidenced by the lack of interaction.

Taking together the results suggest that the order in which cause and effect are placed within a sentence can affect not only the perceived correlation (Study 3a) but also risk perception. In this specific case, differently from previous studies regarding the role of question framing in causal reasoning processes (Meder et al., 2014), we constructed a question able to shift the focus of participants mostly on the cause of health-related situations. By asking participants to express the risk perception, I ensured that the focus of attention was placed on the cause. The intent was to demonstrate that inducing participants to focus on the cause, in particular, when the cause is in first position would increase the risk perception.

These results suggest important social implications for health-related campaigns with the purpose of reducing or avoiding risky habits. By creating a health campaign, that takes into account the importance of the first term together with the attempt to induce people to adopt a healthy lifestyle, can provide at least two different outcomes. On one hand, people who conduct an unhealthy life may start to reduce their unhealthy habits by perceiving their habits as the main cause of negative effects, which may possibly motivate them to adopt a better and less risky life style. On the other hand, people who already conduct a healthy life may be motivated to maintain their habits because they perceive multiple benefits for each of their positive causal behaviors. In this way, trying to avoid negative consequences they can keep conducting a life enjoying positive outcomes. This may be seen as basis of health prevention and promotion campaigns.

Study 3c: The Impact of Word Order on Personal Relevance Perception and Behavioral Change Intentions

This study was conducted in collaboration with Ilaria Battilani and is part of her Master Degree Thesis entitled *"Word Order and Causal Reasoning: does being first matter*?" (Padova University, 2015).

Aims and hypotheses

In this last study we investigated Word Order effects on causal reasoning in an extended online questionnaire. So far we have only considered the first step of the underlying process whereas reactions to cause-effect information may be manifold, including not only the perceived strength of the link between two causally-related elements (Study 3a) and the risk perception (Study 3b), but also the perceived relevance and whether such a different perception can influence consequent decisions and, as in study 3a the intention to change healthy behaviors. Importantly, distinct predictions can be advanced for these different dependent variables.

The study aims to explore whether the two possible orders in which Causes and Effects are placed in health-related sentences generate different relevance perception, and whether they affect participants' choices in decision making tasks and influence the behavioral change intention. By considering these three different aspects in which Word Order can play a role, we organized the study divided into three sections (in addition to a section assessing personal information) and we developed three hypotheses for each kind of potential Word Order effect.

With regard to relevance perception, we hypothesized that information in which Effects precede Causes will be evaluated as more relevant than information where causes are presented first. The hypothesized underlying mechanism is the fact that people who are required to judge the relevance of a health-related binomial will focus their attention on the effect. In fact, they are induced to consider whether a certain health outcome can be important and relevant for them. By

asking to express the relevance, people will be more likely to focus on the effect. Assuming than this promotes a diagnostic frame (the reasoning process that moves from effect to cause) people are more likely to provide several other causes asides from the one given (Twersky & Kahneman, 1974). Thus, my main hypothesis is that, when considering the personal relevance of a health-related issue, the potential presence of a greater number of causes behind a given effect may intensify the perception of issue's relevance.

For instance, by thinking about dermatological diseases as linked with several possible causes (e.g., dermatological diseases have a link with dairy intolerance, but also to pollution, dust, virus and stress) may lead individuals to perceive this health issue as more relevant than by thinking that dairy intolerance is the only reason for the occurrence of skin rashes (e.g. dairy intolerance has a link with dermatological diseases).

In the present study we also tested participants' choices in decision-making tasks, by providing a number of nutritional choices consisting in filling an imaginary food list and choosing across different salt and sweet snacks. In contrast to the previous hypothesis, for these tasks, we expect that healthier choices will be made when participants are exposed to information where causes come first. The presumed underlying process in this case is the change of focus from the effect to the cause. In line with the literature, studies 3a e 3b demonstrated that the causal link between cause and effect is perceived as stronger when the cause precedes the effect. For exemplification, if one believes that smoking is the only cause of lung cancer the motivation to quit smoking should be greater than when other causes can produce the same effect. We hypothesized that health-related issues in which causes precede effects increase healthy food choices and, consequently, intentions to improve future behaviors, presumably because it puts the critical (causal) behavior at the center of attention, while mentally excluding alternative causes.

Thus, we are suggesting hypotheses that go in opposite directions: on one hand, we predict that Effect-Cause ordering will increase the perception of personal relevance because the focus is on the effect (health outcome) rather than on the cause (risk factor); on the other hand, with regard

to behavior change intentions, we predict that Cause-Effect ordering will be more effective. These opposite predictions may arise from at least two different sources, attentional focus and causal reasoning (predictive vs. diagnostic): as far as the former process is concerned, Effect-Cause ordering directs the focus of attention on the Effect (e.g., lung cancer) increasing the perceived relevance of that effect, whereas Cause-Effect ordering directs attention to the cause (e.g., smoking habits) leading people to consider preventive behaviors to avoid the consequences (e.g., quit to smoke). Turning to causal reasoning as an additional mechanism, in Effect-Cause order, the possibility of multiple causes increases the subjective relevance perception because the same health condition can be provoked by many different causes. Logically, a health outcome related to multiple risk behaviors should be seen as particularly relevant. By the same token, the co-presence of multiple causes should discourage people from changing any single cause, whereas the focus of a single cause (Cause-Effect ordering) should encourage people to change this behavior to avoid its negative outcome, especially if a single cause is associated to multiple outcomes. Put simply, the greater the number of health outcomes affected by a single risk behavior, the more people should be motivated to change that behavior.

Given the difficulty in clarifying the underlying process, I consider this study as exploratory without, at this point, trying to disentangle the two processes (attention and causal reasoning). In a future line of this research project, I will attempt to isolate the two processes, whereas here I will simply test the (opposite) effects of word order on relevance judgments and behavior intentions, without involving other variables that may interfere with the main process.

Method

Participants

Italian speakers were invited to participate in a study regarding the perception eating habits and approved by the Ethics Board of the Department of Developmental Psychology and Socialization. A web-based announcement was published on social media platforms (i.e. social

networks, forums), providing the link of the questionnaire. Participants were asked to read and click a consent form before starting the experiment.

One hundred and eighty-eight individuals took part initially in the study. We excluded from the analysis seventy-one participants who did not complete the survey. Because of an unequal distribution of the sample across the 4 order conditions, we considered for the statistical analysis only the first twenty-five participants within each condition who had responded to the entire survey. The final sample included one hundred participants (N_{men} = 36; Age: M = 28.6, SD = 8.6).

Materials

For this study we used a self-report questionnaire consisting in four different sections. The first section included sixteen sentences related to potential risks and potential benefits of several substances contained in food. We started from four nutritional elements: calcium, fiber, sodium and sugar. For each element we chose two potential health related effects, one that is visible (*hair, muscles, skin and teeth*) whereas the others were not (*blood pressure, cholesterol, colon functioning and glycaemia*). This distinction reflects the interest in studying whether the perception of relevance differs with respect to both the visibility and the severity of the effects.

Once we established the experimental pairs of causes and effects, we constructed two sentences for each pair: one sentence was considered in terms of gain and one in terms of loss (See Table 3.1). Previous studies had emphasized the role of framing on judgments and decisions (see Levin, Schneider, & Gaeth, 1998, for a review), hence I wanted to examine whether information regarding potential health risks framed as losses would be perceived as more relevant than information with respect to potential health gain. Perception of relevance was measured across two questions, namely, the relevance to the self ("*How important is this to you?*"), and the relevance to the others ("*How important is this to the population in general?*"). Responses were provided on a 7-point Likert scale, ranging from 1 (*not at all*) to 7 (*totally*).

Table 2. Sentences-stimuli used in study 2.

Food (*high | low*) in calcium has a connection with	(*good | bad*) teeth
	(*low | high*) cholesterol
Food (*high | low*) in fiber has a connection with	(*strong | weak*) muscles
	(*good | bad*) colon functioning
Food (*high | low*) in sodium has a connection with	(*bad | good*) skin
	(*high | low*) blood pressure
Food (*high | low*) in sugar has a connection with	(*weak | strong*) hair
	(*high | low*) glycaemia

Table 3.1. *Set of sentence stimuli*.

The second section of the questionnaire contained two decision-making tasks. In the first, we asked participants to draw up a grocery list with nine items in order to refill the kitchen storage. In the second, we presented a set of pictures of foods and asked to choose three items to eat as snacks. In this task we asked to make choices also for others to investigate potential differences related to the Self and Others. Food choices included both sweet and salty snacks, half of which were healthier than the others. We also included vegan/vegetarian choices for each category of foods to not constrain the choices of vegetarians. Examples of foods are shown in the table 3.2

MORE HEALTHY		LESS HEALTHY	
SWEET SNACKS	SALTY SNACKS	SWEET SNACKS	SALTY SNACKS
Bread and jam	Bread and light cheese (vegetables pate)*	Bread and hazelnut cream	Bread and salami (hummus)*
Corn flakes	Natural dried fruit	Chocolate cereals	French fries
Fresh fruit	Rice crackers	Cookies	Potato chips
Yogurt (Soy yogurt)*	Vegetables	Ice cream (soy ice cream)*	Salted biscuits

Table 3.2. *Food alternatives for vegetarian or vegan participants*

The third section focused on participants' food habits and perceptions. We asked participants to evaluate the quality of their current eating habits ("*To what extent do you judge your eating habits as healthy?*"), the intention of changing their current behavior ("*To what extent would you be motivated to change your eating habits?*") and the time they spend in physical activities ("*How often do you engage in a physical activity?*"). Responses to the first and second question were provided on a 7-point Likert scale in which 1 corresponded to *absolutely unhealthy/unmotivated* and 7 corresponded to *absolutely healthy/motivated*. In the case of the third question, participants could choose between six alternatives: *everyday, twice per week, once per week, once per month, no regular frequency, never*.

The last question asked participants to think about their bodies and order twelve attributes according to the importance given. Examples of questions were "*What rank do you assign to [physical coordination/ health/ weight/ strength/ sex appeal/ physical attractiveness/ energy level/*

sculpted muscles/ physical fitness level/ coloring/ measurements/ stamina]?" (i.e. S*elf-objectification questionnaire*, Noll & Fredrickson, 1998).

The final section of the questionnaire included anagraphic questions such as participants' age, gender, and time of last meal consumed ("*How long ago did you have your last meal?*").

All these variables can be divided in two blocks according to their function within the study.

Dependent variables: *relevance for self and others*, *food choice* and *behavior change intentions*

Moderator variables: *eating habits*, *physical exercise habits*, S*elf-objectification questionnaire* The questionnaire used in the study is reported in Appendix C.

Design and procedure

A between participants design was used to study the effect of Word Order on relevance perception, food choice and behavioral intention. We constructed four conditions in which we manipulated the order of potential Causes and Effects within sentences: in two conditions Causes preceded Effects (e.g. food high in *calcium has a link with* low *cholesterol*), whereas in the other two Effects preceded Causes (e.g. low *cholesterol has a link with* food high in *calcium*). For both, the two Cause–Effect and Effect–Cause conditions, we counterbalanced the order of presentation of the sentences: in one condition sentences followed a sequence from 1 to 16 (Top to Bottom), in the other the order was opposite, from 16 to 1 (Bottom to Top). The four versions of the questionnaire were published online through the software Surveymonkey®.

Participants read one sentence at a time. For every sentence they were asked to express the perceived importance, both for the self and the others. Then, they were invited to complete the following sections of the questionnaire. At the end they were thanked and debriefed about the purpose of the study.

In order to be eligible for the statistical analyses, food choices in the grocery list were recoded into two new variables. Starting from the overall list of provided foods, we created twelve sub-categories: Alcoholic drinks, Animal and plant protein, Cereals and pulses, Dressings, Fruits and vegetables, Herbs and spices, Milk and dairy products, Natural drinks, Processed salty food, Sausages, Starches and carbs, Sweet food and beverages.

We categorized as *Healthy food* the following categories: Animal and plant protein, cereals and pulses, fruits and vegetables, milk and dairy products, natural drinks, starches and carbs; whereas we assembled into *Unhealthy food* label the remaining categories: alcoholic drinks, dressings, processed salty food, sausages, sweet food. We did not use the variable herbs and spices as they could not be categorized as either healthy or unhealthy.

Results

To simplify presentation we will report here only those effects that involve our prime independent variable, namely Word Order. We will report results, presenting first results regarding the relevance perception, then those with respect to food choices, and last results concerning behavioral change intentions.

Relevance. To test our hypotheses regarding the relevance perception, a 2(Word Order: CE vs. EC) x 2(Gain vs. Loss Framing) x 2(Visible vs. Invisible Conditions) x 2(Self vs. Others/Population in general) ANOVA was run, in which the last 3 variables were within-participant factors.

We found two effects involving Word Order. A two way interaction between Visibility and Word Order, $F(1,98) = 5.56$, $p < .05$, $\eta^2_p = .05$, revealed that for invisible conditions Word Order is irrelevant (CE: M = 4.48, SD = 1.01 vs. EC: M = 4.84, SD = 1.06), whereas with regard to visible effects, as we predicted, participants assigned greater relevance to the same health-related sentences when the effect preceded the cause (M = 4.72, SD = 1.15) than when the cause preceded the effect (M = 3.96, SD = 1.39), $t(98) = -2.17$, $p < .05$. This effect was modified by a further interaction with

Self vs. Other, $F(1,98) = 12.95$, $p < .002$, $\eta^2_p = .12$. A separate 2(Visible vs. Invisible) x 2 (Word Order: CE vs. EC) ANOVA for other-ratings revealed a main effect of visibility, with greater importance given to invisible (M = 4.83, SD = 1.22) than to visible conditions (M = 4.01, SD = 1.30), $F(1,98) = 74.68$, $p < .001$, $\eta^2_p = .43$. Also greater importance was assigned to the same health conditions when the effect preceded rather than followed the cause (EC: M = 4.66, SD = 1.09 vs. CE: M = 4.17, SD = 1.20), $F(1,98) = 4.65$, $p < .05$, $\eta^2_p = .045$ (See Figure 3.5).
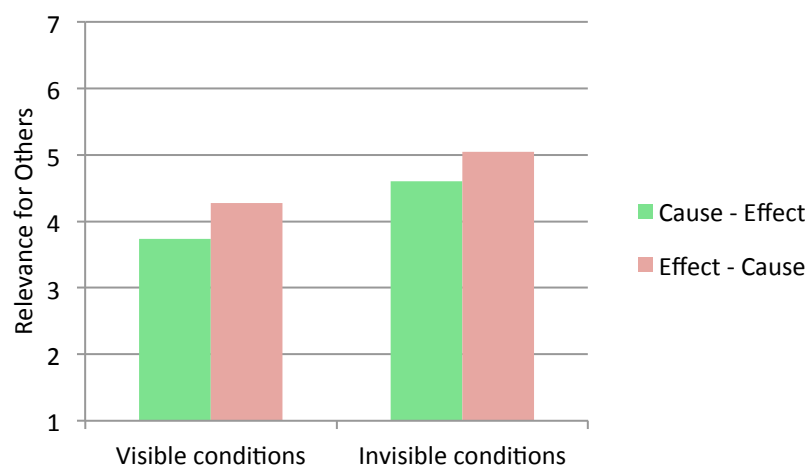
Figure 3.5. *Relevance of visible and invisible conditions for Others as a function of Word Order*

For self-ratings, again, greater importance was assigned to invisible (M = 4.74, SD = 1.33) than to visible conditions, (M = 4.44, SD = 1.43), $F(1,98) = 8.77$, $p < .02$, $\eta^2_p = .08$. This interacted with Word Order, $F(1,98) = 13.13$, $p < .001$, $\eta^2_p = .12$. Word order played no role in judging invisible conditions, p =.42, whereas for visible conditions, marginally greater importance was assigned in the EC than in the CE condition, $t(98) = 1.83$, $p = .07$ (Figure 3.6).
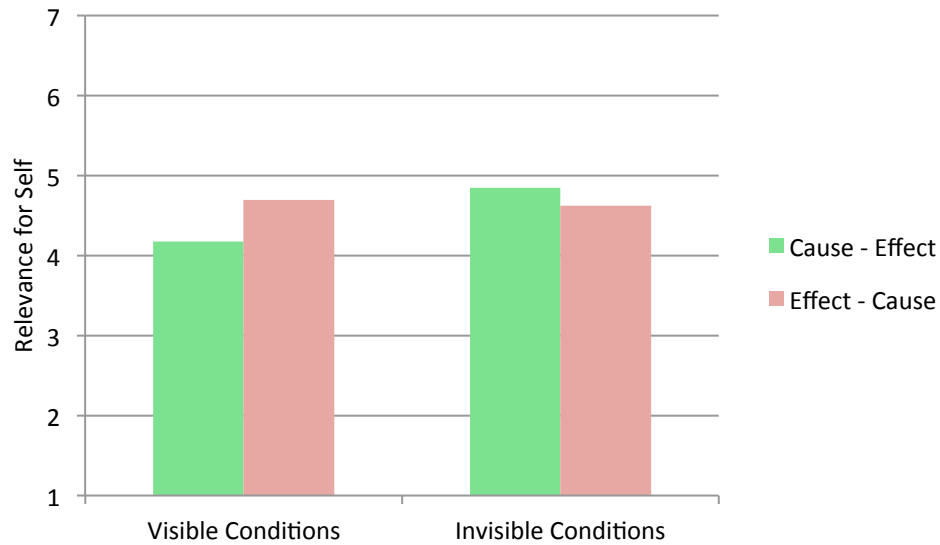
Figure 3.6. *Relevance of visible and invisible conditions for Self as a function of Word Order*

A regression analysis was conducted to test the effect of Word Order on relevance perception. The model included the overall score of relevance perceived for Self as a dependent variable, while Word Order conditions CE vs. EC, eating habits and the interaction between the two factors were considered as predictors. Results revealed that relevance for self was non-significantly predicted by an interaction between Word Order and eating habits B = .28, β = .21, t = 1.36, p = .177. In order to explore the effect of Word Order (*categorical variable*) on relevance perception through the moderation of eating habit (*continuous variable*), we coded the categorical variable as 0,1. Then, I created a centered-score for the continuous moderator. By using the calculation page for examining interactions in multiple regressions (Sibley & Duckitt 2008), I graphically represented the effect (see Figure 3.7). Even though the *p* value did not reach the significance level (*p*=.177), participants with unhealthy eating habits were more likely to perceive health-related statements as relevant when causes came before effects, whereas for participants with a healthy eating habit higher scores of relevance were obtained when effects preceded the causes.
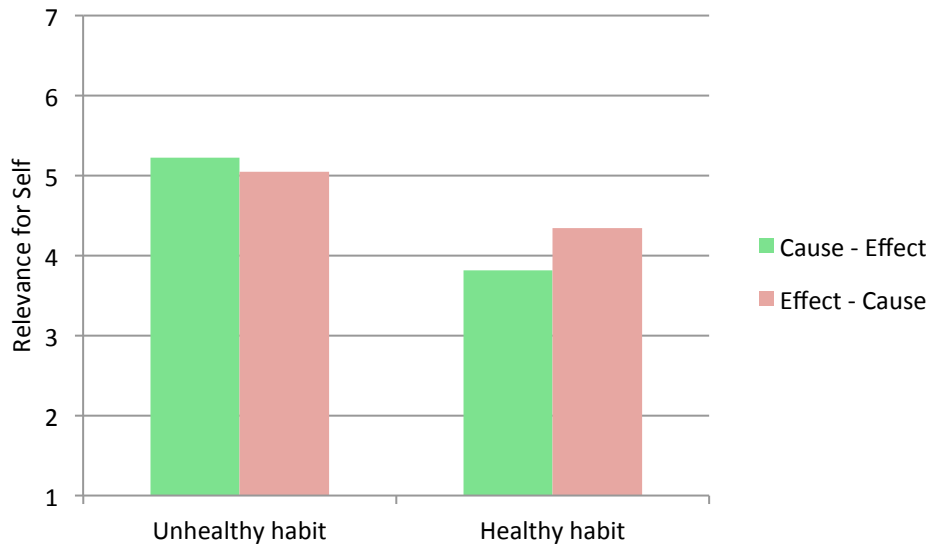
Figure 3.7. *Relevance of health-statements as a function of Word Order X Eating habit*

Food choices task. The two dependent variables food choice (only for self) and grocery list were combined into a single index summing the percentage of healthy foods included in both the food choice and the grocery list, given that the two were reliably correlated $r(100) = .29$, $p = .004$. An ANOVA showed that there was a non-significant tendency to choose more healthy foods in the CE (M = 70.89, SD = 15.86) than in the EC condition (M = 65.67, SD = 22.44), $F(98) = .795$, $p = .375$

To investigate whether Word Order played a role in the decision making process, the same regression model including Word Order, eating habits and the interaction between the two variables was tested. Results showed that the interaction between the two variables marginally predicted healthy food choices, $B = 4.62$, $\beta = .23$, $t = 1.69$, $p = .09$. Again, participants with unhealthy habits tended to choose more healthy food when health-related statements were presented in CE rather than in EC condition, whereas participants with healthy habits showed a trend in the opposite direction (See Figure 3.8).

116
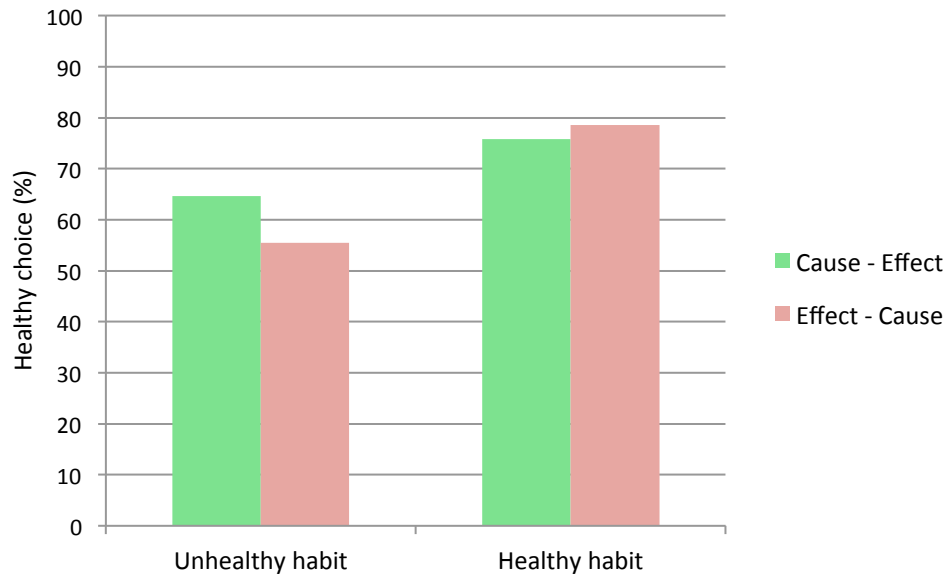
Figure 3.8. *Percentage of healthy food choice as a function of Word Order X Eating habits*

Behavioral intention. To test in relation with behavioural change intentions, the regression model described above was also tested with Behavioral Intention as dependent variable. In this case, the interaction between Word Order and eating habits significantly predicted the behavioral intention of changing the current habits B = .62, β = .39, t = 2.61, p = .01. When reading health-related statements in CE order, participants with unhealthy habit declared a higher intention of changing their eating behavior. On the contrary, participants with healthy habit were more likely to express behavioral intention when reading statements in EC order (See Figure 3.9).

Figure 3.9 *Intention of changing the current eating behavior as a function of Word Order X Eating habit*

Discussion

Study 3c offers additional interesting, though not always coherent, cues on the relation between word order and causal reasoning. We started from predicting opposite effects of word order for personal rele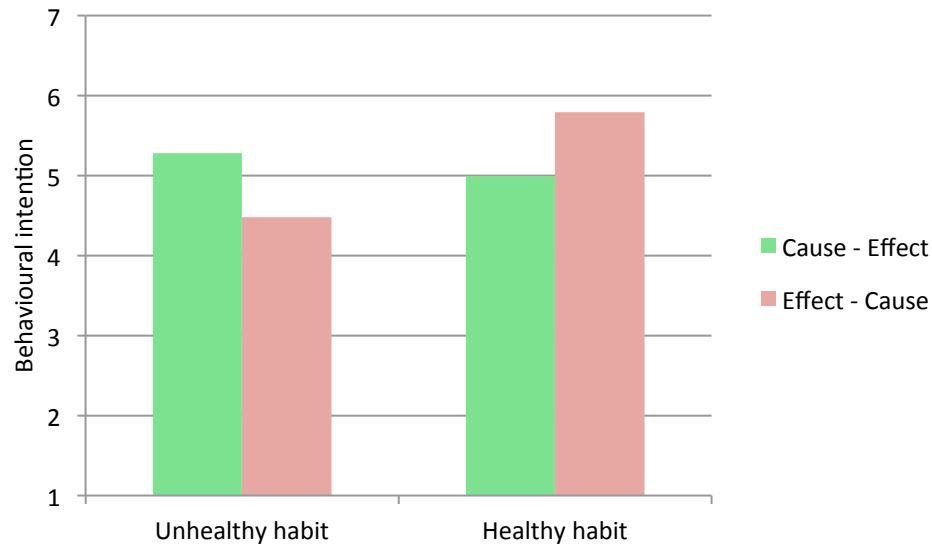vance perception and preventive behavior. Effect-Cause was expected to increase the relevance due to the fact that participants focus on the effect and are more likely to generate different causal relations besides the given one. This hypothesis was partially confirmed by our study, since the relevance ratings in the effect-cause were higher than ratings in the opposite condition. Particularly, this difference occurred when health-related sentences described Visible but not Invisible effects. This may be explained by the importance that people usually place on body appearance. Although Self-Objectification was not found to exert effects, we can observe that aesthetic factors are rather important in contemporary society. Moreover, there is a growing attention on the relation between food and health-related outcomes especially among people more sensitive to ecology. In the last years an increasing number of health-related issues have arisen as a function of changing methods of farming and ranching, leading people, especially those with already healthy habits, to pay more attention to food with potentially negative consequences on physical wellbeing.

Word order seems to play a distinct role in importance ratings for Self and Others: generally participants evaluate sentences more relevant to the Self than to Others. But we can observe an opposite pattern when participants are asked to rate the importance of effect-cause statements describing invisible conditions, which probably were perceived as more severe than visible ones. Effect-cause relations focusing on health-threating outcomes may have increased a self-defensive response in favor of higher other-ratings. However, because we have not pre-tested the actual comprehension and importance attributed to any singular health related sentence, this interpretation is speculative. Thus, a future study should definitely include pre-tested sentences in order to further investigate this interesting pattern of results. A further explanation for this pattern of results may lay in the fact that the relatively young population (M_{age}= 28) does not yet take into consideration "invisible" effects such as cholesterol or blood pressure. Future studies should include effects such as "weariness" (for instance connected to blood pressure variation) that probably occupies a relevant position among young sample.

We prefer to be cautious with the interpretation of these results regarding visible and invisible variables, because even though word order seems to play a role in relevance perception, the underlying process is still not clear. Our purpose is, indeed, to carry out future studies with different materials in which we will be able to control separately the possible effect of the independent variables other than cause-effect ordering.

Turning to the effects on preventive behavior, our hypotheses considered cause-effect ordering as a way to induce people to focus on the cause. Healthier food choices and higher behavioral change intentions can be seen as a result of this reasoning direction because, by presenting the cause (nutrient) before the effect (effect on health), participants are led to perceive a stronger relation between the two elements (see Study 3a). As a consequence, behavior change intentions should increase. This prediction was supported only in part, with eating habits moderating the effects of word order. The effect of word order on food choices varied as a function of people's eating habits such that participants with unhealthy eating habits were more likely to

choose healthy food when causes were mentioned first. By contrast participants with already healthy habits were more likely to choose healthy food when the potential outcome was placed in the first position within sentences. We observed the same effect also in case of behavioral change intentions.

On one hand people with already healthy habits tend to focus on the potential outcome and be influenced by effect-cause order because they are interested in maintaining a healthy status and avoiding negative consequences. On the other hand, individuals with unhealthy habits are more likely to be affected by a cause-effect order. By focusing on the first term, namely, the cause, the link between elements can affect future food choices and behavioral intentions to a greater extent.

These results, as those of our previous studies, suggest that word order may be a subtle tool in social communication with regard to health issues and that any health campaign should pay attention to the direction of the intervention. Prevention and preventive interventions involve two distinct directions, respectively (a) to ensure that people do not adopt unhealthy habits and (b) to help people quit unhealthy habits. Given the subtle role of word order in drawing attention and, consequently, in influencing perceptions, these results seem to suggest that, at a cognitive level, effect-cause relations are more likely to be perceived important than cause-effect relations because the processing of information includes a great number of variables; whereas on a behavioral level cause-effect relations are more likely to elicit stronger responses because one's efforts would be directed towards a single cause, rather than towards multiple causes. In this way, people with already healthy habits should be reached by health promotion campaigns in which the order of health issues induces a diagnostic reasoning helping to maintain their healthy life style. By contrast, people with unhealthy habits need preventive campaigns in which the focus on the causes induces a predictive reasoning able to help them to quit unhealthy habit in order to reach positive consequences.

Conclusions

Through these three studies, I have tried to shed light on the intrinsic link between causal thinking and word order. The original idea of this research topic was to bridge these two different lines of research to figure out, at first, the presence of a potential link. Language seems to play a role in causal reasoning, but the underlying process through which it occurs is still not clear. Future investigations will aim at further investigating how this process develops in affecting causal inferences.

The three studies suggest that word order may serve as a persuasive tool in communicating health-related issues for a number of reasons. First, word order is a subtle method to drive the focus of individuals favoring certain causal inferences over others, depending on the purpose of the intervention. It remains to be seen whether by simply switching the order in which causes and effects occur within a sentence, we are able to draw individuals' attention on a particular element and to induce different reasoning styles, namely predictive or diagnostic processes. In fact, previous literature concerning causal reasoning demonstrated that in causal context, predictive and diagnostic inferences may be distinguished. When people make predictive inferences, they reason from causes to effects (e.g., it is raining, probably the pavement will be wet), on the contrary, when people make diagnostic inferences, they reason from effects to cause (e.g., the pavement is wet, probably it has been raining). According to causal reasoning models (See, Waldmann & Holyoak, 1992; Meder, et al., 2014), inferences are the result of elaborate, cognitively demanding reasoning processes sensitive to various forms of knowledge. However, authors investigating causal reasoning models have generally confounded predictive and diagnostic framing with the order in which they placed causes and effects. Our most relevant intent for future lines consists in testing whether the order of causes and effects can be considered as a crucial aspect in driving people to adopt either the predictive or the diagnostic process.

In the studies I presented, I focused on health issues because they play a substantial role in our society and because my results are potentially relevant for improving preventive and promotional

health campaigns. However, this is only one of many contexts in which the ordering of causes and effects is relevant. We live in a social reality in which individuals spend considerable time in search of causes and effects of significant life events. Most of the information that comes from surrounding reality (newspaper, talks, informal chats) seems to follow a causal structure in explaining social events. Any social situation reported in the mass media, for instance, implies causal links across elements that are part of that situation. By considering the importance of social communication in our life, we can recognize that the order in which elements of news are presented may be partially responsible for reasoning styles embodied in a stereotyped interpretation of events. For example, by presenting a sentence such as "Emily was worried when observing the scratches on the car", in which the social category constitutes the most plausible cause (woman-car damage), participants encounter difficulties in discovering alternative causes, whereas other causes become more accessible in EC order (e.g., "When observing the scratches on the car, Emily was worried"). In the latter case, participants would search for alternative causes thereby reducing the relevance of the stereotype.

I proposed that in cases of health related issues the exposure to information narrated in a cause-effect order leads individuals to keep in mind just one cause out of several. The fact that some nutritional elements are constantly considered as mainly responsible for high blood pressure may lead individuals to focus solely on that element when they attempt to reach a stable pressure situation. By moving people's focus starting from the general effect, it may be possible that positive attitudes toward an overall healthy lifestyle could be reached more easily. Thus, in creating prevention and promotion health campaigns, one should pay attention also to the order in which causes and effects are placed within the messages.

More in general, events that are systematically narrated in terms of cause-effect may led individuals to focus just on one aspect of an entire relational path. For instance, when issues such as immigration are narrated in a cause-effect ordering, people become more likely to interpret the immigration as the single cause of a certain social consequences (such as crime or poverty?),

promoting a stereotyped attitude in interpreting social events. Particularly, in line with literature, when causes are paired with negative effects, the link between the elements seems to be perceived as stronger (reference). Consequently, in line with a heuristic bias promoted by a stereotyped reasoning, individuals will easily think that the elimination of the negative effect (e.g., crime) would be possible if the cause (e.g., immigration) were removed. Thus, when reporting on social minorities such as immigrants, who are considered the cause of social discomfort, we should start to pay attention to the way in which information is conveyed. It is possible that narrations that follow a cause-effect order will increase and promote stereotyped interpretations due to the fact that the link between elements is perceived as stronger (Study 3a). By contrast, effect-cause order may lead individuals to think in a more holistic way, avoiding causal inferences based on stereotypes and prejudices. Future investigations will aim at exploring the role of language in conveying social issues and their interpretation.

Chapter 4: Word Order and Likelihood of Intervention

General Introduction to studies

Within our society, greatly based on mass media and web-spreading communication, we are daily exposed to news, videos and images reporting on our fellow citizens involved in criminal and dangerous situations that, in some cases, include even episodes of murder. In front of this relative new way of sharing information, our reactions are likely to include an empathic feeling towards victims, together with the conviction that these situations can never occur in our own experience.

A dangerous situation not only is infrequent and often unpredictable, but it also requires an instant reaction. Precisely for this reason, several authors in the last decades have tried to understand how people will react when, for instance, hearing during the night a woman's screams coming from the street (Latanè & Darley, 1986).

Queens, New York, 1964. Kitty Genovese is coming back home from work during the night when Winston Moseley, a necrophiliac serial killer, stabs, kills and rapes her in the middle of the street. Besides the several debates about the reliability of the news reported by local newspapers, at least one detail of this story is absolutely real: Kitty Genovese was raped while her neighbors were hearing her screams doing nothing to help and to rescue her from her consequent death. If on one hand, the news of a murder did not give rise to any surprise, especially in a city like New York in the 60s, on the other hand this tragic news caught great attention due to the neighbors' failure to intervene. Kitty's murder, indeed, lasted over half an hour and no one intervened to either rescue her or call the police.

Latanè and Darley (1986), in particular, have dedicated an extensive effort and resources in sorting out the possible reasons behind this failure of intervention. The authors found that the inhibition of helping in situations that need intervention is mainly due to the presence of other people. Starting from these findings, they gave raise to a new line of literature concerning the *bystander effect*.

124

In order to explain and clarify the reasons behind this phenomenon, these authors (1970) proposed a subtle psychological process that may occur when bystanders face a dangerous situation that calls for intervention. The model contemplates a five-step process, during which bystanders need to notice the situation; recognize it as an emergency; develop a feeling of responsibility, acknowledge own skills to succeed (see also Korte, 1971) and finally reach the decision to intervene. Based on this cognitive model, Latanè and Darley (1970) identified three further psychological processes that can affect the proposed sequence and can lead to the inhibition of helping: evaluation apprehension, pluralistic ignorance, and diffusion of responsibility. These psychological processes, respectively, refer to the fear of others' judgment when acting publicly, the tendency to rely on the overt reaction of others to understand ambiguous situations and, finally, the tendency to diffusion of personal responsibility to help among the present bystanders. A decade later, Latanè and Nida (1981) reviewed the potential psychological processes responsible for the bystander effect, proposing three slightly different processes involved in increasing the inhibition of helping. They distinguished the processes of social influence (individuals look at others in order to define and interpret the situation and the expected pattern of behavior), audience inhibition (individuals are fearful that their behavior can be seen by others and evaluated negatively) and, again, diffusion of responsibility (a strategy to reduce the psychological cost associated with non-intervention). Furthermore, the authors also suggest that the bystander effect should be strongest when no one intervenes because everybody fails to recognize the emergency.

The reason behind the failure to intervene has been the focus of classical and recent research. Generally, one of the major finding is that the greater the number of bystanders in an emergency situation, the longer it takes for any single bystander to intervene and, at the same time, the less likely intervention becomes (Darley & Latanè, 1986). One aspect that could potentially interfere with the decision whether or not to intervene consisted in the cost and reward of the intervention (Mogy & Harris, 1971). Authors claimed that when bystanders have to decide whether to intervene or not, they consider if the outcomes (reward minus costs) associated with helping are more positive

125

than the outcomes associated with not helping. For instance, the perceived status of the victim (high vs. low) can have an impact on the decision of providing help: high-status victims can provide more rewards than equal- or low-status victims and for this reason bystanders should be more likely to assist a victim of high rather than low status (Mogy and Harris, 1971). During the last decades, however, the bystander effect has been investigated also from other perspectives such as evolutionary psychology and game theory proposing new and different underlying processes, such as reciprocal altruism (Axelrod & Hamilton, 1981; Trivers, 1971) and competitive altruism (Hardy & Van Vugt, 2006). More recent studies demonstrate, moreover, that the bystander effect does not occur in two specific cases: when the emergency is a very dangerous one and when the bystanders feel highly competent to intervene (Clark & Word, 1974, Van Den Bos, Müller & Van Bussel, 2009, Fischer, Greitemeyer, Pollozek, & Frey, 2006).

Within this theoretical framework, I propose a novel approach, arguing that Word Order could be intrinsically linked to the perception of danger and to the likelihood of bystander intervention. The question addressed here is whether the order in which help requests (Study 4a) and the target of intervention (Study 4b) are disposed within a sentence may facilitate or interfere with the intention to intervene in dangerous situations.

Through two studies I tried to investigate the role of Word Order as a potential moderator in the likelihood of intervention. In the first study, I hypothesized that the order in which a help request is formulated affects the likelihood of intervention. By switching the order in which the pronoun "you" appears in the request (Pronoun-Verb ,PV, "Tu, aiutami"/"You, help me" vs. Verb-Pronoun, VP, "Aiutami tu"/ "Help me, you"[6]) people may feel more or less responsible. In particular, the diffusion of responsibility may decrease in the PV condition since the help request is strictly directed at the bystander by placing "You" in first position.

The second study aimed at investigating whether the order in which the target of intervention was mentioned would change the willingness to intervene and the ease with which this decision is

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[6] Note that this help request, in either word order, sounds much more better in Italian than in English.

made. The hypothetical situations presented in this study varied in danger level and in the type of intervention needed. In some cases the potential intervention was directed at the source of the danger ("The flames expand in the woods"), in other cases at a specific victim in need (e.g., "a woman cries at the park"). All sentences consisted of a subject (S; the target of intervention), a Verb (V) and a complement (C). The main question investigated here was whether the willingness to intervene and the speed with which this decision was made would be greater in reaction to SVC sentences ("a woman cries at the park") than to CVS sentences ("in the park, a woman cries").

Study 4a: Word Order as moderator of intervention

The study was conducted in collaboration with Mariavittoria Masotina and is part to her Bachelor Degree Thesis entitled "Word Order as a possible moderator of diffusion of responsibility" (University of Padua, 2015)

Aims and hypotheses

As pointed out above, the primary purpose for this part of the research project was to understand whether diffusion of responsibility can be affected by word order, leading participants to increase the likelihood of a prosocial behavior by assisting people asking for help. We are interested in investigating how word order can inhibit the bystander effect inducing individuals to intervene in situations that require their assistance. The underlying idea of this study is that by increasing personal involvement in a help request, individuals are more likely to assume responsibility and to intervene more quickly in the described situation. By addressing the bystander of a dangerous situation placing "you" at the beginning of the sentence rather than in a later position (e.g., "Tu, aiutami", "You, help me" vs. "Aiutami, tu", "Help me, you"), we expect to increase his/her willingness to intervene.

We manipulated the word order of the help request by either positioning the second singular pronoun in first position followed by a verbal help request in imperative form (PV "Tu, salvami", "You, rescue me") or by placing the verbal help request first, followed by the second singular pronoun (VP, "Salvami, tu", "Rescue me, you"). For each of the three different situations, participants were shown at the computer monitor a sequence of two images introducing the situation followed by a third computer screen in which both of the possible help requests (PV vs. VP) appeared. Participants saw both help requests counterbalanced one on the upper-right, the other on the upper-left corner of the computer screen, and were asked to reach with the mouse the alternative that they considered instinctively more engaging. Each situation included the presence of other people (e.g., at the market parking lot) in order to justify the direct help request (e.g., "You, help me"). Our hypothesis is that participants get more involved by the pronoun-first (PV) than by

verb-first (VP) help request and for this reason they should choose the PV alternative more frequently and faster than the VP alterative. This prediction rested on the assumption that placing the pronoun "You" in first position may increase the likelihood of intervention since the help request is strictly directed at the bystander, thereby decreasing the diffusion of responsibility. In contrast, by positioning the verb in first position the direct involvement of the bystander may decrease, increasing the conviction that others can intervene to solve the situation.

We also assessed the intervention decision with the Mouse Tracker technique (© Jon Freeman, 2009-2010), an implicit measure of participant's response certainty. This relatively new tool, allows recording of participants' hand movements while they are moving the mouse to reach the favorite response alternative provided on the computer screen. The mouse tracker reveals the degree of certainty with which participants favor one alternative over another. This software provides various measures, including the mouse trajectory, the area under the curve (AUC), the maximum deviation (MD) and the response time (RT).

Hypotheses

We had two main hypotheses. First, we expected participants to be more motivated to intervene when the help request was formulated in PV (rather VP) form.

Second, with regard to the Mouse Tracker measurements, we expected that participants would indicate their choice faster and with a straighter mouse trajectory when choosing the PV (rather than the VP) alternative, indicative of a faster and more certain decision (Freeman, Dale & Farmer, 2011).

Method

Participants

Fifty-six Italian participants took part in the study. The sample was composed of 38 males and 18 females (M_{age} = 22,3, SD= 1.7). They were all unpaid volunteers. Participants were all university students at the University of Padua.

Materials

The study was composed of two sections. In the first section, participants were shown a sequence of two introductory vignettes followed by the two alternative help request vignettes for each of 3 helping scenarios. The three scenarios regard three different slightly dangerous situations: an old woman needing help to cross the street, a senior person having fallen in the parking lot of a supermarket, and a man with a trash dumpster falling on him. In each vignette there was the presence of other people ("bystanders") in the scene. We constructed vignettes keeping the same structure across the three different danger situations. The first vignette (see Figure 4.1) represented the scene prior to the emergency situation, in the second (Figure 4.2) an emergency occurred (e.g. man falling). In all three scenarios, potential bystanders were present, one of which (matched for participant gender) expressed an excuse for not helping (for instance, being late for an appointment). The last two vignettes (Figure 4.3) showed the help request respectively in two different orders (PV or VP). Specifically, we used synonyms of "help", namely "You, help me/ Help me, you", "You, succor me/ Succor me, you", "You, rescue me/Rescue me, you". The vignettes were created with the free online program "Pixton" using a 336x366 pixel JPEG format. The first two vignettes appeared, one at a time, at the center of the computer screen and participants had to press the space-bar to switch to the next one. The last two were presented simultaneously. For half of the participants (n=28) the pronoun-first alternative appeared to the upper left of the computer screen, and the verb-first alternative to the upper right, whereas the layout was reversed for the remaining half of the participants (n=28). In one condition (n= 28), two scenarios (e.g., supermarket and trash dumper falling on a man) followed the PV-upper right PV-upper left positions, and the remaining one (e.g., old woman crossing the street) reversed the order of help request vignettes such that the PV appeared to the upper left side and the VP to the upper right side. On the contrary, for the second condition (n=28) we counterbalanced the position of the help request vignettes with two scenarios in which the VP request appeared to the upper left side and the PV on the right side, whereas the remaining scenario provided the PV vignette on the upper left and

the VP on the upper right side of the computer screen. Participants were asked to decide instinctively which of the two help requests involved them more. Instructions were given both orally and written on the first computer screen in which we specified that we were interested in the most instinctive choice. Our main interest was in participants' decision between the last two vignettes.

Figure 4.1. *First Vignette (Sequence of female vignettes at the supermarket scenario)*

Figure 4.2. *Second Vignette (Sequence of female vignettes at the supermarket scenario)*

START

Figure 4.3. *Third Vignette*, *choice between the two help request vignettes (Sequence of female vignettes at the supermarket scenario)*

The second section of this study consisted in a self-report questionnaire. We presented the second vignette of each scenario (market parking, old woman crossing the street, senior with trash dumpster over him) at the top of each questionnaire page followed by 10 items. Each vignette represented the danger situation but did not contain the help request. *Identification with the spectator* was assessed with four items (item examples, "I identified with boy/girl with the white shirt "; α=.53 in the first situation, .69 in the second situation and α=.50 in the third situation).. Furthermore, we considered 5 single items corresponding to 5 different measures: *dangerousness perception* ("It is a dangerous situation") *diffusion of responsibility* ("If did not help him, somebody else would do so"), *perceived ability to intervene* ("I do not have the ability to help people in similar situations"), *need denial* ("Putting myself in the shoes of the old person on the ground, I could take care of myself"), and *personal disadvantage* ("If I helped him, it would be disadvantageous for me"). Responses to these items were provided on a 7-point Likert scale in

132

which 1 corresponds to "*completely agree*" and 7 to "*completely disagree*" (See Appendix D for the experimental materials concerning this study). An additional item assessed the participant's *Intention to intervene* ("If I were in a similar situation, I would intervene") in each of the 3 situations (yes vs. no). The final score for this variable consisted of the sum of the three responses, ranging from 0 (never intervened) to 3 (always intervened).

Design and procedure

The first section of the study was run on a computer in order to implicitly test participants' choices through the Mouse Tracker technique. This part took about two minutes; participants were initially provided with oral instructions by the experimenter, together with written instructions that appeared subsequently on the monitor. The mouse tracker procedure consisted of the following sequence: After participants pressed the "Start" button, the study began with the first vignette, after that, participants had to press the space-bar to proceed to the second vignette. These first two images introduced participants to the emergency situation. At that point a black screen appeared with a "Start" button at the bottom center of the computer screen. Once participants pressed it, two new vignettes with the help requests appeared at the top edges (one on the upper-right and the other on the upper-left) of the monitor. Participants were asked to choose between the two experimental vignettes as fast as they could. The question was presented during the initial oral and written instruction and consisted in "Choose the alternative that, instinctively, involves you more".

The same procedure was repeated for the following two scenarios. Participants were presented the three situations in the same order, namely, old man on the ground at market parking, old woman needing help to cross the street, and a old person with a trash dumpster falling on him. We counterbalanced the order of layout of the last two vignettes between participants such that the Pronoun-First help request either occurred on the left or on the right of the screen.

Subsequent to the Mouse Tracking section, participants were asked to complete the questionnaire responding to a total of 30 items, 10 for each situation. At the end, participants were informed about the actual purposes of the study with a final debriefing.

Software

Mouse Tracker (© Jon Freeman, 2009-2010) is an user-friendly open-source software that allows researchers to record and analyze hand movements, performed with a mouse, from a starting position (generally at the bottom center of the screen) towards one of two response alternatives (generally at the upper left and upper right corner of the screen). The software not only registers which alternative is chosen but also the trajectory through which the final location is reached. By looking at the trajectory of participants' hand movements, researchers can retrieve relevant information about real-time cognitive processing, in particular about the degree of certainty or uncertainty in reaching the decision (Freeman et al., 2011).

The software package provides two distinct programs. The first one is the "Runner", which, basically, is the program that includes the study design. It allows experimenters to set up stimuli positions and data they want to code. Secondly, the "Analyzer" generates a file that contains all eligible data for statistical analysis including reaction times (RT), area under the curve tracked by the mouse (AUC), and the maximum deviation of the mouse-tracked trajectory from a straight line (MD) (See Figure 4.4). We considered these three variables as our dependent variables in order to test the quality and the direction of participants' responses.
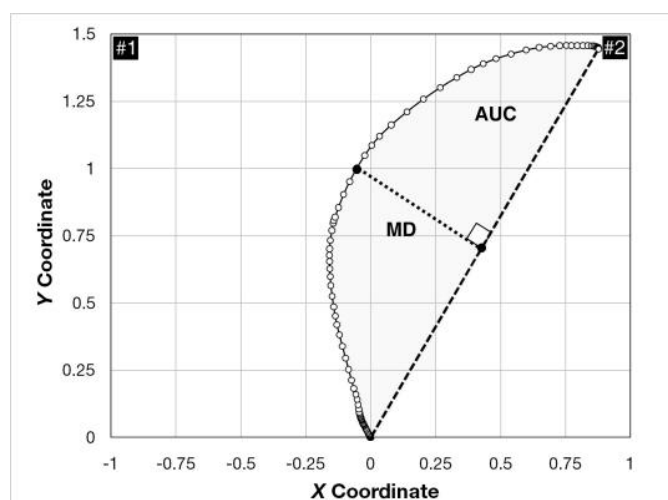

Figure 4.4. *Mouse Tracker Measures.*

Results

To simplify the presentation of the results, we report results divided in sections corresponding to different tasks and variables.

Choice: PV vs. VP

We hypothesized that participants would choose the PV over the VP order. Since we presented three situations, participants' choices could range from 0 to 3 with 3 indicating a strong preference for the PV alternative. We coded whether participants preferred PV over VP (by choosing PV al least 2 out of 3 times) or VP over PV (by choosing VP at least 2 out of 3 times). In line with our hypothesis, there was a almost significant preference for the PV framing which was chosen by 35 participants, whereas 21 preferred the VP framing of the help request, binomial, $p = .081$.

RT, MD, and AUC

For each of these variables, we ran a general linear mixed model (GLMM) in which the three different situations were considered as random effects, while the choice (PV or VP), the position of the alternatives on the monitor (left or right), and the interaction between these two variables were considered as fixed effects. With regard to the RT measures (see Table 4.1), results revealed a borderline significant main effect of choice, namely, in line with hypothesis, participants were faster when choosing the PV than when choosing the VP alternative, $t(123)= -1.87$, p= .06. An additional interaction with the position of the alternatives revealed that participants were faster in choosing the PV alternative only when it is was placed on the left of the monitor, $t(111)= 2.09$, p < .05 (See Figure 4.5) .

	Estimated	Std. Errors	df	*t*-value	*p*-value
(Intercept)	3.46366	0.04275	19.62000	81.028	<2e-16 ***
Order (PV.VP)	-0.06871	0.03678	123.93000	-1.868	0.06
Position of the alternative (DX)	0.01905	0.03692	117.36000	0.516	0.67
Interaction between Choice and Position	0.09808	0.04696	111.25000	2.089	0.04*

* < .05. ** < .01. *** < .001

Table 4.1. *Lixel Mixed Model with RT for choice and position of the alternatives*.
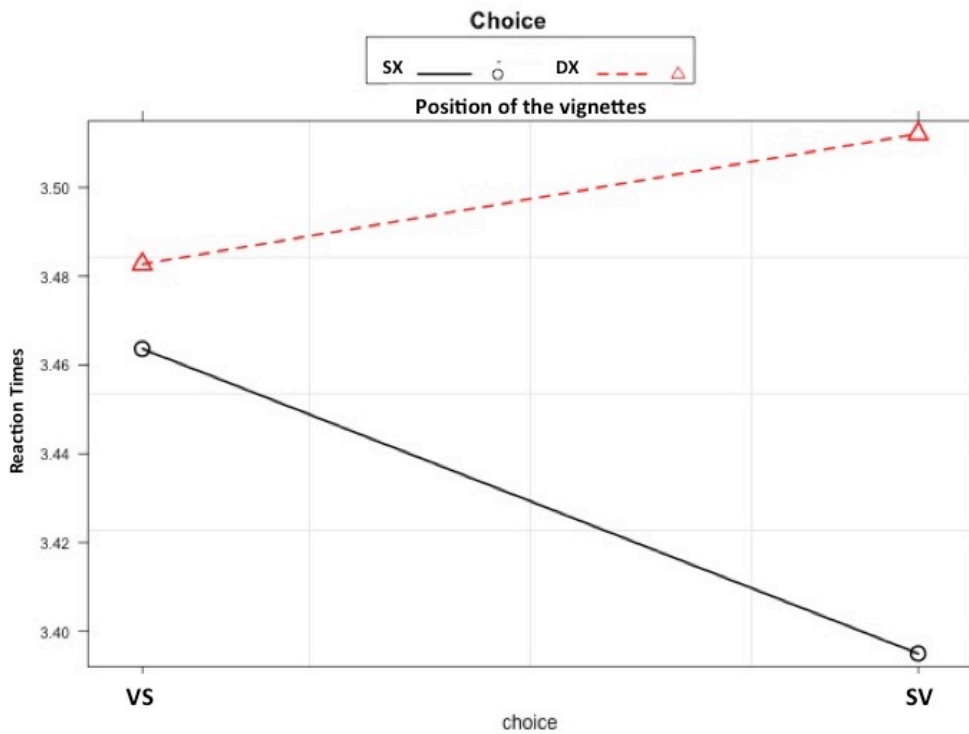

Figure 4.5. *RT interaction between choice and position*

Regarding MD and AUC variables, in contrast with hypothesis, results did not reveal any significant difference favoring one order over the other (See Table 4.2 and Table 4.3).

	Estimated	Std. Errors	df	*t*-value	*p*-value
(Intercept)	73.361	7.861	39.120	9.333	1.69e-11 ***
Order (PV.VP)	13.985	9.930	152.090	1.408	0.161
Position of the alternative (DX)	13.258	10.297	139.700	1.288	0.200
Interaction between Choice and Position	-21.588	13.560	121.100	-1.592	0.114

* < .05. ** < .01. *** < .001

Table 4.2. *Lixel Mixed Model with MD for choice and position of the alternatives.*

	Estimated	Std. Errors	df	*t*-value	*p*-value
(Intercept)	-1.4559	0.2906	17.7900	-5.011	9.39e-05 ***
Order (NV.VN)	-0.1599	0.3065	140.9500	-0.522	0.603
Position of the alternative (DX)	-0.1856	0.3133	129.5200	-0.592	0.555
Interaction between Choice and Position	0.3474	0.4052	117.0200	0.857	0.393

* < .05. ** < .01. *** < .001

Table 4.3. *Lixel Mixed Model with MD for choice and position of the alternatives.*

Correlations between implicit and explicit measures

Subsequently, we correlated the implicit measures of certainty (RT, MD, AUC), independently from the choices, with the explicit questionnaire measures. With regard to the supermarket parking situation, results show a negative correlation between RT and the *need denial* variable, $r(56) = -.315$, p < .02. The more participants denied the victim's need for help the faster

they made their decision. Furthermore, when participants revealed to be unable to help (*perceived ability to intervene*), they were slower in reaching the chosen alternative, $r(56) = .32$, p < .02 . By correlating this last scale with the AUC variable, results revealed that the area under the curve tended to be greater when participants were not sure to be able to intervene, although the correlation did not reach the conventional significance level, $r(56) = .242$, p = .072.

Regarding the need situation in which a senior was represented under a trash dumpster, results showed higher MD values, $r(56) = .318$, p < .02, and higher AUC values, $r(56) = .273$, p < .05, when participants expressed a greater *need denial*. Together, greater *denial of need for help* was associated with greater choice uncertainty, as indicated by increases in RT in the first scenario and in MD and AUC in the third scenario.

Discussion

Although Study 4a confirmed only partially our hypotheses, it offers interesting cues on the role of word order as moderator of the likelihood of intervention. The first hypothesis regarding the choice between PV and VP help requests was partially confirmed by our study, since the PV alternative was chosen somewhat more frequently than the VP alternative. This means that participants were involved to a greater extent by the help request formulated in PV order than in VP order. Although the results did not reach the conventional significance level, participants revealed the tendency to get more involved when the pronoun "you" was placed in first position rather than after the verb. According to these results, the diffusion of responsibility may decrease when a bystander faces an emergency situation in which the request of help is directly addressed to him/her. Therefore, besides the situations in which the bystander effect does not occur because a) the emergency is a very dangerous one (Van Den Bos et al. 2009) and b) the bystanders feel highly competent to intervene (Fisher et al., 2006), our study suggests that also the formulation of the help request can affect the likelihood of intervention due to the differential degree of involvement.

With regard to the implicit measures Study 4a provides an additional interesting aspect. In fact, results showed that participants decided faster when choosing PV (rather than VP) and this was particularly true in those cases in which the PV alternative was placed on the left of the monitor. Previous literature concerning the motor-perceptual system (Casasanto, 2009, Suitner, Maass, Bettinsoli, Carraro & Kumar, 2015) supports the idea that rightward movements require less effort in right-handed participants because outward movements are easier to perform than inward movements. This would suggest that our (predominantly right-handed) participants should have been faster in responding when moving the mouse towards the right. By contrast, our results revealed lower response times in choosing the left rather than right alternative, thus ruling out a motor explanation. Hence, this outcome may be interpreted as a consequence of our writing and reading system (SAB, Maass, Suitner & Deconchy, 2014). Several studies provided evidence for the importance of writing and reading habits as a cultural factor influencing our spatial

representation (Maass et al., 2014). In rightward writing systems, the left position is the starting point of the spatial scheme. Applying this reasoning to the current findings, Study 4a suggests that decisions are made fastest when two processes co-occur, namely when attention is drawn to the self-relevant pronoun ("you") through first-positioning and when the spatial location coincides with the place at which of scanning starts in left-right writing cultures. Moreover, by combining this outcome with the lack of significance for MD and AUC variables, we can hypothesize that, although participants seemed to show some uncertainty about the choice, in those cases in which they chose the NV alternative, their choice occurred more quickly.

The divergent pattern of results across the three scenarios suggests some limits of this study in relation to the type of stimuli we proposed. First, vignettes, representing complex scenes, may have been interpreted differently across participants, thus producing a considerable error variance. Secondly, in line with the bystander effect methodology (Latanè & Darley, 1986), computer simulations of diffusion of responsibility may have limited validity because of the fact that participants are not actually required to take a decision of intervention. In fact, the bystanders involved in the three scenarios were not actually present, but were part of the hypothetical scenario. More relevant, the choice between the two alternatives is strictly "theoretical" and far from a real decision. As a possible solution to this limit, future studies should consider to measure the intention to intervene (e.g., "to what degree would you intervene to help/solve the situation?") after presenting only one of the two alternatives (PV or VP). In fact, the comparison between two highly similar alternatives requires considerable insight.

Although our results do not confirm completely our hypothesis, this study suggests a possible impact of word order on the likelihood of bystander intervention. Hence, future studies are needed in order to investigate whether word order can contrast the bystander effect by decreasing the diffusion of responsibility and enhancing the likelihood of intervention.

Study 3b: Intervention as a function of target position

The study was conducted in collaboration with Davide De Toffoli and is part to his Bachelor Degree Thesis entitled "Word Order in motivation for intervention: a measure of risk perception through the reaction times" (University of Padua, 2015)

Aims and hypotheses

In this second study we investigated the role of the first term in motivating individuals to intervene in risk situations representing principally danger and people in difficulty. Previous literature suggests that, everything else being equal, people are reluctant to intervene in very dangerous situations (see Fischer, Greitemeyer, Pollozek, & Frey, 2006) and that the decision may also depend on the victims' social status (Harris & Robinson, 1973). They are also less likely to intervene in the presence of other bystanders, unless it is a clear-cut emergency situation (see Fischer, Krueger, Greitemeyer, Vogrincic, Kastenmüller, Frey, Heene, Wicher & Kainbacher, 2011).

We manipulated the order in which the targets of intervention were presented in sentences describing either a general situations of danger (e.g., "Il fuoco si espande nel bosco" ,"*The fire* expands in the woods") or a person in need ("Una persona soffoca al ristorante" ,"*A person* chokes at the restaurant"). We constructed sentences following both the canonical Subject-Verb-Complement (SVC, "*A person* chokes at the restaurant") order and the less frequent CVS order (e.g., "Al ristorante soffoca una persona" "at the restaurant chokes *a person*")[7]. We measured the speed with which participants decided to either provide help or not to provide help in these hypothetical situations. The underlying idea of this study is that the ordering of the elements will affect the speed with which people reach a decision whether to intervene or not.

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[7] It should be noted that the CVS order sounds more appropriate and is more common in Italian than in the English translation.

We voluntarily mixed sentences with high danger level (e.g., "the electricity comes out from the cable") and low danger level (e.g., "a woman cries at the park") to appositely induce participants to choose either to not intervene or to intervene. In fact, in extremely dangerous situations people would not choose to intervene whereas in the slight dangerous situations they would choose to intervene. Furthermore, extremely dangerous situations are expected to not elicit an intervention in any order they are arranged (SVC or CVS). In addition, extremely dangerous situations are needed also to reduce the social desirability effect (Fischer, 1993) given that participants should tend to not intervene in those types of situations. Thus, we did not expect differences in type of response.

Given that in SVC the target of the intervention appears in first position, whereas in CVS it is placed at the end of the sentence, the main hypothesis is that participants may find easier to reach a decision whether to intervene or not when encountering the target of their intervention immediately, hence in SVC (e.g., "*A shot* is heard in the house") rather than later, hence in CVS (e.g., "In the house is heard *a shot*") order. For this reason, they also may decide faster in SVC order.

Method

Pilot study

In order to select sentences for this study, we initially asked a pre-test sample (N=10) to rate 40 sentences in SVC order representing dangerous situations. Participants were asked to answer a simple question ("To what extent would you intervene to solve this situation?") on a 5-point Likert scale (from 0= "Not at all" to 4= "Totally"). From these 40 sentences, we selected 24 with means ranging from 1 to 3 to avoid either a *floor* or a *ceiling effect*.

Main study

Participants

Sixty students from University of Padua volunteered for this study (N_{men} = 27; Age: M = 22 SD= 1.6). They were asked to fill in the consent form in which a brief description of the study was given.

Materials

The study materials were composed of 24 sentences characterized by different levels of danger based on the pilot study. Each participant read all 24 sentences, half in SVC and half in CVS form. Order of presentation for each sentence (SVC and CVS) was counterbalanced across participants.

We uploaded the 24 sentences in E-Prime Studio Software creating two conditions defined by the order of presentation of sentences (SVC vs. CVS), such that the same sentence was presented as SVC to half of the participants and as CVS to the other half. We added three further trial sentences taken from those excluded on the basis of the pilot study that preceded the actual experimental session to exemplify the procedure. Sentences were presented randomly and the "D" and "L" keys were respectively marked with "No" and "Yes" on the keyboard in order to facilitate the participants' responses when they had to decided whether to intervene or not.

Design and procedure

After an initial part in which we collected participants' gender and age data, participants read the instructions in which we informed them that we would present a series of dangerous situations and they were asked to try to identify themselves with these situations and make a quick and instinctive decision with regard to their intervention intention. More precisely, the instructions read "the following task includes a series of sentences representing dangerous situations and people in difficulty. Your task consists in deciding whether you want to provide help or not by pressing the

"Yes" or "Not" button on the keyboard." They were required to answer as fast as they could "as if they really were in a dangerous situation and had to decide whether or not to intervene for solving it". Sentences remained on the monitor until participants chose to provide or not to provide help by using the keyboard (self-paced reading task). For each sentence, participants chose to intervene pressing the "Yes" key or not to intervene pressing the "No" key. Once they pressed one of the two alternatives, the next sentence appeared after one second. We constantly reported the possible choices "No" and "Yes" respectively in the upper left- and in the upper right-hand corner of the monitor (See Figure 4.6 for an example of computer screen during the experimental session). The duration of the experimental session required around 90 seconds.

We measured reaction times coded from the instant in which the sentence appeared until participants pressed the key of the chosen alternative. After completion of the task, participants were provided with a final debriefing with regard to the real purposes of the study and were thanked for their participation.
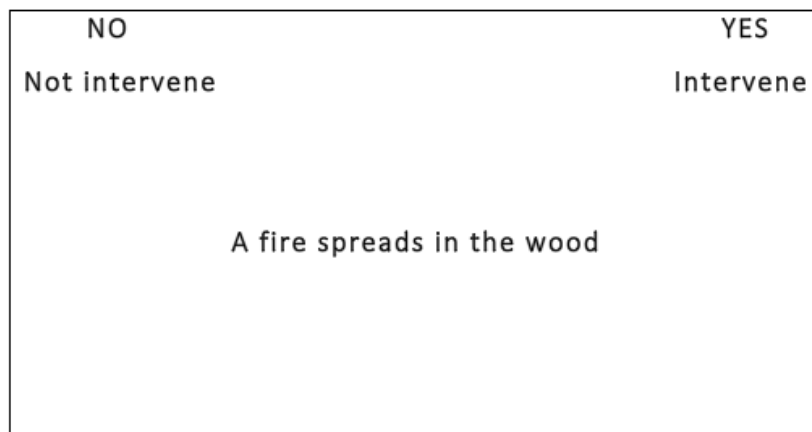
Figure 4.6. *Example of computer screen during the experimental session*

Results

We measured means and standard deviations for each participant's reaction times. From a total of 1440 responses, we discarded 66 responses that deviated two standard deviations or more from the mean. Subsequently, we ran general linear mixed models (GLMM) on RStudio in order to analyze the role of word order and participants' choices on response times.

Choice

As expected, the decision (Yes vs. No) was unaffected by word order, with yes responses representing 66.48% of the decisions for SVC sentences and 64.50% for CVS sentences.

Response Reaction Times

In order to test the effect of word order on reaction times, we ran a general linear mixed model. For the model we considered sentences as random effect, whereas word order (SVC vs. CVS), the choice alternatives ("Yes" vs. "No") and the interaction between these two variables were treated as fixed effects. Results (see Table 4.4) show two main effects on reaction times. On one hand, in line with hypotheses, participants were faster in providing responses with SVC rather than CVS order, $t(93) = -2.266$, $p < .05$. On the other hand, in relation to the choice alternatives, participants were faster when they decided to intervene than when they decided to not provide help, $t(1283) = -3.095$, $p < .01$ (see Figure 4.5).

	Estimate	Std. Error	df	*t-value*	*p-value*
(Intercept)	2268.37	103.04	129.90	22.014	<2e-16 **
ORDER (SVC)	-230.03	101.51	93.10	-2.266	0.02577
RESPONSE (YES)	-197.40	63.78	1282.80	-3.095	0.00201 **
ORDER (SVC): RESPONSE (YES)	110.29	90.24	1255.20	1.222	0.22184
*Significance levels: * < .05. ** < .01. *** < .001*					

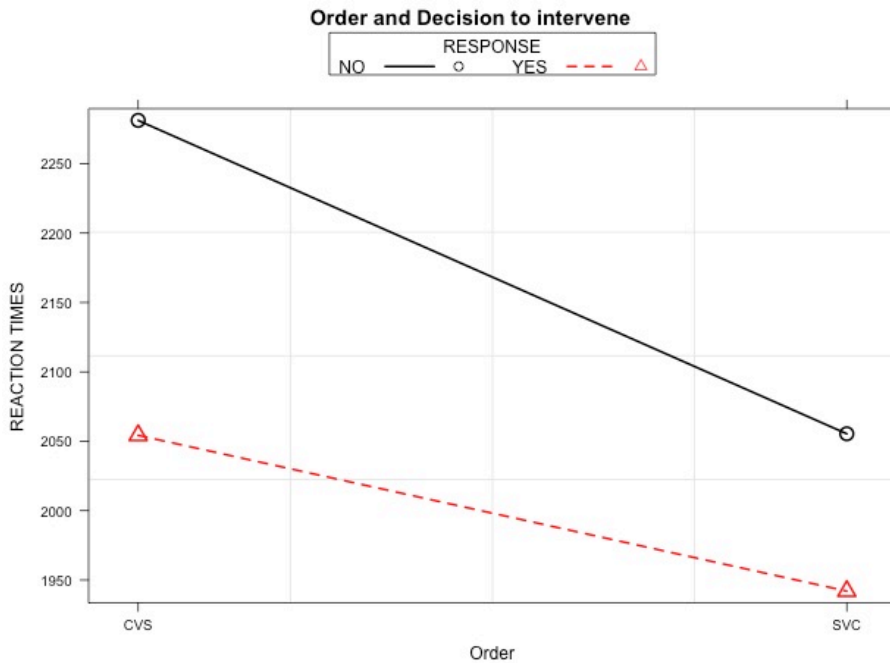Table 4.4. *Linear Mixed Model for Order and Choice Alternatives*

Figure 4.7. *Reaction times with regard to Word Order and Choice Alternatives*

Discussion

Study 4b suggests a direct link between word order and the rapidity of intervention. We started from the hypothesis that by placing the target of intervention in the first position in a sentence composed by a Subject, a Verb and a Complement (SVC), participants would take the decision whether to intervene or not more quickly with respect to positioning the target in a postponed location (CVS). Results confirmed our hypothesis and demonstrated that when participants encountered the target of intervention in the first position (SVC), they were faster in reaching a decision and they also were faster in deciding to intervene rather than to not intervene.

Thus, in line with our hypothesis, the earlier accessibility of the target facilitated the decision of the participants and, at the same time, accelerated the decision with respect to those situations in which the target of intervention appeared in a later position (CVS). In line with literature regarding the advantage and the accessibility of the first term (Gernsbacher & Hargreaves, 1988, ; Kim, Lee

146

& Gernsbacher, 2004), results presumably reflect an attentional processes such as when the target of intervention is placed in first position, the attention is mainly focused on it.

Another possible explanation for this pattern of results arises from the fact that the SVC order corresponds to the grammatical canonical order of Italian participants (SVO) and the variation CVS, though legitimate, is less frequent. Thus, participants may decide faster in this case simply because they process the information easier when it is provided in the most common and natural order, with the subject as the starting point of the sentence. Thus, the easier elaboration process facilitates comprehension of the situation and hence aides to reach a decision in a delicate situation such as whether to provide help in dangerous events.

Taking together these results contribute to our understanding of word order and in particular of the important role of the first term. Both the position of the target in first position and the canonical order in which elements appear, offer people a quick and easy way for focusing on the target and for processing the information efficiently. Moreover, people were faster when they decided to intervene rather than to not intervene. This is important because it suggested a potential role of order also in the field of decision-making, when individuals face with task that generally involve different possible alternatives.

In conclusion, results indicate that people are faster to take the decision whether to intervene or not when sentences are presented in canonical order. This aspect is interesting in terms of taking decisions especially in those cases in which people are asked to seriously consider their subsequent actions and consequences (e.g., a police officer required to shoot in case of armed robbery).

Conclusions

In these two studies, I have tried to shed light on the possible role of Word Order as a moderator for the likelihood of bystander intervention. The original idea of this research was to explore whether there may be a link between these two different lines of research. Results show that people feel more involved when a help request is directed personally to them in a form in which the personal pronoun "you" appears in the first (rather than later) position (Study 4a). Conceptually similar are the findings of Study 4b where participants were faster in deciding whether to intervene or not when the target of intervention was encountered as the first element. However the results of this latter study do not entirely confirm our hypotheses, given that only the speed but not the outcome of the decision was affected by word order. Despite these limits, it nevertheless suggests that language may affect the speed with which individuals can recognize the emergency, which, in turn, translates into the decision to intervene or not to solve a dangerous situation.

Interestingly in both studies, placing the critical element (the "you" in a personal help request, Study 4a, and the target in a description of the emergency, Study 4b) in the first position had beneficial effects. On one hand, placing the "you" at the beginning of the sentence in a help request (Study 4a) produced a decrease in diffusion of responsibility; and on the other hand, the focus on the target of intervention (Study 4b) facilitated the comprehension of a situation inducing individuals to take a decision more quickly.

A main limit of these studies is represented by the methodology. Numerous studies in the bystander effect literature show that this phenomenon emerges usually for both, real and hypothetical decisions to act. Language effects are generally more difficult to be revealed due to the fact that language manipulations presuppose subtle differences across experimental conditions. For this reason, language experiments need to be supported by a strong and well-defined methodology in order to be able to control the real effects of language on variables.

I am suggesting here, that considering the large amount of everyday dangerous events to which we are exposed through mass media and, at times, through real experiences, the linguistic strategies with which they are conveyed to us, respectively in terms of news or help requests, can affect our approach in processing a potential empathic and real reaction increasing the likelihood of intervention.

Conclusions

Conversing in our native language is as natural and as spontaneous as breathing. Although for formulating a sentence or arguing our ideas we engage in an active and conscious process, the mere fact of producing words requires a minimum effort. This ease with which we organize words in sentences contrasts the complexity that characterizes the differences between the thousands of languages present in the world. We can distinguish languages principally in two systems. First of all, languages differ with respect to their *structures* in terms of grammatical, semantic and syntactical aspects. The World Atlas of Language Structures (WALS, Dryer, 2011) classifies more than 1000 languages analysing the specific characteristics of each language from a linguistic perspective. For instance, languages differ in number of vowels, sounds and case marking. For decades scholars have dealt with the countless differences related to, among others, the variability of grammatical and semantic components of world languages. Because the combination of these aspects gives rise to meaningful communication, languages that, for example, do not share the same grammatical and semantic structure, contribute to the definition of the *cultural* system in which they are grounded. This bi-directional relationship between language and culture is one of the most widely investigated issues, as proven by a number of cross-linguistic studies over many decades. Despite the lack of evidence to empirically support his ideas, Sapir (1921) suggested that language and culture are embedded in a circular relation of mutual influence, such that the presence of one is essential for the presence of the other. Decades later, several studies addressed this issue from a social-cognitive perspective and evidenced how language shapes thought in terms of the temporal dimension (Boroditsky, 2001), spatial representation (Maass, Suitner and Deconchy, 2014), and the way of transmitting information (Maass, Salvi, Arcuri, & Semin, 1989). The single cultural approaches, indeed, differ also on how their communities decided to convey messages, producing unexpected but interesting consequences.

This research project represents a first attempt to investigate whether and how Word Order affects social-cognitive processes. Word Order is a feature of languages that we naturally assimilate in early age (see Akthar, 1999). For this reason, the main challenge of this project was to demonstrate that such an intrinsic, and (almost) taken for granted, feature of language hides a critical role in influencing social cognition. Word Order combines the three basic elements Subject (S), Object (O) and Verb (V) in six possible logical orders (Dryer, 2011). If on one level, the combination of the three basic elements represents a mere grammatical and syntactic aspect, a second level considers that the placement of each element in the temporal and spatial sequence is part of the higher level cognitive processes of meaning creation and meaning comprehension. For instance, the way in which we construe mental models (Zwaan & Radvansky, 1998) and interpret linguistic binomials (Hegarty et al., 2011; Mollin, 2012) is strictly connected to the order in which elements are positioned and presented within a sentence.

Throughout this project, Word Order was investigated <u>beyond</u> its three basic grammatical constituents of sentences (S, O, V), by addressing the positioning of Agents-Action-Recipient, Cause-Effect, Pronoun and Verb, and Subject-Verb-Complement. The logic behind these studies was to test the role of ordering, and in particular the key role of the first position in information arrangement, within written communication. In particular, by varying the position of images representing the Agent, the Patient and the Action, Studies 1a and 1b confirmed the role of order in linguistic production. The six possible combinations of the three images, indeed, showed an influence of the temporal dimension implied in image sequences on sentence production (Chapter 1). The power and the strength of Word Order have been evidenced by both Italian and English speakers who spontaneously transformed differently ordered sequences mostly into their canonical order. But more relevant, a frequent occurrence of different linguistic strategies highlighted the importance of the *first* term, suggesting a strong relationship between the order of the sequence of presented images and the syntactic arrangement of the produced sentences. Then, I showed that

causal attribution to an element changes depending on the position of S, O, and V within a sentence (Chapter 2). In particular, by observing that the co-responsibility of an action depends on the position of the elements that are involved in a given event, Italian (Study 2a) and English (Study 2b) speakers provided evidence that the causal attribution to an element is stronger when this element appears in *first* rather than in a later position. In Chapter 3, I experimentally switched Causes and Effects ordering (CE vs. EC) while keeping the structure of the sentence in which they appeared constant. In three studies I demonstrated the role of Word Order in influencing risk and relevance perception. Specifically, attention is caught mainly by the *first* term. Thus, the different objects of the focus (causes in CE condition vs. effects in EC condition) lead to a different perception of, respectively, risk and relevance related to health-related habits. Finally, Word Order has a further subtle impact on the decision to intervene in a critical situation (Chapter 4), such as in help requests (formulated as Pronoun-Verb vs. Verb-Pronoun) and danger situation descriptions (formulated as Subject-Verb-Complement vs. Complement-Verb-Subject). Whenever the potential helper ("You") or the target of the intervention ("A woman") occupy the *first* position in help requests ("You help me" vs. "Help me, you") or in danger descriptions ("A woman broke her ankle" vs. "Her ankle broke a woman"), the likelihood (Study 4a) and the speed of intervention (Study 4b) increase. This is important because it confirms a key role of order also in the field of decision-making, which is a complex cognitive task that typically involves the evaluation of several potential alternatives.

Although the full clarification of the specific processes behind the Word Order phenomenon needs further work, I have confirmed a subtle influence of the Word Order both at production and comprehension levels. In fact, using different experimental paradigms involving both implicit and explicit measures, this research project has investigated Word Order both at production and comprehension levels contributing to the evidence for the small but consistent effects of Word Order. At the production level, in particular in Chapter 1 (Linguistic Production) but also in Study 4a (Chapter 4, likelihood of intervention) where Word Order was the dependent variable, I found a stronger effect of Word Order with respect to studies where Word Order was manipulated (Chapter

2, 3, Study 4b). When asked to generate sentences, people are free to choose in which order to place elements depending on which message they want to convey; within the grammatical constraints of their language, they can choose to follow the order in which elements are presented (Study 1a and 1b) or follow the prominence suggested by images based on life experiences. By contrast, when they are required to establish the degree of responsibility of actors within a sentence, they start from a given sentence and interpret a message conveyed by someone else (Study 2a and 2b). In the former case we have an example of how Word Order is used as a strategic tool for language production, in the latter case we can observe the role of Word Order as a cue on which people rely in comprehending events. The evidence that Word Order effects emerged by means of different experimental methodologies (Image presentation and transformation in Chapter 1, Translation Paradigm in Chapter 2, Binomial Structures in Chapter 3, Reaction Times and Mouse Tracker in Chapter 4) and of different experimental measures (Explicit and Implicit).

The fact that comparable findings were found in two different languages, and that the few differences between them were meaningful, confers additional generalizability and ecological validity to the role of Word Order both at production and comprehension.

Limits and Future directions

The present research project addressed many issues related to the role of Word Order in social cognition, and given that it represented a first attempt to investigate this phenomenon from a social cognitive perspective, a critical discussion about encountered limits and potential future directions is worthy.

Additional research is desirable to solve the methodological limits that emerged in the presented studies. First of all, studies involving different canonical order languages should be conducted to investigate whether the effects of Word Order can be extended cross-linguistically. If confirmed, Word Order could be considered as one additional factor contributing to cultural differences. For instance, it is possible that people of languages with different canonical word order pay chronically more attention to the element they encounter first (e.g. the object in Malagasy), which may in turn shape their habitual causal reasoning styles. Along the same line, it may be interesting to investigate bilinguals of languages with different canonical order, such as Welsh (VSO) - English (SVO) bilinguals, who may adopt different explanatory styles depending on the language they are currently using and who may even favour one language over the other depending on their communicative intentions.

Second, the specific role of Word Order in influencing social-cognitive processes should be investigated separately from other variables. It would be desirable to conduct studies in which the manipulation of Word Order is isolated to avoid that other more salient variables overcome such a slight difference as order in experimental materials. For instance, in Study 3c testing the role of Word Order in relevance perception (Chapter 3), I included also many other variables that may have blurred the effects of order of presentation on causal reasoning. In fact, it is not clear whether the relevance perception among people with unhealthy habit is prompted by motivational processes (e.g., choosing healthy food and expressing intention to change future behavior in Study 3c), which may moderate order effects.

Third, with regard to Chapter 3 on causal reasoning, additional studies should be carried out to disentangle the confounds present in previous research on predictive and diagnostic reasoning. In particular, it remains to be seen whether the Word Order can be considered a crucial trigger of one process or the other.

Fourth, further studies involving more realistic methodological settings should be designed to investigate how Word Order can influence the likelihood of actual bystander intervention (Chapter 4). Computer simulations, indeed, could be invalidated by the fact that participants are not realistically required to take a decision of intervention. Similarly, the impact of word order in health promotion (Chapter 3) should be investigated systematically as part of real health campaigns outside the lab.

Fifth, information regarding the educational and cultural background of participants should always be included as potential moderators of the role of Word Order. For instance, differences in language proficiency and in the knowledge of grammatical rules may play a dual role in perceiving the order variations. For instance, on one hand by enhancing the salience of the word order variation (e.g., in those cases in which individuals are familiar with a polished use of language), on the other hand by minimizing the effect of word order change (e.g., with individuals used to be exposed mostly to dialects that allow several variations of order). Furthermore, by considering the case in which individuals are familiar with word ordering, opposite predictions may be advanced depending on the task and the level at which the research is collocated (production or comprehension). At the comprehension level, greater familiarity with word ordering may either lead to minimize the effects of word order because alternative orders are not surprising or may enhance word order effects given that individuals are used to include order as a cue in the process of comprehension. In line with this last assumption, also at the production level, individuals familiar with word ordering may show a more likely use of linguistic strategies.

Also, in order to understand the developmental trajectory through which different language word order rules are learned, it would be interesting to consider immigrants as sample, especially in

cases in which L1 and L2 have different word orders. As pointed out by the linguist MacWhorter in the on-line magazine *The Atlantic* ("How Immigration changes language", December 2015), one of the surprising consequences of the current wave of mass migration into Europe is likely to be the development of even more new ways of speaking in the future. Related to Word Order, one may envisage that the errors in ordering committed by immigrants could be explained by a low knowledge of the new country language. Yet, it may due to an ordering that mainly follows an *importance degree* direction given a reduced availability of more sophisticated linguistic strategies in L2.

Finally, another interesting extension of this project is to investigate the role of Word Order in stereotyping and stereotype reduction. When explaining events, people often resort to social categories as the simplest explanation (e.g., "Emily got into a car accident", because women are bad at driving). Given that social membership often serves as explanation for behavior and that alternative causes are easily overlooked (Schaller & O'Brien, 1992), I suspect that, when mentioned early, social membership will have a greater weight (e.g., Mohamed was worried while observing his girlfriend on the ground). When the social group membership is encountered as first element, it will easily trigger predictive causal reasoning in which the social category (immigrant) constitutes the most plausible cause of the event (violence). In contrast, late mentioning (e.g. While observing his girlfriend on the ground, Mohamed was worried) should encourage diagnostic reasoning and hence a search for multiple causes. In this case, the common failure to recognize alternative causes (identified by Schaller & O'Brian) may be reduced due to a shift in causal reasoning mode. Similarly, word order may offer a key to interpreting feedback situations in which elements are simultaneously cause and effect. For instance, poor performance may lead to stereotyping (e.g., women are poor in math) but stereotypes may also cause poor performance (see Stereotype Threat Model, Steele, 1997). Thus, stereotype threat constitutes a typical example of a circular situation in which word order may disambiguate the causal direction. From a social perspective, word ordering provides a powerful language tool to solve ambiguity in situations of uncertainty. In particular,

Effect-Cause ordering may induce listeners to adopt a diagnostic reasoning perspective in which stereotypes become less influential. This further future line of research could provide new insights into the mechanisms underlying the link between order and causal reasoning with potentially important social implications for stereotype transmission and change.

Implications

In my opinion, the subtle role of Word Order in influencing social cognition has a number of interesting implications in different areas. The most straightforward implication derives from the line of this project that considers the role of Word Order in causal reasoning. In fact, many possible implications in social communication area may be advanced. We should not forget that we live in a social reality in which individuals spend considerable time in search of causes and effects in their life. For instance, the order in which elements of news are presented can prompt interpretations and argumentations that rely, to different degrees, on stereotypes. As argued above, a relation between Word Order and causal reasoning may help to reduce stereotyping and solve ambiguity.

In addition, in the studies we presented in Chapter 3, I focused on health issues demonstrating that risk and relevance perceptions depends on the order in which causes and effects are disposed within a health-related message. Given that health issues play a substantial role in our society, Word Order could be varied strategically in prevention and promotion health campaigns to convince people to avoid risky habits and to adopt healthy life styles. For instance, in order to catch the attention of individuals with risky habits (e.g., smoking) a health campaign should consider creating a slogan in which a possible effect (e.g., lung cancer) comes at first in the sentence. The attention of either smokers or non smokers would be caught because that possible effect may arise from different alternative causes (e.g., smoking, but also pollution). At that point, to promote a healthy (non-smoking) life style, the consequent argument of the campaign should consider placing the cause to-be-removed (smoking) in a prominent position. In this way, a smoker's attention is, at first, caught by the effect of smoking (EC order, lung cancer-smoking) and then exposed to the cause to be eliminated (CE order, smoking-lung cancer). At the same time, a non smoker's attention is, at first, caught by the effect (EC order). Although smoking in this case does not present a potential cause, by focusing primarily on the effect, the non-smoker has the opportunity to think about other possible causes that may be present in his/her life (e.g. pollution). By the same logic, Word Order

may be used intentionally in political communication, especially when addressing controversial issues such as immigration or gay rights.

The relation between Word Order and causal attribution may have interesting implications in in the juridical field. Studies presented in Chapter 2 evidenced that the co-responsibility for a given action changes depending on the position of the elements involved in that action. This may become quite relevant in trials;, for instance, the way in which a lawyer presents his/her client, may induce the judge to attribute different degrees of responsibility to the accused depending on his/her position in the closing statement.

As the above examples illustrate, the line of research on word order that I have started in this Thesis may have implications well beyond the specific experiments reported here. Exploring these implications outside of the lab remains an interesting challenge for future research.

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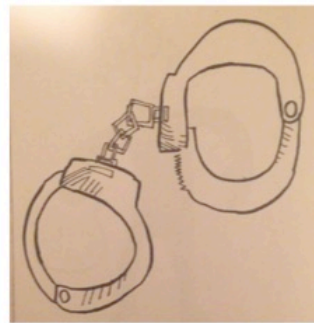
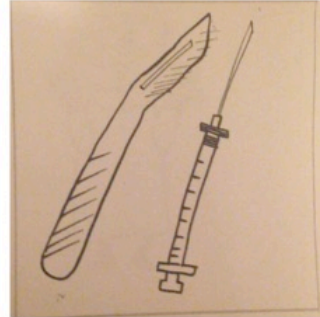Zipf, G. K. (1949). *Human Behavior and Principle of Least Effort*, 2nd edn. Addison-Wesley, New York.

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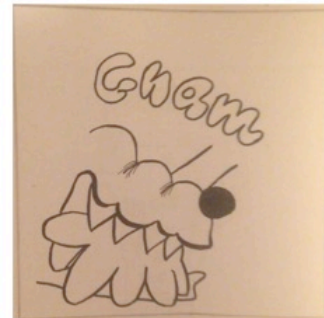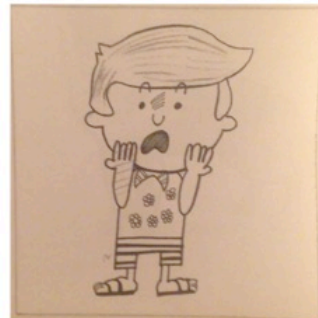
Appendix A

Images representing Agents, Patients and Actions used in Study 1b and 1c, Chapter 1.

Thanks to Riccardo Busato for drawing the images.

Appendix B

Version 1 of sentences used in Study 2b, Chapter 2

1) (Original Urdu Sentence) دی دعوت کی پوتے چھوٹے اپنے دادا کے کھانے کے رات (1

1) Invited to dinner the Grandpa his little grandchildren. (Translated Sentence)

a) How much do you think the action is due to the Grandpa?   1   2   3   4   5   6   7

b) How much do you think the action is due to little
grandchildren?   1   2   3   4   5   6   7

c) How much do you think the action is a reaction to the
situation?   1   2   3   4   5   6   7

d) How much do you think the action reflects the personality of
the Grandpa?   1   2   3   4   5   6   7

e) How much do you think the action reflects the personality of
grandchildren?   1   2   3   4   5   6   7

f) How much do you think the action is due to the situation?   1   2   3   4   5   6   7

2)   .

2) The teacher has criticized students.

a) How much do you think the action is due to the teacher?   1   2   3   4   5   6   7

b) How much do you think the action is due to students?   1   2   3   4   5   6   7

c) How much do you think the action is a reaction to the
situation?   1   2   3   4   5   6   7

d) How much do you think the action reflects personality of the
teacher?   1   2   3   4   5   6   7

e) How much do you think the action reflects personality of students? 　　1　　2　　3　　4　　5　　6　　7

f) How much do you think the action is due to the situation? 　　1　　2　　3　　4　　5　　6　　7

3) نینی چلنے کے لئے بچے کو لے.

3) The babysitter the child to walk took.

a) How much do you think the action is due to the babysitter? 　　1　　2　　3　　4　　5　　6　　7

b) How much do you think the action is due to the child? 　　1　　2　　3　　4　　5　　6　　7

c) How much do you think the action is a reaction to the situation? 　　1　　2　　3　　4　　5　　6　　7

d) How much do you think the action reflects personality of the babysitter? 　　1　　2　　3　　4　　5　　6　　7

e) How much do you think the action reflects personality of the child? 　　1　　2　　3　　4　　5　　6　　7

f) How much do you think the action is due to the situation? 　　1　　2　　3　　4　　5　　6　　7

4) انہوں نے کہا کہ کنسرٹ میں ان کے دو بیٹوں ایا.

4) Brought to the concert her two sons the mother.

a) How much do you think the action is due to the mother? 　　1　　2　　3　　4　　5　　6　　7

b) How much do you think the action is due to the sons? 　　1　　2　　3　　4　　5　　6　　7

c) How much do you think the action is a reaction to the situation? 　　1　　2　　3　　4　　5　　6　　7

d) How much do you think the action reflects personality of the mother? 　　1　　2　　3　　4　　5　　6　　7

e) How much do you think the action reflects personality of the sons?

1   2   3   4   5   6   7

f) How much do you think the action is due to the situation?

1   2   3   4   5   6   7

5) ۔ہے کیا خبردار نے ریفری کھلاڑی

5) The player admonished the referee.

a) How much do you think the action is due to the referee?

1   2   3   4   5   6   7

b) How much do you think the action is due to the player?

1   2   3   4   5   6   7

c) How much do you think the action is a reaction to the situation?

1   2   3   4   5   6   7

d) How much do you think the action reflects personality of the referee?

1   2   3   4   5   6   7

e) How much do you think the action reflects personality of the player?

1   2   3   4   5   6   7

f) How much do you think the action is due to the situation?

1   2   3   4   5   6   7

6) ہے جھگڑا سرجن ساتھ، کے نرس

6) With the nurse the surgeon has quarrelled.

a) How much do you think the action is due to the surgeon?

1   2   3   4   5   6   7

b) How much do you think the action is due to the nurse?

1   2   3   4   5   6   7

c) How much do you think the action is a reaction to the situation?

1   2   3   4   5   6   7

d) How much do you think the action reflects personality of the

1   2   3   4   5   6   7

180

surgeon?

e) How much do you think the action reflects personality of the
nurse?   1   2   3   4   5   6   7

f) How much do you think the action is due to the situation?   1   2   3   4   5   6   7

APPENDIX C

Correlations used in Study 3a, Version 1, Chapter 3

Gentile partecipante, legga le seguenti frasi e ci fornisca la sua percezione di correlazione tra gli argomenti presentati. Nel segnare la risposta, consideri che -1 corrisponde a "all'aumentare dell'una diminuisce l'altra", a 0 corrisponde "nessuna relazione" e +1 corrisponde a "all'aumentare dell'una aumenta l'altra"/ "al diminuire di una diminuisce l'altra".

L'efficacia della memoria a breve termine ha un legame con l'alcol.

-1,00	-0,80	-0,60	-0,40	-0,20	0,00	0,20	0,40	0,60	0,80	1,00

Il fumo passivo ha un legame con l'asma.

-1,00	-0,80	-0,60	-0,40	-0,20	0,00	0,20	0,40	0,60	0,80	1,00

Cibi ricchi di zuccheri hanno un legame con la glicemia alta.

-1,00	-0,80	-0,60	-0,40	-0,20	0,00	0,20	0,40	0,60	0,80	1,00

L'innalzamento del colesterolo ha un legame con cibi poveri di calcio.

-1,00	-0,80	-0,60	-0,40	-0,20	0,00	0,20	0,40	0,60	0,80	1,00

L'Inquinamento ha un legame con l'ipertensione.

-1,00	-0,80	-0,60	-0,40	-0,20	0,00	0,20	0,40	0,60	0,80	1,00

Il rendimento al lavoro o a scuola ha un legame con l'alcol.

-1,00	-0,80	-0,60	-0,40	-0,20	0,00	0,20	0,40	0,60	0,80	1,00

I cibi ricchi di potassio hanno un legame con l'ipertensione.

-1,00	-0,80	-0,60	-0,40	-0,20	0,00	0,20	0,40	0,60	0,80	1,00

Il buono stato della pelle ha un legame con cibi ricchi di sodio.

-1,00	-0,80	-0,60	-0,40	-0,20	0,00	0,20	0,40	0,60	0,80	1,00

Il fumo ha un legame con la disfunzionalità erettile.

-1,00	-0,80	-0,60	-0,40	-0,20	0,00	0,20	0,40	0,60	0,80	1,00

Uno stile di vita sedentario ha un legame con la velocità del metabolismo.

-1,00	-0,80	-0,60	-0,40	-0,20	0,00	0,20	0,40	0,60	0,80	1,00

L'insorgenza di tumori ai polmoni ha un legame con il fumo.

-1,00	-0,80	-0,60	-0,40	-0,20	0,00	0,20	0,40	0,60	0,80	1,00

La velocità dei riflessi ha un legame con l'alcol.

-1,00	-0,80	-0,60	-0,40	-0,20	0,00	0,20	0,40	0,60	0,80	1,00

1. Età: _____

2. Genere:
       Uomo
       Donna

3. Pratica attività fisica? Se sì, con quale frequenza?

       Tutti i giorni
       Almeno due volte a settimana
       Almeno una volta a settimana
       Almeno una volta al mese
       Ogni tanto
       Non pratico attività fisica

4. Con che frequenza fa uso di superalcolici?

○ Tutti i giorni   ○ 4 volte a settimana   ○ 3 volte a settimana   ○ 2 volte a settimana   ○ 1 volta a settimana   ○ Raramente   ○ Mai

5. Con che frequenza fa uso di alcolici (quali vino o birra) durante o fuori pasto?

○ Tutti i giorni   ○ 4 volte a settimana   ○ 3 volte a settimana   ○ 2 volte a settimana   ○ 1 volta a settimana   ○ Raramente   ○ Mai

6. Quante sigarette fuma al giorno? _____ sigarette

   ○   non fumo

7. Quanto giudica sana la sua alimentazione?

○ Per nulla   ○   Poco   ○   Non so   ○ Abbastanza   ○Molto

8. Quanto sarebbe disposto/a a modificare le sue abitudini alimentari o il suo stile di vita?

○ Per nulla   ○Poco   ○Non so   ○ Abbastanza   ○Molto

APPENDIX C

Questionnaire used in Study 3c, Version 1, Chapter 3

Cibi poveri di sodio hanno un legame con l'abbassamento della pressione sanguigna.
Cibi ricchi di sodio hanno un legame con il peggioramento della pelle.
Cibi poveri di sodio hanno un legame con il miglioramento della pelle.
Cibi ricchi di zuccheri hanno un legame con la glicemia alta.
Cibi poveri di zuccheri hanno un legame con la glicemia bassa.
Cibi ricchi di zuccheri hanno un legame con capelli deboli.
Cibi poveri di zuccheri hanno un legame con capelli forti.
Cibi ricchi di fibre hanno un legame con un buon funzionamento del colon.
Cibi poveri di fibre hanno un legame con un cattivo funzionamento del colon.
Cibi ricchi di fibre hanno un legame con muscoli forti.
Cibi poveri di fibre hanno un legame con muscoli deboli.
Cibi ricchi di calcio hanno un legame con l'abbassamento del colesterolo.
Cibi poveri di calcio hanno un legame con l'innalzamento del colesterolo.
Cibi ricchi di calcio hanno un legame con un buono smalto dentale.
Cibi poveri di calcio hanno un legame con un cattivo smalto dentale.

Quanto questo è rilevante per gli altri?

○   ○   ○   ○   ○   ○   ○

Per nulla   Totalmente

Quanto questo è rilevante per lei?

○   ○   ○   ○   ○   ○   ○

Per nulla   Totalmente

*Immagini ora di non avere alcun alimento nella sua cucina. In base alle sue preferenze, compili una lista della spesa contenente i **primi 9 alimenti** che le vengono in mente (cibi e/o bevande, confezionati e/o freschi). Per favore, cerchi di essere il più preciso/a possibile.*

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

Immagini ora di preparare uno spuntino per sé. Indichi il suo stile alimentare (onnivoro o vegetariano/vegano) e scelga 3 alimenti tra quelli proposti.

Alimentazione onnivora
Scelga tre alimenti tra quelli proposti.

○ Frutta Fresca

○ Pane e salame

○ Gallette di riso

○ Biscotti

○ Mix di frutta secca al naturale

○ Pane e crema alla noccciola

○ Cereali

○ Patatine fritte

○ Pane e marmellata

○ Mix di salatini

○ Pane e formaggio spalmabile

○ Gelato

○ Mix di verdure

○ Cereali

○ Yogurt

○ Patatine confezionate

1. Età: _____

2. Genere:
   □ Uomo
   □ Donna

3. Indicativamente, quando ha consumato il suo ultimo pasto?
   □ Meno di un'ora fa
   □ 1-2 ore fa
   □ 3-4 ore fa
   □ Più di 4 ore fa

4. Pratica attività fisica? Se sì, con quale frequenza?
   □ Tutti i giorni
   □ Almeno due volte a settimana
   □ Almeno una volta a settimana
   □ Almeno una volta al mese
   □ Non ho una frequenza regolare
   □ Non pratico attività fisica

5. Le domande seguenti identificano attributi legati al corpo umano. Le chiediamo di pensare al proprio corpo e di classificare le caratteristiche secondo ordine di importanza. Consideri che 1 corrisponde a "meno importante" e 12 a "più importante".

   … Quale posizione assegna alla coordinazione fisica? _____
   … Quale posizione assegna alla salute? _____
   … Quale posizione assegna al peso? _____
   … Quale posizione assegna alla forza muscolare? _____
   … Quale posizione assegna al sex appeal? _____
   … Quale posizione assegna all'attrattività fisica? _____
   … Quale posizione assegna al livello di energia fisica? _____
   … Quale posizione assegna al rassodamento o muscoli scolpiti? _____
   … Quale posizione assegna alla forma fisica? _____
   … Quale posizione assegna alla colorazione? (ES: colore della pelle, occhi e capelli) _____
   … Quale posizione assegna alle misure? (ES: seno, vita, fianchi) _____
   … Quale posizione assegna alla resistenza fisica? _____

6. Quanto giudica sana la sua alimentazione?
   ○   ○   ○   ○   ○   ○   ○
   Per nulla   Totalmente

7. Quanto sarebbe disposto/a a modificare le sue abitudini alimentari sulla base di ciò che ha letto nel compito iniziale?
   ○   ○   ○   ○   ○   ○   ○
   Per nulla   Totalmente

APPENDIX D

Stimuli used in Study 4a, 1° Version, Chapter 4

Mouse Tracker Stimuli
First Image

Second Image

Third Image with the choice between SV or VS order

QUESTIONARIO (femmina)

Gentile partecipante,

le chiediamo ora di rispondere ad alcune domande sulle immagini da lei appena viste: indichi il suo grado d'accordo riguardo l'affermazione cerchiando il numero che più rispetta la sua personale opinione. Le ricordiamo che non esistono risposte giuste o sbagliate e le domandiamo di essere sincero.
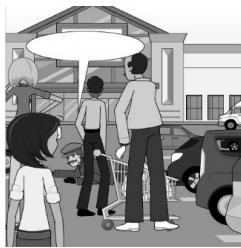
Completamente in disaccordo	In disaccordo	Abbastanza in disaccordo	Né d'accordo né in disaccordo	Abbastanza d'accordo	D'accordo	Completamente d'accordo

1.Si tratta di una situazione pericolosa

1	2	3	4	5	6	7

2.Mi sono immedesimata con la ragazza con la maglietta bianca.

1	2	3	4	5	6	7

3.Non mi è mai capitato di cadere per terra in un luogo pubblico

1	2	3	4	5	6	7

4.Il signore per terra ha bisogno di aiuto.

1	2	3	4	5	6	7

5.Se mi trovassi in una situazione simile, interverrei

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

6.Non ho le capacità per aiutare una persona nella stessa situazione.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

7.È possibile che io mi trovi nella situazione della ragazza con la maglia bianca.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

8.Se mi trovassi nei panni del signore per terra potrei cavarmela da sola.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

9.Se non intervenissi, potrebbe farlo qualcun altro.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

10.Se lo aiutassi, ci rimetterei qualcosa.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |