A Psycholinguistic Exploration of Human Individuation of Events and the Perception of Time
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Declaration

I hereby declare that this thesis is entirely my own work and that it has not been submitted as an exercise for a degree at any other university.

______________________________  May, 2006
Claire Morris
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Firstly, I’d like to thank Dr. Carl Vogel, who has patiently helped me throughout this project and over the last four years, his advice and encouragement have been invaluable. I’d also like to thank all the people who took part in the experiments because without their time and contributions there would be no project.
“The only reason for time is so that everything doesn’t happen at once”

*Albert Einstein*

“You may delay but time will not”

*Benjamin Franklin*
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Abstract

This paper describes a psycholinguistic exploration undertaken to determine whether people perceive time to be discrete or to be dense through the construction of experiments that control the number of consciously attended and unconsciously attended events. Furthermore, the paper seeks to determine human perception of events and causes through experiments that alter linguistic descriptions of events to see if individuation of events is in fact influenced by linguistic representation of them.
1 Background

1.1 Introduction

The subject of time has been heavily debated amongst philosophers since the beginning of philosophy. Within this paper, I focus on people’s perception of time. It has been said that *a watched phone never rings* and *time flies when you’re having fun*. These two sayings underlie the two comments made by vanLambalgen and Hamm (2004): “time filled with exciting events will seem short in passing... however, a period of time in which little new happens will seem long in passing” (pg. 10). This model of time is based on the assumption that time is dense — more like the real numbers than the integers, and this perspective is objected to by Fernando (2005). My project, in part, attempts to explain whether there are testable empirical hypotheses that can be attached to these assumptions.

The subject of the individuation of events and causes with regards to linguistic descriptions has also been discussed from an empirical perspective by a number of other researchers. I focus on the no-intervening-cause hypothesis given by Phillip Wolff \(^1\) in exploring people’s construal of causal chains through linguistic descriptions and numbers of events.

1.2 Motivation and Aims

This topic of time and events has greatly intrigued me because time is something that people argue about everyday, whether it is that people have too little time or too much time, but more often than not it appears that people will always complain of having not enough time because they have so many events taking place in their life. So, do people judge time by events or events by time? People’s perception of time is an extremely interesting conception. Do people perceive time as passing faster when their time is full of events or lacking in events? The answer to this second question is what I hope to discover through my empirical analysis. As regards people’s perceptions of events, it is interesting to explore how people break down chains into events and when they do so what part of a chain do they see, do they see a whole event, part of an event or in fact numerous events and do linguistic descriptions of events effect this individuation? I also seek to explore the answer to these questions through my second empirical analysis.

\(^1\)This is introduced more completely in Section 3.3.1.
1.3 Structure of the Paper

Chapter 2 provides a short literature review of some empirical and philosophical articles on the perception of time. I give my own empirical analysis of the human perception of time, exploring the possibility of time being either dense or discrete. Participants without any knowledge of German are given a crossword with mixed German and English answers to complete within a time frame and I control the number of events that can take place within the timeframe through an instant messaging service set up to enable participants to ask me answers to the crossword as it cannot be completed without my help. Half the participants experienced a delay in responses to their messages and half received instant messages in reply. Here I am investigating whether consciously attended events affect people’s perception of time. A second empirical analysis is conducted, similar to the first but, this time participants listen to music while completing the crossword. Here I am assessing whether the inclusion of unconsciously attended events as well as consciously attended events affect people’s perception of time. The results of these experiments are discussed both separately and together comparing and contrasting the experimental factors.

Chapter 3 provides a short literature review on linguistic influences on event individuation and also on spatio-temporal and causal influences on event individuation. The Wolff (2003) paper is discussed in detail providing in-depth analysis of his no-intervening-cause hypothesis and his experiments constructed and discussed in relation to it.

Chapter 4 begins my empirical analysis on perception of events. I proceed to construct a linguistic experiment using an on-line experimenter tool, in response to the Wolff experiments in Chapter 3 to further investigate his no-intervening-clause hypothesis. I assess people perceptions of events through participant’s choice of one of three anaphoric descriptions of 5 passages that each denote a specific event type, 3 of which are explored and discussed by Wolff and the remaining two I thought interesting to explore as well. The results of this experiment lead to the construction of 2 further experiments again making use of the on-line experimenter tool. The second experiment gets participants to construct their own description for each of the passages denoting events and the third gets people to judge the number of events they feel each passage is about. Results and discussion of these experiments are included followed by an overall discussion of Wolff’s no-intervening-cause hypothesis regarding my findings.

Chapter 5 includes a conclusion of all the chapters tying them together and making overall judgements to the results of my empirical work.
2 Perceived Time

2.1 Introduction

In this chapter I intend to provide the reader with a review of some of the existing literature on the perception of time. This is not intended as a comprehensive review, but a selection of empirical and theoretical perspectives that interest me.

2.1.1 Synchronicity V's Protracted Duration

Flaherty (1991) introduces the concepts of synchronicity and protracted duration. Synchronicity being where “10 minutes as measured by the clock seems like approximately 10 minutes from the perspective of lived duration (pg. 77)”. That is, synchronicity is when human perception of time coincides with an objective measure of time determined outside the observer. In contrast protracted duration refers to when we feel more time has passed than actually has been measured by a physical indicator e.g. a clock or calendar. Flaherty investigates the concept of protracted duration by getting people to recall events in their life where they perceived time as passing very slow. His findings show that people do not experience protracted duration when normal day to day events occur but rather when unusual events occur. An interesting point in his findings is that people experience protracted duration both when the stimulus complexity is both high and low i.e. in periods where both little events take place and when many events take place. Flaherty comments on his results by stating “according to folk theory, busy time seems to pass quickly while empty time seems to pass slowly. The shortcomings of this theory are exposed by the fact that a majority of our narratives were coded as depicting highly eventful situations, and all of them document the experience of protracted duration (pg 80)”. Flaherty quotes Schwartz (1975) (pg. 168) when he states that “we often judge the waiting period to be longer than it is because we then pay more attention to time than we would ordinarily do during an objectively longer active period (pg. 82)”. Overall his results show that periods of time that are filled with events or periods of time that are scarce of events have the exact same effect on the perception of duration of these time periods, they both can be examples of protracted duration. What does distinguish situations in which people experience protracted duration rather than synchronicity is that they are unusual, distinctly not normal everyday situations. However, it must be noted that Flaherty’s results depend on reflection long after the fact and there is nearly no independent control of the number of events during the relevant time spans, only the subset of
those cognitively attended events that were also remembered.

2.1.2 South African V’s European Perception of Time

Lemmer, Lemmer, Smit, and Vreken (1999) carry out research on “students’ perceptions of time”. They obtain survey results from 517 first year students studying at the universities in Namibia and South Africa. They investigate the perception of time in accordance with physics and then in accordance with the traditional African view of time. They state that “in ancient times, time was thought to be cyclic...derived from the recurrence of natural events” (pg. 1), Aristotle then believed the perception of time to be concurrent with changes in events, the mechanical clock led to the physical conception of time and Newton and Einstein developed the perception of time in terms of Physics. The results from the survey showed that students of European descent perceived time formally in terms of classical Physics in accordance with Newton and Einstein while African students mainly perceived time in terms of events in accordance with Aristotle. Those students who had a high level of science education perceived time in term of classical physics.

2.1.3 Time as Dense

The belief of vanLambalgen and Hamm (2004) is not that we perceive time but instead that we construct time. They believe in three aspects of time:

1. Time as duration.

   They believe it is necessary to differentiate between experienced duration and remembered duration, as they state that “a period of time filled with exciting events will seem short in passing, but long in retrospect. However, a period of time in which little new happens (e.g. a protracted period of illness, or waiting for a connection to a helpdesk) will seem long in passing but short in retrospect” (pg. 5). It appears that if one focuses on events you do not focus on time and thus time isn’t encoded properly. We do not have an internal watch inside our heads telling us how much time has passed; however, there have been theories to suggest that our mind does hold default values of time for certain events i.e. if one routinely carries out a specific event for example making a cup of tea, one stores a default value for how long it normally takes one to do this. The fact that one is able to say that an event is passing fast or slow is dependent on the comparison of this event with a stored default scenario of this event.

2. Temporal perspective: past, present and future.
This aspect of time introduces the “deictic now” to which all events are perceived as either past or future in comparison to it. Temporal perspective is responsible for the ordering of events. They describe how James (1890) gives a meaning of ‘now’ as the ‘specious present,’ that present is bi-directional to one end is the past and to the other end is the future and it is the succession from past to future that gives the perception of time.

3. Time as succession.

vanLambalgen and Hamm (2004) quote Block (1990) (pg. 6) when they state that

information relating to the ordering of events from earlier to later gives rise to the common idea that the progression of time may be represented as a line or arrow in the process of encoding an event, a person remembers related events which preceded it, anticipates future events, or both (pg 9).

So as we encode one event, we remember a previous event and anticipate a future event.

vanLambalgen and Hamm (2004) quote Zacks and Tversky (2001) when they state that “The basic building block of the human construction of time is the event” (pg. 15). They thus continue to try to clarify what an ‘event’ is. In general terms they describe events to be “referents of certain natural language expressions” (pg 15). and they provide the following as examples: “hearing a tone, a wink, stopping a penalty kick, a marriage ceremony, a solar eclipse, a stock market crash, World War II, a tank battle, an individual act of bravery, a memorial service, writing a book about World War II” (pg. 15). However, they search for a more defined notion of event from which they provide Zacks and Tversky (2001) definition of an ‘event’ as “a segment of time at a given location that is conceived by an observer to have a beginning and an end” (pg. 16). But what if one did not live through an event, then you would not have experienced its beginning and its end, how then would one be able to conceive it as an event? Or, any proper subsegment of such an event, by hypothesis also has a beginning and end — this definition means that all parts of events are events. It appears that changes allow one to individuate events but also that “goals and plans play an important role in individuating events, and hence indirectly also in constructing time” (pg. 17). The Russell-Kamp construction of time from events is based on metaphysics. It was Newton who believed time itself to be a physical entity “absolute, true and mathematical time, in and of itself, in its own nature flows equally without
relation to anything external” (pg.17). In contrast, “Leibniz believed that time is relative in the sense that it is dependent on the events that occur: no events, no time, and moreover the structure of time depends on the structure of events” (pg. 17). The Russell-Kamp construction allows the time-line to be derived from event structures, modelling the assumption that between any two instants there will be another instant. Collections of instants are dense provided with a strict precedence relation. Thus, effectively time is modelled by the real number line.

2.1.4 Time as Discrete

An alternative concept is that time is discrete; for example, Fernando (2005) distinguishes the notion of observation time from real time by stating that he believes that observation time is not arbitrarily divisible (like the real line) and that it can be “assumed to be discretely ordered (with well-defined next moments, just as sequentially structured plans and computations)” (pg. 4).

2.1.5 Conclusion

It can be noted from the preceding literature review that a number of conflicting theories exist regarding the perception of time, mainly time as either being dense and modelled by the real numbers or time as being discrete. Also contentious is the perception of duration in relation to events. I intend to investigate this discrepancy, to find out whether people perceive time to be dense or discrete. I do this by manipulating the number of events that people encounter as events they must cognitively attend to as well as simply experience, assessing their perception of time in relation to an objective measure of the time passing through their task.
2.2 Human Perception of Time Experiment

2.2.1 Introduction

In reference to the various literature reviewed I decided to test the hypothesis of time being either discrete or dense as it has been clearly shown that these two conflicting theories exist. I wanted to design an experiment that would test people’s perception of time by altering the number the number of events that could take place within a given time frame where that duration is explicitly evaluated from a participant-external frame of reference. External duration is defined where time is time independent of the number of observed events.

The **discrete view** is that events determine duration, more events = more time\(^2\). In Figure 1, (1) involves more time than (2), where the short vertical lines mark events and the horizontal line, duration. In the discrete view, the events provide the clock of event experience. In the **dense view** the clock of experienced time is independent of the number of experienced events. In the discrete view the distance between events should be constant, so the more events, the greater the experienced duration. In the dense view, this constraint should not hold. Given a humanly reasonable externally defined duration (that is one that a reasonable human could be more or less expected to perceive ‘accurately’), under the dense view, few attended events could be perceived as either very long or very short, but under a discrete view certainly very short; many attended events under a dense view could go either way, but under a discrete view, should go very long.

\(^2\)One could argue that one could have more events and less time if the events “happen faster” or “are smaller”, but this more appeals to a measure of time that is not determined by events.
If people perceive time as passing faster (i.e. less time has passed) with the inclusion of more events in the time frame then this will agree with claim that time is dense. However, if people perceive time as passing slower with the inclusion of more events (i.e. more time has passed) in a given time frame then this will agree with the claim that time is discrete.

2.2.2 Design of Experiment

I decided that a suitable way to test participant perception of time would be to give them a crossword and get them to complete the crossword within a certain time frame, the time allowed being unknown to the participant. A crossword, with its discrete number of answers to be filled in, provides a natural locus of events that are cognitively attended to: obtaining an answer. Of course, there are other events (e.g. writing it down) but by construction of the task the number of answers to provide is the greatest determinant of the number of events. Giving participants an ordinary crossword would not work as I would have no way of controlling the number of events with each participant, since I have no control over their world knowledge or English vocabulary. It was decided upon that the crossword would be designed in such a way that the number of events taking place could be controlled by me.

The design of the crossword took the form of 32 clues and corresponding answers. For the crossword itself see Appendix A.2 and for its solution, Appendix A.3. All of the 32 clues would be in English. However, the corresponding answers to all the clues would not be in English. I decided to have some of the answers in German assuming all participants would have no knowledge of German. I decided upon having one quarter of the answers (i.e., 8) in English as I thought that this was a reasonable amount to keep the participants occupied for a short timeframe without frustration of being able to do nothing. It would give them a purpose to do the crossword with the encouragement that they could answer some of it and small enough so that it could not possibly keep the participants occupied for the entire timeframe of the experiment. The remaining three quarters (i.e. 24) of the answers would be in German. The idea behind this is that there is no way the participants would be able to complete the crossword without my help as they do not have any German. Participants were to complete the task while in text based communication with me so that I would have an additional set of events to count (message sendings), each with time stamps on them.

Participants are given a set of instructions see Appendix A.1. They are told that they have a crossword to complete, they are given a blank printed version of the crossword with a pen and a set of instructions. They are set
beside a computer terminal and are given a set of earplugs so no background noise can interfere with the number of events taking place. On the computer I set up an instant messaging service using internet relay chat and the netsoc server, a dedicated computer server owned by a student society at Trinity College\textsuperscript{3}. See Appendix A.4 to see how the messaging service was set up. It works just like any other internet based messaging service such as, MSN messenger. However, MSN messenger was not a suitable messaging service for this experiment, because I needed to be able to edit the messaging service, so that my messaging screen had a timestamp allowing me to see the time when the experiment began, the time questions were asked, the time answers were given and the time the experiment ended. At the same time, I did not want the messaging service of the participants to display a timestamp, as an essential part of the experiment is that they have no physical indicator of the “absolute” time, as the experiment is testing their perceived duration of time. Participants were shown how to use the messaging service just in case they were unfamiliar with instant messaging services. I let the participants read the instructions and then gave them a chance to ask me any questions that they might still have regarding the experiment.

All physical indicators of time were removed from participants: watches, mobile phones, i-pods. I was also careful to block the time on the computer screen so they were left with absolutely no “physical” indicator of time passing. They were told that they were not allowed to make contact with anyone during the experiment process, except with me through the messaging service. They were informed that the point behind the use of the instant messaging service was that the crossword had mixed answers between English and German, and due to the fact that they had no German they would be unable to complete the crossword without my help. It was made clear that they could ask me as many questions as they liked, and I would give them the answers if they requested them. They were told that they could begin the crossword when I messaged them saying start and that they would be stopped after a certain amount of time when I messaged them to stop. I told them that I would ask them a number of questions about the crossword when they were finished. In this experiment I decided that participants should wear earplugs to ensure that they each took the crossword in complete silence, as background noise could interfere with the number of events taking place. Once all the required information had been given to them I told them to insert the earplugs.

\textsuperscript{3}The version I used was the freeware system mIRC 6.17 which is available online: http://www.mirc.com/get.html (last verified, May 2, 2006).
2.2.3 Participants

There were 18 participants in the experiment. In order to alter the number of events taking place for the participants, I decided that half of them (9) would receive instant replies to the clues they asked. The idea behind this was that they would be able to ask as many clues as they wanted and would receive as many answers as they wanted allowing the maximum number of consiously attended events to take place in the timeframe. It was decided that the other 9 participants would receive delayed answers to the questions asked and the delays experienced would be anything from 30 seconds to 5 minutes for each answer. The idea behind this was to control the number of attended events taking place. Because of the delay factor, this set of participants would not obtain responses to as many questions as the first set of participants and therefore they would not ask as many questions as the first set, either. Because of these factors this set of participants shouldn’t be able to complete as much of the crossword as the first set who receive instant instead of delayed messages. Recall: no participant knew German and three quarters of the crossword puzzle involved German words as answers to English clues. The delay factor means that these participants will be left waiting for answers and will have nothing to do as they wait. In contrast, the first set of participants with instant replies will not be left waiting at any time. I was able to obtain immediacy through having a file of answers open and cut and paste and return reactions deciphering the sought clue.

2.2.4 Length of experiment

I decided that the experiment should last 12 minutes 18 seconds, and the reasoning behind this was that it was a short enough time period to keep people interested, a reasonable amount of time for external and internal perceptions of durations to exhibit synchrony (see 2.1.1), and also in the interest of participants it was short enough not to take up too much of their time. Furthermore, as the crux of this experiment is finding out people’s perception of time I didn’t want to choose a value for the length of the experiment that people would have as a stored default value for events e.g. multiples of 5, so therefore that ruled out choosing 10 minutes or 15 minutes.

2.2.5 Questions Asked

As with any psycholinguistic experiment it is essential to ask a few dummy questions so participants do not guess what the experiment is in essence testing. If participants realise what is tested it is highly likely that they will give a biased answer to suit what they think you want to hear or do not
want to hear. That is why it was essential for me to ask participants a series of questions when they had completed the experiment, because if the only question I asked was “how long do you think the experiment lasted,” they would become much more aware of the time factor under examination. I decided to ask them 5 questions in a randomised order. The five questions were:

1. How long do you think the exercise lasted?
2. What was the longest/shortest word in the crossword?
3. How many words do you think you typed to me using the instant messaging service?
4. What German words do you remember?
5. What do you think I am testing for?

The answer to the final question would be very important as I want to find out if they are consciously aware that I am testing their perception of time. However, the first question in the set is obviously the real experimental question.
2.2.6 Results and discussion

This bar chart clearly shows that participants who received a delayed response to messages perceived the timeframe as being significantly longer than those participants who received immediate responses to messages. In graphing the actual duration instead of perceived duration, the two bars would obviously have exactly the same height. It can be clearly seen that those participants who received a delayed response to messages on average perceived the timeframe of the experiment to be 6 minutes longer than the perceived duration of the time frame by participants who received instant responses to messages. This shows that with more events taking place participants perceive time as passing quicker. The greater number of events led not to perception of a greater duration but to perception of a shorter duration. These results agree with the theory that time is dense.
2.3 Part two of Human Perception of Time Experiment

2.3.1 Introduction

In response to the results of the first experiment I decided to further investigate this point about the perceived duration of time in relation to the number of events taking place. In contrast to the first part of the experiment where participants were dealing with consciously attended events as manipulated through the asking of questions and the receiving of answers I decided to introduce unconsciously attended events into the experiment. The assumption made was that accompanying music would not be attended to if it lacked vocals. However, attended to or not, the music would provide a set of events at fixed sequences of externally defined duration. The music events are distinct from the crossword events in lacking cognitive effort. With music, the perceived duration should be greater than without music, on the discrete view of time. “With music” and “no delay” should be perceived as greater duration than “with music” and “with delay”.

2.3.2 Design of Experiment

I decided that a feasible way to alter the number of events unconsciously attended by participants would be through the introduction of music, with each note of the music representing an unconsciously attended event. I decided to repeat the above outlined experiment and the only change this time would be that instead of wearing earplugs, participants would wear headphones and listen to a piece of music. This meant that both groups had comparable extraordinary earwear to contend with, thus controlling for that as a possible confounding factor between the two conditions.

2.3.3 Choice of Music

When choosing a suitable piece of music there were a number of considerations. Firstly, the piece needed to be longer than 12 minutes 18 seconds, as it was essential that same piece of music played for the entire duration of the experiment, and that it didn’t have to be put in a loop. I didn’t want to put the music in a loop as I felt that it would affect the participants judgement of events and time because if they noticed the loop it could add to the number of events taking place. Also, I thought that it would be best if the piece of music contained instruments only and had no words as I wanted the participants to be unconscious of the music, with words in the music I
felt that participants would become consciously aware of the music. Furthermore, when choosing the music I was careful not to choose a piece that had an extremely high or low tempo because it is more likely that when high tempo music is played participants will see the time passing as shorter and in contrast, if low tempo music is played participants will see the time passing as longer. The piece chosen was Symphony No. 38 in D major KV 504 “Prague” number 1 ‘adagio-allegro,’ by Wolfgang Amadeus Mozart which lasted 13 minutes 49 seconds. The music was played at the default volume setting.

2.3.4 Participants

The experiment was carried out exactly as before: a fresh set of participants were given the exact same set of instructions, only this time they were told to start listening to the music when I finished explaining the experiment instead of inserting the earplugs as done in the first experiment. Again, as before, there were 18 participants in this experiments, 9 of whom received instant replies to their questions and 9 of whom received delayed replies to their questions again the delay ranging from 30 seconds to 5 minutes for each reply to each question. This set of delays was the same as with the first experiment.
2.3.5 Results and discussion

This graph is on a different scale to the last graph and it gives the impression that there is a major difference between the perceived duration by the two sets of participants when in fact the difference is relatively small, not even that of one minute in contrast to almost 6 minutes in the previous experiment. Figure 11 puts the two conditions in context with each other, thus revealing the difference. Still, even though the difference is shorter in duration for the experiment with music, when participants experienced no delay they still perceived shorter durations than those with a delay.

The results of this experiment are evidently quite different from the results of the first experiment. In this experiment, the perceived duration of the experiment didn’t differ that much between the two sets of participants, the difference is less than one minute. Those participants with a delayed response to messages perceiving the timeframe of the experiment to be just under a minute longer than those participants with instant responses to messages.
2.4 Pooled Results of the Two Experiments

This bar chart shows that those participants receiving so called instant responses to messages were only delayed on average by 6-7 seconds in both sets of experiments. In contrast, those participants receiving delayed responses to messages were delayed on average by 90 seconds. This shows that I was consistent in the amount of delay experienced by participants across the two experiments with their two conditions.
It can be clearly seen from this bar chart that those participants with instant responses to messages got the opportunity to ask me on average more than twice the number of answers to the clues given, independently of whether there was music in the background. A minority of participants kept asking clues regardless of whether they received answers to previous clues already from me. The average number of clues asked was a smaller number in the delay condition with music than without and clues asked was larger in the delay condition with music than without. Overall, this shows that music made the delayed people more patient and made the people without delayed responses quicker. Figure 6 deals with the amount of answers people received to their clues asked.
This bar chart shows that participants with instant responses to messages received on average 3 times the amount of answers to the crossword from me than those participants with delayed responses to messages. Answers given was larger in both the delay and no delay condition with music than without. The reason why participants didn’t receive all the answers to the clues asked in the non-delayed condition is because they may have asked a clue just a second or two before the experiment time was up so I was enabled to answer their question quickly enough. The reason why delayed participants didn’t get all the answers to the clues they asked was because I was purposely delaying answers.
Figure 7: Average Percentage of Crossword Completed

This bar chart shows that participants with instant responses to messages got more of the crossword completed than participants with delayed responses to messages. It also shows that in the two conditions, delay and no delay, both sets of participants completed marginally more of the crossword when listening to music. Figure 8 shows the percentage of the crossword that was completed that was correct.
Figure 8: Average Percentage of Crossword Completed Correctly

This bar chart shows that participants with instant responses correctly completed a significantly greater proportion of the crossword than the participants with delayed responses to messages.
Figure 9: Breakdown of non-musical events by participant

This clearly shows more events were allowed to take place when there was no delay. Participants 1-18 were earplugged while Participants 19-36 were made listen to music. Participants 1-9 and 19-27 were in the delay condition and participants 10-18 and 19-36 experienced no delay.
Figure 10: Average non-musical events by condition

Like Figure 9 this Figure shows on average more events were allowed to take place when there was no delay. This Figure is an average summary of the data from individual participants in Figure 9.
There is a greater difference shown here between participants who were earplugged and those who were made to listen to music. With a delayed response and no music, participants perceived the time frame for the experiment to be over 6 minutes longer than those participants who had an instant response to messages with no music. In contrast, when listening to music, participants with a delayed response only perceived the time frame for the experiment to be just under 1 minute longer than those participants who had an instant response to message while listening to music. What is interesting is that both sets of participants with an instant response (regardless of music or no music) perceived the time frame on average to be the same. As people were arbitrarily assigned to each condition of the experiment, it is unlikely that a sample of amusical hearing people was involved. Rather, this is evidence that the events supplied by music are more important when there are no other events to supply cognitive grist.
Figure 12: Average number of participants who guessed the perceived time to be a multiple/or not a multiple of 5 over the varying conditions

Given the choice of 12 minutes 18 seconds as the duration out of fear that people would guess in multiples of 5 minutes, I explored this by examining guessed durations in those terms. It was not expected that there would be an effect of either factor on the guess.

It can be seen that with no music and a delay all participants guessed that perceived time was a multiple of 5 and with no music and no delay 7 out of the 9 participants guessed the perceived time was a multiple of 5. In contrast, the results with music show a smaller proportion of participants guessing the perceived time to be a multiple of 5, with a delay 6 out of 9 participants guessed with a multiple of 5 whereas without a delay only 5 out of 9 guessed with a multiple of 5. I referred earlier Section 2.2.4 that I did not want to choose a multiple of 5 for the length of experiment as people sometimes guess in 5 minute intervals. It can be seen here that quite a number of participants did guess with 5 minute intervals.
Figure 13: Average percentage of the longest and shortest words in the crossword guessed correctly by participants over the different conditions.

Section 2.2.5 pointed out that a number of filler questions were asked in addition to the main experimental question of perceived duration. Out of curiosity I explored these responses as well. This graph refers to how correct participants were when guessing the longest and shortest words from memory in the crossword. Overall, it can be seen that more than half the participants guessed the longest and shortest words correctly. It must be noted that this is a difficult task to ask participants as most of the words in the crossword were in German and participants had no knowledge of German.
Figure 14: Average number of the actual words typed by participants V’s perceived words typed by participants

This graph shows how accurate participants were when asked to make judgments about the number of words they thought they had typed to me in their messages. It can be seen that the perceived amount with a delay and no music was significantly greater than the actual amount typed. In contrast participants with no delay and no music perceived the amount of words they typed to be significantly less than the actual words typed. Participants were much more accurate when judging the amount of words they typed with music. In fact, participants with music and a delay perceived on average the amount of words they typed to be on average the same as the actual number of words they typed. With music and no delay participants perceived to have typed more than they actually did, but only marginally.
2.5 Overall Discussion of the Two Experiments

The results clearly show that more events were allowed to take place when participants received instant responses to messages regardless of whether they were listening to music or not. On average, participants got to ask twice as many questions, got three times as many answers from me and got twice as much of the crossword completed correctly.

As regards the first experiment conducted in silence, it was no surprise that participants with instant responses to messages perceived the duration of the experiment on average to be less than the actual duration and 6 minutes less than the average perceived duration of the participants with delayed answers. It is clear that significantly more events were allowed to take place with participants with instant responses. Again, as has been previously stated, this experiment shows that with more consciously attended events taking place participants perceive time as passing faster than those with fewer consciously attended events taking place.

As regards the second experiment conducted with music, the number of unconsciously attended events has increased for both sets of participants but participants with instant responses to messages having a greater number of events taking place overall as they have the maximum number of consciously attended events taking place as well. In the first experiment participants were wearing earplugs; thus, they were in silence while taking part in the experiment, the silence does not add any more events to the experiment. In the second experiment each of the 18 participants were listening to a piece of music while taking part in the experiment. The idea behind getting participants to listen to music was to increase the number of unconsciously attended events taking place in the time frame, whereby each note of the music would correspond to an event. Figure 7 and Figure 8 give evidence that it is unconscious, as the participants completion percentages and correct completion percentages of the crossword are almost the same with music and without music. It can be seen from the results of the second experiment that participants with delayed responses to answers only perceive the time frame as just one minute more than participants with instant responses but in comparison to the first experiment with delayed response and no music they perceive the time frame to be 5 minutes less. This shows that increasing the number of unconsciously attended events for participants with delayed responses decreases the amount of time they perceived the experiment to take. However, participants with instant responses to messages do not perceive time as passing any faster than in the first experiment with no music this shows that increasing the number of unconsciously attended events for them has no effect.
The results from these experiment show that one can manipulate human perception of duration by varying consciously attended and unconsciously attended events. These results correlate with the theory that time is dense i.e. it is more like the real numbers than integers as the number of events within a timeframe seems to alter peoples perception of the duration of the time frame. If time were discrete; then an increase in the experienced number of events would increase the perceived time, instead of decreasing it occurred in these experiments.

2.5.1 What Participants Thought was being Examined

The responses to the questions showed that participants were in fact unaware that I was testing their perception of time as no one guessed perception of time as an answer to the question “what do you think i was testing for?” I do believe though that if I had of constructed the experiment with only two questions i.e. “how long do you think the exercise lasted” and “what do you think I was testing for,” I would in fact have received perception of time or answers to do with time as answers to the final question of what I was testing for. Because of the inclusion of the dummy questions most people responded to the final question with answers related to memory retention. Figure 13 shows that only slightly more than half the participants guessed the longest and shortest words to be correct. As aforementioned, this is a difficult task. However, Figure 14 shows that participants when listening to music were on average, quite accurate in guessing the number of words they typed.

2.5.2 Problems encountered with the Experiments

A major problem with these sets of experiments assessing the human perception of time was the availability of suitable participants. I chose German as the second language for the experiment as I felt less people on average have French than have German, and, thus, that it would be easier to find participants without any knowledge of German. This did seem to hold true, as most people I asked didn’t have German past junior cert level, which was perfect for the experiment. However, in the first experiment I needed 18 participants which I didn’t think would be much of a problem, but, when I couldn’t tell participants how long the experiment was going to last, this posed a big problem as each participant requested this information when I asked them to take part. I had to tell them that I couldn’t release this information but that it wouldn’t take up too much of their time. Also, the fact that a participant could not take the experiment on the spot also stopped me from obtaining more participants. It was hard to get participants firstly
to come to the computer lab with me to take part in the experiment and secondly it was difficult once in the computer lab to find two free computers that would be suitable to set up the experiment on. It also took a bit of time to set up the messaging service as each time I wanted to use it I had to download it from the internet and adjust the settings for each individual participant. The messaging service needed to be downloaded each time a new participant took part in the experiment because it needed to be run on their college account so I could store a log of their answers on their computer. This log was distinct from my log as their log did not display a timestamp, whereas mine did. All in all, it took an average of 30 minutes for each individual experiment including the setting up of the experiment, reading and understanding of instructions, taking part in the crossword and then answering the questions about the crossword afterwards. The participants I got to take part were mostly friends of mine or else friends of friends who I contacted via email. I found it almost impossible to find a further willing set of 18 participants to take part in the 2nd experiment where music was used. If I were to test the perception of time again I would seek to devise an experiment that didn’t need the use of a computer terminal as I feel I would have got a lot more participants if they were not required to meet me in the computer room. However, one advantage of the computer mediation of the experiments was in automatically recording data and response times in electronic format.

2.6 Concluding remarks

This chapter began with a discussion of the role of language use influencing perceptual individuation of objects and events. Experiments were constructed to explore the relationship between quantities of events and accompanying perception of time. The next chapter returns to events and their complex internal structure, including causal relations, in assessing willingness to construe complex situations as individual events. This is pursued in the context of past empirical research and elaborated with follow-on experiments and analysis.
3 Perception of Events and Causation

3.1 Introduction

The role of this chapter is to review empirical research on the perception and individuation of events and causation as well as the linguistic coding of the same. The review is supplemented with presentation of my own experiments, and analysis of results, intended to shed light on the matter.

3.2 Linguistic Influences on Event Individuation

Wagner and Carey (2003) in their empirical paper entitled “Individuation of objects and events: a developmental study,” investigate how children and adults individuate objects and events linguistically. In everyday life we individuate objects and events as they state,

> the world provides us with an undifferentiated stream of experience, full of sounds and sights, surfaces and motions. Making sense of it requires (among other things) breaking that stream into individual units such as tables, dinners and events of eating. (pg. 164)

How people choose to divide the “undifferentiated stream of experience” lies at the heart of their work, whether people choose to do it spatio-temporally, or on the basis of transitional probability, or even on the basis of conceptually mediated kind or causal analysis. In terms of language, people must individuate these objects or events in a similar way so that they understand the concepts that each of us speak about, this means that language forces individuation criteria. Their experiments seek to find “under what circumstances are children and adults are guided by others’ linguistic descriptions to focus on one possible unit of experience over another?” (pg. 164). Objects are generally encoded with nouns and events with verbs (although exceptions to this generalisation abound). Because nominals encode number and verbs are marked for aspect, the choice of a linguistic label for an object or event focus attention to the relevant properties in individuation that correspond to the linguistic marking. In their first experiment children and adults were presented with pictures of objects broken into a number of pieces and asked to count the number of entities shown in the pictures with the use of the word “thing” or a with a specific label. They found that children preferred to individuate objects using spatio-temporal criteria i.e. “thing,” but in contrast adults preferred to individuate objects using a kind-based criteria i.e. a specific kind label. In the example given whereby two forks were each broken
into two pieces, they were each asked “how many X are here/ The X term was either an appropriate kind label description of the object or else the word “thing”” (pg. 170). Children counted 4 “things” and four “forks.” In contrast when the adults were asked to count the number of forks they gave two as their answer and when asked to count the number of things they strangely gave two as well. Also in experiment 1 children and adults were presented with a number of goal-oriented movie clips that they had to watch and then they had to count the number of events that took place with the movie when given a telic description and then an atelic description. In the case of events, linguistically “telic predicates specify the end-point of the event they describe and this end-point defines the criteria for individuation and numerical identity for that event” (pg. 166). In contrast to telic predicates, atelic predicates do not describe endpoints of events they simply describe an action or a process. For this example they were presented with a rabbit hopping twice and then into a hole and hopping twice again and into another hole. This meant that the rabbit moved (atelic) 6 times but hopped into the hole (telic) twice. When asked “how many times X? Let’s watch! The X term was an appropriate description of the event which targetted either the goal of the event or the temporally discrete processes” (pg. 170). When given an atelic description both children and adults used spatio-temporal counting criterion. When given a telic description some children still used a spatio-temporal counting criterion however most used goal-based. All adults used goal-based. Children this time were able to alter the number the events they counted given the linguistic description just like the adults although again they did prefer a spatio-temporal counting approach. Overall, the adults were just as insensitive to the linguistic description given as children in the object description but in the event description both children and adults were sensitive to the linguistic description given when asked to count, however, adults were more sensitive.

Experiment 2 sought to further test the hypothesis that regardless of the linguistic description given to children in which they are all allowed to count they still prefer to count spatio-temporally defined individual objects (pg. 177). The entities that children were asked to count took the form of split objects e.g. an object split into different parts, collection/object items e.g. “family” picks out a number of people as members of a family and part/noun object items e.g. “a bike” is made up of a number of parts. The experiment took the following form:

the collection/object items showed one, two or three collections (forests, piles) each consisting of from three to six basic level objects (trees, books). The part/object items consisted of
two or three objects from familiar basic level kinds (butterflies, bicycles), each of which also had easily nameable subparts (wings, wheels). (pg.176)

The children were asked to look at the various clip-art images and were then asked to count

“how many X are here?’ For the split items, the noun either labeled the basic level object kind (e.g. “car, pencil”) or . . was the general term “thing”, meant to label spatio-temporally separate objects. (pg. 178)

In the case of the collection/object items their answers could be a noun that labeled the collection or a label that identified the separate objects of the collection. For the part/object items their choice was between labels that identified the bounded objects or labels that identified parts of the objects. The results from the split objects experiment show just like experiment 1 did that children prefer to count spatio-temporally in contrast to the labels used by adults for counting. However the collection and part experiments show that children as well as adults were able to adjust what objects they counted by the linguistic descriptions given.

Overall these Experiments show that linguistic descriptions can affect the way children individuate events and objects. Here the spatio-temporal extent of the events and objects has been relatively straightforward. In the next section, events alone will be focussed on, but they will be considerably more complex internally.

In “Events and the ontology of individuals: verbs as a source of individuating nouns” by Barner, Wagner, and Snedeker (2005), they state that verbs typically express events but they are differences to be noted between verbs. Some verbs are punctual (i.e. iterative), for example, one could not hiccup all day without repeatedly doing so. In contrast some verbs are non-punctual (i.e. non-iterative), for example, one could stand all day without repeatedly standing. They address the fact that verbs can be nominalised and therefore events can be expressed as nouns. What is interesting is that the nominals retain the event structure of the underlying verb. This is explored indirectly by testing what “more” of X means where X is an abstract noun formed as a nominalisation of a corresponding verb. For example take X1 and X2: X1 came from an iterative verb, and “more” induced counting individual events; X2 came from a non-iterative verb and “more” induced focus on duration. This again shows the interplay between linguistic encoding and individuation of underlying events. Here the effect is of the nominal type on the meaning of “more”.
3.3 Spatio-Temporal and Causal Influences on Event Individuation

I review the article, “Direct causation in the linguistic coding and individuation of causal events” by Wolff (2003) and hope to explain why I have decided to test his no-intervening-cause hypothesis regarding the individuation of events.

3.3.1 No-Intervening-Cause Hypothesis

Philip Wolff, in his article, “Direct causation in the linguistic coding and individuation of causal events” puts forward the no-intervening-cause hypothesis which states that “a causal chain can be described by a single-clause sentence and construed as a single event if there are no intervening causers between the initial causer and the final causee” (pg. 1). His theory is based on causation and the individuation of events. With direct causation he believes that individuals will be able to describe a causal chain with a single clause sentence and therefore construe it as one event. Whereas, with indirect causation he believes that individuals will describe a causal chain with a multi-clause sentence and therefore construe it as more than one event.

3.3.2 Direct Causation

He defines direct causation as being

. . .present between the causer and the final causee in a causal chain

1. if there are no intermediate entities at the same level of granularity as either the initial causer or final causee, or

2. if any intermediate entities that are present can be construed as an enabling condition rather than an intervening causer (pg. 4)

He gives an example of a direct causation by stating that “if a father were to sit his preschool child up in a chair, the causation would be direct since there is no intermediary between the father and the child, let alone one that could be construed as an intervening cause” (pg. 5).

3.3.3 Enabling Cause

He sheds further light on what exactly defines an enabling condition and it would be
3 PERCEPTION OF EVENTS AND CAUSATION

...an entity that enables a cause... an intermediary will be construed as an enabling condition if the backwards link from the intermediary to the causer instantiates an enabling relationship as defined in terms of force dynamics. (pg. 6)

This means that the intermediary does something that is the intention of the causer as Wolff further states “when the causer intends a result, an intermediary can be viewed not only as causing a result to the causee, but also as enabling the causer to produce the result (pg. 6).” His example of an enabling cause is:

Consider a mediated chain in which a woman with her arms full leans against a button that activates a door, the door opens, and she walks through. The button simultaneously causes the door to open and enables the woman to achieve her goal of getting through the door. (pg. 6)

3.3.4 Indirect Cause

When an intermediary cannot be interpreted as an enabling condition then Wolff believes the causal chain is indirect and cannot be described sensibly with a single clause sentence and the causal chain should therefore not be viewed as a single event. In contrast to section 3.3.2 an example of an indirect cause would be: “if a father were to tell his child to sit up, the causation would be indirect since the causee, the child, would also be acting as an intervening cause” (pg. 5).

3.3.5 Cause V’s Enable

In order to fully understand the no-intervening-cause hypothesis one must fully understand the semantic difference between cause and enable. I will make use of the examples given by Wolff to explain the difference. It is idomatic to say “the explosion caused the windows to shatter”; however, it wouldn’t be idomatic to say, “The explosion enabled the windows to shatter.” It is idomatic to say, “Gasoline enables cars to run” but again it wouldn’t seem correct if someone said, “Gasoline causes cars to run.” The no-intervening-cause hypothesis makes forecasts of how causal chains can be coded in English. Direct causation has been used to explain the semantic difference between lexical (single-clause) and periphrastic (multi-clause) causatives with researchers believing that lexical causatives can only be used when causation can be defined as direct. In the experiments in section 4.8 I will explore a few possible additional interpretations of “periphrastic” — total word counts and verb counts and coordinated clause counts.
3.3.6 Mediated Chains V’s Unmediated Chains

In reference to mediated and unmediated causal chains, the no-intervening-cause hypothesis predicts that people will use lexical causatives to describe unmediated chains but not when describing mediating chains as the intermediary is not an enabling condition.

3.3.7 Wolff: Direct causes inspire shorter descriptions

The hypothesis is “people will be more willing to say that a single event occurred between entities in the chain that make physical contact then between entities that do not make [direct] physical contact” (pg. 15). Wolff adds further light to this prediction as events are sometimes individuated by change together with changes in position. Wolff asked his participants whether the scenes depicted were described best by a lexical causative e.g. “the red marble moved the blue marble” or by a periphrastic causative e.g. “the red marble caused the blue marble to move” or neither. Half of the sentences mentioned unmediated chains whereby the marbles were referred to by their colour and the fact that the marbles made direct physical contact and the other half named mediated chains where the marbles did not make physical contact.

After participants chose the lexical or periphrastic sentence they thought best described the chain they were then asked to say the number of events that occurred between the two marbles referred to each pair of sentences. Although a version of this is replicated within my study this is a very artificial task to impose on people. People are asked to self count yet to an artificial count. Asking people to count means that people will find things to count and one does not know what granularity people are using to count. My experiment gets people to choose one of 3 descriptions and it is from the description that I construe the number of events participants counted, anaphora in the description tells me if the antecedent is singular or plural. As regards Wolff’s method of getting people to choose between a lexical and periphrastic description, I again feel this is artificial in the sense that Wolff explicitly uses the verb “cause” which I feel affects peoples linguistic judgements in identifying causation. ⁴

The experiment included 8 mediated chains and 8 unmediated chains. Wolff’s results coincided with the predictions of the no-intervening-cause hypothesis as participants preferred lexical causatives for unmediated chains more frequently than for mediated chains. Just as the linguistic descriptions

⁴Perhaps the result discussed in Section 3.2 suggests this concern is too great: recall that asked about two forks broken in half, adults saw both two “forks” and two “things”.

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were in line with the predictions of the no-intervening-cause hypothesis so too were the event judgements as participants seemed to prefer to say a single event occurred with unmediated chains than mediated chains.

3.3.8 Wolff: Not all causal chains are causally alike

Wolff’s first experiment directly tested direct and indirect causation through the use of unmediated chains and mediated chains. There are two types of mediated chains. In one sort, an intermediate link is an enabling condition, in the other it is not enabling. The difference was described in Section 3.3.3 and Section 3.3.5. In order to ensure that a mediated chain would be construed as direct, Wolff introduces the notion of sentience as it implies intention and therefore carries out the wishes of the initial causer making the intermediary an enabling condition through aiding the wishes of the initial causer. The background intuition is that human perception of causation is mediated by perception of intention. It must be noted here that intention is a subset of enablement\(^5\). Wolff then proceeds to test the effect of varying the sentience of the initial causer to further test the no-intervening-cause hypothesis and to see if sentience alters people’s description of the causal chains and how they individuate the events within the chains. While intention entails sentience, sentience does not entail intention, but it should increase people’s construal of sentient causal chains as being intended. Wolff manipulates intention so to make the enabling conditions more obvious.

The experiment consisted of half the marble examples from experiment 1 and the other half were also of marbles except contained a sentient causer; i.e., instead of the first marble, the marble was flicked by a hand and body animation. The hand is the sentience hoped to suggest intention. Just like in the first experiment, participants were asked to choose between pairs of lexical and periphrastic sentences the one they thought best described each animation and subsequently like before write down how many events occurred between the initial causer and one of the marbles. Again, Wolff’s results coincided with the predictions of the no-intervening-cause hypothesis, whereby participants were more willing to describe unmediated chains with lexical causatives than mediated chains, and in the case of mediated chains sentence did have an effect where mediated chains with sentient causers were more willingly described by participants with lexical causatives than periphrastic causatives, and in contrast participants preferred periphrastic causatives to describe mediated chains with non-sentient causers. Just as the linguistic descriptions again followed the predictions of the hypothesis so

\(^5\)Gasoline in the tank enables the car to operate or explode, but there is no necessary intention involved
too did the event judgements, with the chains that were described by lexical causatives more often described as one event than those with periphrastic causatives. Unmediated chains were more willingly described as one event than mediated chains; however, sentient mediated chains were more willingly described as one event than non-sentient causal chains. Thus, there is a continuum by which complex relations among events including causal relations and intermediate links exhibit ease of individuations larger single events: direct causes which involve an initiation and outcome are at one extreme; multiple events with clear causal chains are at another extreme; causal with enabling intermediate links are in the middle. In analysing these results and extending them with my work I address additional event complexes: those with only arbitrary links among them although they are all of the same sort and very distally linked (e.g. weekend sports results; the distal link is that we chose sports in which teams play only one match per weekend) and those of heterogenous types, but which jointly define a larger event e.g.: a war or a wedding.

Wolff admits after this second experiment that his results although agreeing with the no-intervening-cause hypothesis are not substantial enough as they are limited to a small set of given events and verbs. He decides to further test that direct causation is construed when intermediaries in chains are in fact enabling conditions with respect to the intention of the causer. In contrast, my experiments do not depend on intention like Wolff’s.

3.3.9 Wolff: Obtaining labels for intermediaries

In experiment 3 participants are given 3 tasks. Participants were presented with 12 pairs of animations, and they firstly they were asked to choose from a pair of sentences which described the animation best — a lexical causative description or a periphrastic causative description. The second task presented to participants was the event judgement task in which they were asked to provide a “yes” or “no” answer to whether each animation portrayed a single event. The final task was to judge the causer-intermediary relationship. Firstly, a forward relationship judgement was requested whereby participants were specifically asked whether the initial causer caused the intermediary to produce the result or whether the initial causer enabled the intermediary to produce the result by answering either “yes” or “no” to each of these questions. Then participants were asked to make a backwards relationship judgement whereby participants were asked whether the intermediary caused the initial causer to produce the result or whether the intermediary enabled the initial causer to produce the result by answering either “yes” or “no” to this set of questions. These four questions were asked for each of the 12 pairs
of animations. Here, Wolff specifically asked participants to choose between “cause” or “enable”, so participants have no choice in producing descriptions, they are only selecting.\(^6\)

Again the results coincided with the predictions of the no-intervening-cause hypothesis. Participants were more willing to use lexical causatives to describe mediated chains when the chains were intended in contrast to those chains that were unintended again participants were more willing to say a single event occurred for intended chains than unintended chains and participants were more willing to construe an intermediary as an enabling condition for intended chains rather than unintended chains. People were more likely to view the intermediary as a causer in the unintended chains meaning they saw these chains as indirect as implied by participants preference of periphrastic causative descriptions for them and the preference for saying more than 1 event occurred within the chain. However intended causal chains are not always direct. Wolff states “while intention may often allow an intermediary to be viewed as an enabler, it doesn’t guarantee that it will, and unless the intermediary is viewed as an enabler, a single-clause descrip of the situation will be unavailable” (pg. 28). As with the previous experiments Wolff questions whether his results from experiment 3 about enablement are attached to the use of the verb enable itself. In order to capture the general notion of enablement Wolff decides to rerun the experiment with the verb “allow,” as (Goldvarg & Johnson-Laird, 2001) use allow to capture the general notion of enablement. Wolff hoped this fourth experiment will prove that his results are based on a wider notion of enablement in terms of force dynamics rather than just on the verb enable.

3.3.10 Wolff: “Allowing” is “Enabling”

Experiment 3 was rerun replacing the verb enable with the verb “allow” rather than “enable”. So participants were asked whether the initial causer caused the intermediary to produce the results or whether the initial causer allowed the intermediary to cause the results. Also, participants were asked if the intermediary caused the initial causer to produce the result or whether the intermediary allowed the initial causer to produce the result. Again Wolff’s results coincide with the predictions of the no-intervening-cause hypothesis as participants are more willing to describe intermediaries as enabling conditions using the verb allow when the causal chains were intended rather than unintended. The intermediary of “allow”, in the intended animations, was

\(^6\)His results can be compared with mine in Section 4.8 were I ask participants to construct there own description of events without simply asking them to select a description.
preferred by participants as a linguistic description of relationship between the initial causer producing the final result.

### 3.4 Conclusion

Wolff deals with direct causation, sentience, enabling and non-enabling intermediaries and thus indirect causation. His no-intervening-cause-hypothesis is that “a causal chain can be described by a single-clause sentence and construed as a single event if there are no intervening causers between the initial causer and final causee.” His hypothesis has been the motivation for my next experiment. I intend to retest some of the positive aspects of his paper namely direct causation, enabling causation and non-enabling causation however, I intend to do this by modifying the description length of sentences and the number of events to one anaphorically referenced sentence, see Section 4.2. In his first two experiments, regarding linguistic description participants were only presented with a choice between a lexical causative description and a periphrastic causative description and they were asked to give the number of events that they thought had taken place. In experiments 3 and 4 Wolff alters his questions slightly, 3 questions are asked instead of two. The first question is the same, asking participants to choose between a lexical causative description and a periphrastic causative description, the second question asks participants to make judgments on the intermediaries whether they caused or enabled or in the case of experiment 4 whether they caused or allowed the result, and the third question in both experiments 3 and 4 gets participants to say whether a single event occurred by answering simply “yes” or “no”. I intend to provide participants with 3 linguistic descriptions of events from which they must choose one. It will be from their choice of description how I will construe the number of events they see as taking place see, I will do this through the anaphoric reference of the composed descriptions see Section 4.2 for more information on this. In the second experiment I will asked participants to construe their own description for the events which is an arguably more complex task than simply choosing between a lexical or periphrastic causative description. In the third experiment I will mirror Wolff’s question were he specifically asks participants how many events are taking place, I hope through my results to show that this is a question that can have an arbitrary number of answers.
4 Individuation of Events Experiment

4.1 Introduction

I wanted to test the no-intervening-cause hypothesis put forward by Wolff as described in Section 3.3.1 to see if direct causal chains and causal chains with enabling conditions are described by single-clause sentences and construed as single events by individuals and also if individuals are more willing to describe indirect causal chains by multi-clause sentences and construe than as more than one event. My method retains certain aspects of the original experiment but significantly modifies others. In particular, these are highlighted as I describe the design and explain its predictions relative to Wolff’s hypothesis in the next sections.

4.2 Design of Experiment

Wolff focuses on 3 types of events in his empirical paper:

1. an event with a direct cause,
2. an event with an enabling cause and
3. an event with a non-enabling cause.

In order to test his hypothesis I will need to include these three types of events. I decided the best way to test his hypothesis, that “a causal chain can be described by a single-clause sentence and construed as a single event if there are no intervening causers between the intial causer and final causee” (pg. 1), would be to compose three passages that linguistically describe these three types of events. Thus events are presented entirely linguistically rather than through static pictures. The presented events are intended to be readily easy to imagine for adult native English speakers. They are detailed individually below in sections 4.2.1, 4.2.2, 4.2.3, 4.2.4 and 4.2.5. Constructing complexes of events that seem natural, and describing them in tasks balanced for length is a nontrivial task. I also thought that it would be interesting to include two further types of events that Wolff does not deal with in his paper and these are:

1. a definitional event and
2. an arbitrary event.

A definitional event is an event with defined related sub events such as a wedding which includes the exchanging of vows and rings, pronouncements
of weddedness, witnessing etc. They necessarily involve a heterogeneous collection of events standing in a range of intentional relations and jointly defining the larger event. We see these as distinct from but akin to events with enabling links. If they are identical, so should be responses to them. An arbitrary event is one that possesses a set of unrelated sub events, such as a list of match scores. An arbitrary event like a definitional one is a collection of effective unrelated events (even if likenesses can be found between them) but it is distinct in not having a natural super-event. Put differently, a definitional event is more than the sum of its parts, and an arbitrary event, if it can be constructed is just the sum of its parts. An arbitrary event is included because accidental correlations and these have been conspicuously absent from Wolff’s discussion.

I decided that his hypothesis would be best tested by providing participants with these passages about the events and then asking them to choose a headline from a list of three given that best describes the passage i.e. unconsciously through choosing a headline that best describes the passage they are choosing a headline that best describes that particular type of event. I decided to provide participants with three types of headlines to describe each passage i.e. each type of event. The three headlines were designed very carefully making sure that each of them represented a different construal of the event. The three headlines I decided would be best designed to the specification of being:

1. A singular whole headline. This is a headline that describes the passage anaphorically as being composed of a single event, and we interpret a persons selecting it as having thought the description best described with anaphoric reference involving linguistic marking of a singular.

2. A singular part headline. This is a description that picks out a particular event from the passage, and I decided it would be best to pick out the last event of the passage to include as the singular part headline. Through anaphoric reference the linguistic coding of the final event and its subsequent choice by participants to describe the given passage means that they see more than one event taking place in the passage if they are able to pick out the final event, in this way the choosing of a singular part headline is more like the choosing of a plural headline than an actual singular headline. The reason for 1 and 2 is that in many cases, choice of a singular pronoun is ambiguous between the entirety of the event and a singular part. I attempted to allow either sort of reference, but to force a singular part to be the last part described, not simply depending on recency effects to make it the most salient part,
should a participant prefer a singular. This will become clear with the examples below.

3. A plural headline. This sort of description gives plural marking to its anaphor.

See sections 4.2.1, 4.2.2, 4.2.3, 4.2.4 and 4.2.5 for examples of each type of these headlines used to describe events in the experiment.

Through the anaphoric design of the three headlines, participants, by choosing a headline for each passage will be indirectly providing me with details on how they individuate the events in the passages. It is important that the choice of description includes linguistic encoding of the event count, not direct counting of events (which could introduce arbitrarily many events the longer people think about a passage). A also include average reaction time analysis for participants choice of headline per passage. I also include a reaction time analysis of participant’s choice of headline, see Section 4.5, this is something which Wolff does not include.

As earlier stated, if they choose a singular whole headline for the passage they see that passage as comprising a single event. If they choose a singular part headline they see that passage as comprising of more than one event and likewise if they choose a plural headline they see the passage as comprising of more than one event.

I feel the design of my experiment is better than the design of Wolff’s as previously referred to in Section 3.4 he asks participants to count the number of events taking place (experiments 1 and 2) and then specifically asks his participants is this a single event with the only options as answers being “yes” or “no” (experiments 3 and 4). The way in which my experiment has been designed allows participants to subconsciously individuate the passages in terms of events. It means that participants, when choosing the headline they think best describes the passage, are letting me know how they individuate the passage in terms of events, through anaphoric reference.

In the design of this experiment firstly I decided to compose the each of the 5 passages denoting each of the 5 different types of events in turn and after the composition of each passage I decided to compose the three suitable headlines. It was decided that each of the five passage should be of the same length, each being 57 words long. There was no real reason for this number except that it was simply the number of words in the first constructed passage that could be easily achieved in the other passages as well. I did not, however, balance the length of each of the headline choices.
4.2.1 Event with a Direct Cause

I started with the event with a direct cause. I decided upon the event of a mother awaking her son. There are no intermediaries in this event and certainly not any that could be construed as an intervening cause. In this example the mother is the causer and the son is the causee. The direct cause of the event is the mother (the causer) awaking the causee (her son).

John’s mother knew that on the morning of John’s 7am flight to London for a very important job interview, he would sleep through his alarm which was set early to awaken him at 4a.m. It was for this reason that she took it upon herself at 4.30 a.m. to enter his room and to shake him awake.

Next came the task of designing three headlines, one of type singular part, one of type singular whole and one of type plural, that each could adequately be used to described the event.

The headlines to choose from were as follows:

1. John was shaken awake.
2. John’s mother awoke him in time for his flight.
3. They each tried in their own way to get John up in time.

For the singular whole the anaphoric referent used was “it” and for the plural headline the anaphoric referent used was “they”. For the singular part the last event of the chain was always chosen. For the singular part headline for this event I chose “John was shaken awake” as this clearly refers to the last event in the chain. For the singular whole I chose “John’s mother awoke him in time for his flight” as this linguistically clearly encodes the whole event of John’s mothers awakening him as a single event. For the plural headline I decided upon “They each tried in their own way to get John up in time” as the ‘they’ here refers to more than one event, and in this example it would be the alarm clock and John’s mother.

4.2.2 Event with an Enabling Cause

In designing a passage about an event with an enabling cause I made sure that the intermediary was seen to be an enabler and not a further cause. For this event I choose the example of someone going to the shop and purchasing a lottery ticket and then winning the lottery. The lottery ticket did not cause the individual to win the lottery instead it enabled them to win it: winning
the lottery entails obtaining a ticket. The intention when purchasing the lottery ticket was to win the lottery. However, the intention is an ineffectual one since if, separate from obtaining a ticket, has no role in producing the result — one doesn’t win the lottery because one intends to. Therefore, it can be clearly seen that the purchasing of the lottery ticket was an enabling cause for the winning of the lottery.

John Hagan decided to go to the local shop last night for apples, bread and milk. While there he chose six numbers and purchased a lottery ticket naming those six numbers. He went home in the evening and watched the lottery draw on TV. His six numbers came up and John won the 6 million euro jackpot.

The headlines to choose from were as follows:

1. John won the jackpot.
2. John’s shopping trip made him rich.
3. They were lucky decisions.

When choosing the three suitable headlines for the singular part I decided upon “John won the jackpot.” This headline clearly identifies the last event in the chain. For the singular whole I decided upon “John’s shopping trip made him rich” as this clearly defines the entire event with an anaphoric singular referent. For the plural headline I decided upon “They were lucky decisions” as this clearly defines the entire event with an anaphoric plural reference i.e. his going to the shop, his decision of the numbers, his purchase of the lottery ticket and the numbers coming out as the winning numbers.

4.2.3 Event with a Non-Enabling Cause

In designing a passage about an event with a non-enabling cause I needed to ensure that the intermediary in the chain of events would be construed as a cause and not an enabler. Here it proved easiest to work from Wolff’s marbles example. I decided to take the example of two teams playing a football match, a penalty being awarded and the ball being deflected from the goal and subsequently smashing the window of the penalty taking’s team van.

7The plot device of *The Producers* in which the intention is to produce a flop but what actually happens is a hit; this is like wanting to purchase a losing lottery ticket. More realistically, arguably, insurance policies are also ‘lottery tickets’ that people purchase, intending to ‘lose’ by failing to have conditions for payout.
Howth and Raheny played a match last night. Raheny were awarded a penalty in the dying minutes of the game. Raheny took the penalty, but Howth’s goalie made a great save to a hard kick, deflecting the ball out of the goal. Unfortunately, the ball still carried great momentum and smashed the window of Raheny’s team van.

In this event, the intermediary is the ball deflected from they goal by the goalie and the result being the smashed window of the van. It is clear that the deflected ball caused the window of the team van to smash, but it would sound strangely odd to say the deflected ball enabled the window of the team van to smash. It was not the intention of the penalty taker to smash the window of his own team’s van; surely his intention would have been to score a goal. The goalie deflecting the ball intended to deflect the ball out of the net, but it couldn’t have been his intention to smash the window of a van. Moreover, for the window to be smashed does not entail that a deflection of a ball should happen. This is therefore an example of an event with a non-enabling cause.

The headlines to choose from were as follows:

1. The ball smashed the window of Raheny’s van.
2. The football match broke the window of Raheny’s van.
3. Raheny had some misfortunes.

In choosing suitable headlines I decided upon for the singular part “The ball smashed the window of Raheny’s van” as this clearly refers to the last event in the chain of events. For the singular whole, I chose: “The football match broke the window of Raheny’s van” as this clearly refers to the entire event with singular anaphoric reference through the use of the definite NP, “the football match.” For the plural headline I chose “Raheny had some misfortunes” as this clearly refers to the whole event in a plural way with the use of “misfortunes”. The “misfortunes” refers to the misfortune of losing the penalty and having the window of their team van smashed as well.

4.2.4 Definitional Event

Now, I had to design the events that Wolff did not deal with in his investigation and the first one I am going to describe is that of the definitional event. In my opinion a definitional event refers to an event that can be clearly defined by certain sets of sub events, but in which people would be rather
disinclined to say causal relationships exist among the subevents. For this example I decided upon the defined event of a football championship. The sub events being the particular matches that are played in a championship i.e. the first rounds, second rounds, quarter finals, semi-finals which then lead to an overall final with an overall winning team claiming the championship cup. I chose the example of the Sigerson Cup as it is the biggest college football competition in Ireland.

The Sigerson Cup games began as usual on the first weekend in February and the finals were played as usual on the last weekend in February. Jordanstown lost to Queens in the first semi-final while DCU hammered Cork in the other semi-final. The final was played on the Saturday and DCU beat Queens by a single point.

In my definition I included the fact that certain games were held at the beginning of February (typically the first set of rounds) then the semi-finals and finals being played over the last weekend in February with the crowing of the overall college team as winners after that weekend.

The headlines to choose from were as follows:

1. The Sigerson Cup winners were victorious by a single point.
2. The Sigerson Cup lasted a month.
3. The Sigerson Cup matches happened according to schedule.

My choice of singular part headline for this event was “The Sigerson Cup winners were victorious by a single point” the reason being the same reason for each of the other events in that this clearly refers to the last event mentioned in the passage. In this and the following section, vast differences in outcomes of this sort were used to help discriminate the final event from preceding ones. I chose “The Sigerson Cup lasted a month” for the singular whole headline as it refers to the whole event of the Sigerson Cup in a singular way. For the plural headline I chose “The Sigerson Cup matches happened according to schedule” as the referent here is clearly plural “Sigerson Cup matches” and refers to the entire championship in a plural way.

4.2.5 Arbitrary Event

The final type of event to describe is that of an arbitrary event, and as in the case of the definitional event, this type of event has not been dealt with
by Wolff. Because it is an instance of accidental correlation (at best) it seems essential to any treatment of cause. Lewis (1993), for example wrote, “nowadays we try to distinguish the regularities that count — the ‘causal laws’ — from mere accidental regularities of succession” (pg. 193). I define an arbitrary event to be an event that consists of a set of events that are unrelated. The example I have chosen is that of a list of football scores. Unlike in the definitional event the sub events here have no effect on the other events. In the definitional event the winners of the semi-final go on to play in the final and have a chance of winning the cup but the losing semi-finalists do not have a chance to play in the final and win the cup. However, the results at any one level in the tournament hierarchy are independent. The result of each sub event determines who will take part in the next event. In the case of a list of football scores the score of one match has no effect on the score in another match.

Sunday’s Bank Of Ireland Football Championship Results Tyrone 1:14 destroyed Armagh 1:04; Derry 1:09 hammered Down 0:02; Cork 0:16 squashed Kerry 0:06; Mayo 0:14 slaughtered Galway 1:01; Meath 0:11 overwhelmed Dublin 0:01; Offaly 0:12 thrashed Roscommon 0:02; Sligo 1:17 outclassed Leitrim 1:07; Longford 0:16 trounced Westmeath 0:06; Wexford 1.15 surpassed Louth 1:05; Laois 1:11 beat Kildare 1:10.

The design of this passage is a list of championship scores, all of the games bar the last one, have been won or lost (depending which team you are for) by 10 points with the last game being won or lost by a single point. The reasoning behind this was so when designing a suitable headline for singular part the last event could be clearly distinguished from the others. The headlines to choose from were as follows:

1. It was a close call.
2. It was a day of clear victory.
3. There were clear victories.

The singular part headline was thus chosen as “It was a close call” as the scores in the last game were very close, only a point separated the teams unlike 10 points in all the other matches. The headline I chose for singular whole was “It was a day of clear victory” as this defines the whole set of scores of a single event through the anaphoric referent “it”. With the accidental correlation that most of the victories were overwhelming. Finally the plural headline I decided upon was “There were clear victories” referring to the scores as a set of numerous events.
4.3 Set-up of experiment

The experiment was set up online using the online experimenter tool developed by Graham (2006) and instructions on its use can be found in Buckley and Vogel (2003). To see how the experiment was set up see Appendix A.5. The experiment was given a name, then a description, then a username and password had to be composed so that participants would be able to access the experiment, but in a way that allowed me to control access. The next step was to design an instructions page for the participants so they would know what the experiment was about and what they were required to do for the instructions I included the following:

You are asked to read the stories presented to you, and then choose from the list of statements provided in a list, the particular statement that most accurately describes the story.

An example might be: A post-earthquake tsunami washed away the island of Maui early yesterday morning. It is the second catastrophic seismic event in the Pacific in as many years. Thousands are presumed dead.

1. Earthquake causes Pacific destruction.
2. Waves kill many.
3. Thousands drowned by tsunami.

There is no ‘correct’ answer. Choose what you find most appropriate.

(1) is a singular whole headline as it clearly refers to the whole (event, both the washing away of the island and the killing of people, anaphorically in a singular way through the use of “earthquake” as a singular referent. (2) is a plural headline as it refers to the whole event through the plural anaphoric referent “waves”. (3) is a singular part headline as it clearly refers to the last event in the chain.

Once the participants click on “continue” they will begin the experiment. The 5 passages were then typed into the experimenter system with the 3 composed headlines for each. The experimenter tool allows participants to work through the experiment at their own pace. Once they have finished the experiment they will be asked to submit their answers. The experimenter tool allows the randomisation of sections and of answers and I made use of these features so that the passages would be presented in a randomised order and the corresponding headlines in a randomised order. I feel that it is extremely important that the headlines are presented in a randomised order because if
the same pattern was followed for each of the passages then participants may start to realise that for each passage the same 3 types of headlines appear. Another useful feature of the experimenter tool is that it records response times and I will make use of this feature to calculate how long on average it took participants to choose a headline for each of the passages, see Section 4.5.

4.4 Predictions

I am going to make my predictions according to Wolff’s no-intervening-cause hypothesis which states that “a causal chain can be described by a single-clause sentence and construed as a single event if there are no intervening causers between the initial causer and the final cause”. With reference to relative cardinality he comments on his results stating

Participants used single-clause sentences (lexical causatives) more often than two-clause sentences (e.g. periphrastic causatives) for causal chains in which (1) the causer and the causee touched (Experiments 1 and 2), and (2) an intervening entity could be construed as an enabling condition rather than another cause (Experiments 2-4). In addition, event judgements paralleled linguistic descriptions: chains that could be described with single-clause expressions were more often construed as single events than chains that could not (Experiments 1-3). (pg. 1)

This means that Wolff expects that people would be more likely to say a single event occurred when that event has a direct cause or when it has an enabling cause however he believes that when an event has a non-enabling cause people will construe it as being composed of more than one event.

The choosing of a singular whole headline to describe a passage will be concurrent with construing that passage of consisting of one event due to the design of the singular whole headline with the use of the anaphoric singular “it” referent. The participants thus see this passage as composing of a single event. In contrast, the choosing of a singular part headline is consistent with seeing a passage as comprising of more than one event as they construe the final event in the chain as being the most important event in the passage. If they are able to identify the final event in the chain they obviously see more than one event as taking place in the entire passage. The choosing of a plural headline, just like the choosing of a singular part headline, coincides with the participant’s construal of the passage as consisting of more than one event.
This Figure 15 shows how Wolff would predict the events to be construed in absolute terms. Noting that Wolff presents his empirical predictions in less absolute terms referring to a greater propensity to single clause descriptions for direct causal relations than to multiple clause descriptions we can fabricate an alternative data set consistent with Wolff’s position interpreted against my experiment I designed in which the relative frequencies of headline type selection for the corresponding scenarios is as in Figure 16.
Figure 16: Wolff’s Predicted Distribution of Event Construals in Cardinal Terms

Taking the scenarios as labels for the cardinality of judgements made in a particular category of question. It is possible to symbolise the relation among the scenarios as follows:

\[ \text{Dir} < \text{E} \leq \text{Def} < \text{NE} \leq \text{A} \]

where Dir is the direct cause scenario (the passage about John’s awakening) and E is the enabling cause scenario (the passage about John winning the lottery) and Def is the Definitional cause scenario (the passage about the Sigerson Cup) and NE is the Non-Enabling cause scenario (the passage about Howth and Raheny football game) and A is the Arbitrary cause scenario (the passage about the list of football scores). These relationships are shown in Figure 16.
4.5 Results and Discussion

Twenty-one people participated in the experiment. The graph in Figure 17 demonstrates the pattern of results with one column per scenario just as depicted above for the results that it is reasonable for Wolff to predict from my experimental design. The raw numbers are summarised in the table below.

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Singular Part</th>
<th>Singular Whole</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Cause</td>
<td>13</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Enabling</td>
<td>15</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Non-Enabling</td>
<td>13</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Definitional</td>
<td>14</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Arbitrary</td>
<td>1</td>
<td>8</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 1: Absolute number of responses to each category

Relative to the predictions there are surprisingly few singular whole responses for the direct cause scenario. Singular anaphora had the majority reply but it was indicated above that this necessarily focuses on only a part
of the scenario thus emphasising its non-unitary structure. For the enabling cause scenario there were more plural and singular part replies than singular whole, over four times the amount, again contrary to prediction. For the non-enabling cause scenario only one person described it with the singular whole headline just as for the direct cause scenario however, in this case Wolff would have predicted no such labelling. So, his prediction is borne out for the more complex mediating situation but not for the simpler direct cause. The definitional scenario for which I project his prediction again as entirely non-unitary, indeed only two participants labelled the scenario with a headline employing anaphora to the event as a whole. I would predict that Wolff would feel the same way about the arbitrary event situation. However, it was this scenario which received the greatest number of responses labelling it with the headline referring to a singular event as a whole.

Overall, it can be seen that a singular part headline is the most common response for all types of events except for arbitrary. It would have been predicted that an arbitrary event would be construed as a plural event and it has the greatest plural headline response although it does also have the greatest singular whole response. In contrast, it would not have been predicted that both an event with a direct cause and enabling intermediary would be construed by participants to have more than one event taking place. It would have been predicted that a non-enabling event would have more than one event taking place.
Figure 18: Distribution of Event Construals with singular part added in with plural event construals

This graph adds the count of choices of the singular part headline in with the choices of the plural headline. “Singular” in the legend of the Figure refers solely to the singular whole response count. It can be clearly seen from this graph that most events were seen to have been comprised of more than one event. What is most interesting is that both a direct causal event and an event with a non-enabling intermediary follow the same pattern, which is totally the opposite of what would have been predicted.
Wolff did not report on response times for his own experiment, if he did measure them. But given his general inclination to take direct cause scenarios as involving the least number of events, the simplest clause structures, etc., and causal chains with enablers between direct causes and causal chains with non-enabling intermediaries, it is safe to assume that he would make the same predictions about response times in reference to my experimental design. Figure 19 shows the actual results. It took participants longer to choose a headline for a non-enabling event as regards both an enabling event and a direct event but what is surprising is that it took longer to choose a headline for a direct event than an enabling event. The greater response time for definitional events than arbitrary ones is at first surprising, given the similarity in structure to enabling cause events, however this may be explained by the fact that the definitional scenario includes reflection on whether the definition is satisfied.
4.6 Discussion

It is clear from Figure 18 that the most popular answer for a passage with a direct cause is a singular part headline followed by a plural headline. These results show that participants see this passage as containing more than a single event. The overwhelming choice of a singular part headline shows that participants are singling out the last event whereby John’s mother shook him awake. A significant number of participants thought the plural headline best described the passage; these participants saw the alarm clock and the mother trying to wake John as two events. Wolff would have predicted a singular whole headline.

With the passage describing an enabling event the majority of participants chose the singular part headline, again most participants identified the last event in the chain as being the most important. These results differ from those of the direct cause in that in this case more participants chose a singular whole headline over a plural headline. Again Wolff would have predicted that the majority of participants would have chosen a singular whole headline.

The results for the non-enabling cause event have exactly the same results as those for a direct cause event which Wolff would find highly surprising. The majority of participants preferred the singular part headline, followed by the plural headline meaning they construed this passage as comprising of more than one event. This is what Wolff would have predicted for this type of event but he would not have predicted that these results would match those obtained for a direct cause event.

As regards the definitional event the singular part headline was again the most popular answer followed again by the plural headline indicating that participants saw the definitional event as comprised of more than a single event. Although a definitional event consists of a number of events, they are related and the choice of a singular part headline shows that people did see the relation among the events.

The results for the arbitrary event differ significantly from the results for all the other events. Overall it appears that participants preferred the plural headline as a description of this passage followed by a singular whole description. These results indicate that the majority of participants saw this type of event as comprising of more than one event. This would have been expected as an arbitrary event consists of a number of sub events however unlike the sub events contained within a definitional event, the sub events here are not related that is why I would have expected a plural headline rather than a singular part headline even though both denote the construal of the event as more than one event the choosing of a singular part indicates that the events
would be related whereas the choosing of a plural means that overall the participant does not view the events as related. One thing that is surprising from these results is the fact that quite a significant number of participants choose the singular whole event means that this set of participants saw this passage of comprising of a single event.

The response times results are interesting as they show that it took people longer to choose a headline for a Direct event than an Enabling Event. It would have been expected that it would take people the least time to respond with an answer to the direct event as it contains no intermediaries. The fact that it took people longer to choose a headline for a non-enabling event than for both a direct and enabling event is not surprising because of the non-enabling intermediary in this event.

4.7 Conclusion

Clearly, my results do not support Wolff’s no-intervening-cause hypothesis. However, I do not feel that I have adequately tested his hypothesis yet in order to make a disagreement about its validity. It is for this reason that I have decided to test his hypothesis further by checking if participants choose to describe events with a direct cause and events with an enabling cause with single-clause sentences and subsequently whether they choose to describe events with a non-enabling cause with a multi-clause sentence as predicted by Wolff. This is tested in an additional experiment in which participants (not among the participants in any of the prior experiments) were asked to produce their own descriptions. These phrases are analysed in terms of: the number of words, the number of NP-only descriptions, the number of verbs in the descriptions and the number of clauses in the description, along with time-responses of how long it took participants to construct the descriptions for each passage.
4.8 Second Event Experiment

4.8.1 Introduction

I want to ask participants to construe their own headline for each of 5 passages to see whether they prefer lexical headlines for direct and enabling events and periphrastic headlines for non-enabling event. Also, I wanted to see, if they preffered to use less words and less verbs in the construction of descriptions for a direct cause scenario and an enabling cause scenario than for a non-enabling cause scenario.

4.8.2 Design of Experiment

It was decided that the same five passages should be used so that the data retrieved could be compared with the results from the first part of this experiment. The experiment was set up much the same as before using the on-line experimenter tool however instead of including three answers for the participants to choose from I designed this experiment in such a way that participants are asked to provide a headline that they themselves felt best describes the given passage. Unlike Wolff, I do not simply get participants to choose between a single-clause and multi-clause sentence constructed in advance, I am specifically asking them to devise their own headline without any mention of it being single-clause or multi-clause in nature.

4.8.3 Participants

As I had exhausted my friends for their participation in experiments up until this point I sought participants from my project supervisor, Dr. Carl Vogel who was able to contact his sister\(^8\) who subsequently provided the participants, undergraduate students in Louisiana. For this reason some of the passages had to be altered slightly so that the participants did not feel in anyway confused by their meaning. Small adjustments were made for example in the case of the passage about the enabling cause event the 6 million pound lottery was change to the 6 million dollar lottery and instead of a list of Gaelic football scores for the arbitrary event I thought it more appropriate to include a list of American football scores. 19 people took part in this experiment.

\(^8\)Dr. Dianna Laurent, in the English Department of Southeastern Louisiana University; participants received extra credit for their time.
4.8.4 Results and Discussion

![Graph showing average number of words in headline compositions](image)

Figure 20: Average Number of Words in Headline Compositions

The raw responses provided by participants are included in Appendix A.6. Participants used the least amount of words to compose a headline for a direct event, which would have been expected. However, participants used more words on average when composing a headline for an enabling event than a non-enabling event which would not have been expected. However, this difference is marginal. Participants on average used the same number of words to compose a headline for an arbitrary event and a definitional event. This equivalence seems reasonable. That so many more words on average went into the enabling and non-enabling chain events than into headlines for definitional and arbitrary collection events is surprising: they seem equally complex. Wolff would have predicted fewer words for the enabling event, a number closer to that of the direct cause. Note that this addresses the fact that I did not control for word lengths in my headline constructions.
Figure 21: Average Number of Words in my Headline Compositions in the Original Experiment

Given the results summarised in Figure 20, it is interesting to return to the headlines I produced myself for the original experiment. This graph shows that I did not balance the headlines in each of the three answer categories for length; the bars indicate the average length of the three headlines I produced for each of the five scenarios. On average the headlines with the most words correspond to the direct cause scenario and the headlines with the least average amount of words are for the enabling cause, which is completely the opposite pattern of the corresponding average amount of words in the headlines constructed by the participants for those two scenarios. There also appears to be a significant difference between the shortest average headline and the longest average headline, the longest headline is in fact just more than double the length on average of the shortest headline. In Figure 20 the difference on average between the longest and shortest headlines is in fact just slightly less than that of an actual word. It didn’t occur to me until now that I should have balanced the headlines given for length particularly in light of attempting response time analysis and this is something I would do if I were to repeat this experiment. However, it must be remembered that the headlines I produced were carefully produced to cover an exact set of referential possibilities.
It seemed relevant to analyse the number of NP-only productions given that the experimental design categorised the descriptions as headlines, and NP-only expressions are fairly idiomatic for Headlines. It is not actually obvious what predictions anyone would make about the occurrence of NP-only constructions in relation to the underlying event structure described. In fact, I produced none for the experiment materials. However because of the instruction to participants to construct headlines, and the plausibility of NP-only titles for news articles (which most people assume describe fairly complex underlying scenarios) it is interesting to see just how the results broke down.

Participants used more NP only composed headlines for a direct event than an enabling or non-enabling event. Participants used more NP-only headlines for a non-enabling event than an enabling event. Participants composed on average the most NP only headlines for an arbitrary event. Perhaps this is not at all surprising since by construction there is little to link the underlying events other than something like "Saturday’s Football Scores".

Figure 22: Average Number of NP only Headline Compositions

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Because Wolff examined the number of clauses, making predictions and finding a clear difference between direct cause enabling, and non-enabling chains, I examined the average numbers of clauses produced by participants for each of the relevant categories. Participants described a non-enabling event on average with more clauses than both an enabling and a direct event which would have been expected. Participants on average used the same amount of clauses to describe both an enabling event and a direct event. Participants used more clauses on average to describe a defitional event than an arbitrary event which would also have been expected. Contrary to Wolff’s results, the outcome here demonstrates little differences among the categories.
Having analysed NP-only constructions, and multiple clause constructions, it is also necessary to count the average number of verbs in descriptions. Note that “the deflection caused the window to break” counted as a single clause in the analysis shown in Figure 23, but Wolff would count this periphrastic cause statement as two clauses. I prefer to keep ‘clause’ for finite matrix, coordinated sentences and relative clauses, to account for constructions like that in Figure 24 I counted all verbs (including auxiliaries).

Participants used on average more verbs in their composed headlines for a non-enabling event than an enabling event, and participants used on average more verbs in their composed headlines for an enabling event than a direct event. All these results would have been expected. Participants used more verbs in their headlines for a definitional event than an arbitrary event. The paucity of verbs for arbitrary events is explained by the large number of NP-only constructions for that category. Why there were not as many NP-only constructions for definitional events is still a bit mysterious though.
This time the time responses match predictions as it took people on average longer to compose a headline for a non-enabling event than either an enabling event or a direct event. Also it took people on average longer to compose a headline for an enabling event than a direct event.
4.9 Third Event Experiment

4.9.1 Introduction

It was clear that the second experiment was dealing with participants linguistic coding of passages/events now I want to test people’s event judgements of each of the passages/events. That is, I want to know how many events people see when asked to focus on how many events there might be. In this third experiment I want to test Wolff’s hypothesis that people construe an event with a direct or enabling cause as being one event and an event with a non-enabling cause as comprising of more than a single event. In this experiment I am using the same methodology as Wolff, in his experiments 1 and 2, as I am going to ask participants how many events they feel the passages are about. This should allow additional direct comparison of my materials with those of Wolff.

4.9.2 Design of Experiment

Again the design of this experiment follows the design of the last two experiments. The same 5 passages were used and again the on-line experimenter tool was used. However this time when the participants were presented with each of the passages to read they were asked to provide an answer to the number of events they thought the passage was about.

4.9.3 Participants

Those people who had taken part in experiments one and two could not take part in this experiment as well as I felt that they would bias the results therefore an entirely new set of participants was sought. Like before Dr. Carl Vogel’s sister provided participants (a distinct group from the first set of college undergraduates) however this time I needed some more participants so I posted a note on the Trinity College noticeboard. Nineteen people took part in this experiment. However, one person’s results had to be discarded for reasons of obvious recalcitrance.
4.9.4 Results and Discussion

![Average Number of Events Construed by Participants from the Passages](image)

Figure 26: Average Number of Events Construed by Participants from the Passages

Participants identified more events as taking place on average in the passage about an enabling event than a direct event which would have been expected but also than a non-enabling event which would not have been expected. Participants identified more events as taking place on average in the passage about a non-enabling event than a direct event which would have been expected. Participants identified significantly more events on average as taking place in the passage about an arbitrary event in comparison to the passage about a definitional event.
Figure 27: Average Response Time for Perceived Number of Events

Surprisingly, it took participants on average longer to construe the number of events from the passage about a direct event than both the passages about an enabling event and a non-enabling event. Unsurprisingly, it didn’t take participants as long to construe the number of events from the passage about an enabling event as it did to construe the number of events from the passage about a non-enabling event. Performance for definitional events and direct causes was the same, at the greatest duration. Arbitrary events and non-enabling mediating chains were also comparable and next in average length.
4.10 Overall Discussion of the 3 Event Experiments

Given that definitional events were constructed with the thought that they are distinct from enablers, yet similar, it is interesting to test that. Note that response to the two categories patterned together (but not equally) in the overall results with the main experiment Figure 17 and in the second experiment and similarly in the third experiment. That their results differ is either due to the materials and arbitrary issues with these particular scenarios as constructed, as the event types are genuinely and empirically distinct.
5 Conclusion

5.1 Introduction

Within this paper I have discussed people’s perception of time as being either discrete or dense through the construction of experiments controlling the number of consciously attended and unconsciously attended events. I also discussed people’s perceptions of events and their individuation through the constructing of experiments in response to those constructed by Wolff (2003).

5.2 Achievements

I set out in Chapter 2 to explore whether people perceived time to be either discrete or dense and I did find that people perceive time to be dense as with more events taking place people perceived time as passing faster. Also, it was shown that both consciously attended and unconsciously attended events affect peoples perceptions of time. In Chapter 4, I set out to explore the no-intervening-cause hypothesis of Wolff (2003) and while I cannot deny its validity I have proved that people do not always use single-clause sentences to describe direct and enabling events and they are not always construed as single events. What has been clearly shown is that my results certainly do not lend support to the no-intervening-cause hypothesis.

5.3 Issues for further research

I feel that more work could be conducted on people’s perception of time through the gathering of more data as I only had 36 participants in total. More investigation could be done on the difference of altering consciously attended and unattended events to further explore their effects on people’s perceptions of time. Regarding the event individuation experiments, these could be conducted using headline choices that would be balanced for word length to see if this has any effect on people’s choices or response times to the questions. Again, a larger number of participant responses would effectively give more conclusive data regarding the no-intervening-cause hypothesis.

5.4 Concluding Remarks

Everyday people subconsciously break down experiences into events and time. It has also been extremely interesting to explore how some people perceive time as passing faster or slower than other people and I have successfully discovered through my exploration that this perceived difference in
time is due to the fact that time is dense, with more events time seems to pass faster and with less events time seems to pass slower. It has also exciting to discover that the perception and construal of events is highly influenced by their linguistic representation.
References


A Appendices

A.1 Instructions for the Crossword Experiment with Earplugs

INSTRUCTIONS

You are asked to complete a crossword that has all its clues in English and its answers are a mixture between German and English. As you have no knowledge of German you will be unable to complete this crossword without help. I have set up an instant messaging service on the computer so that you will be able to make contact with me and ask me for the answers to clues as you desire. I will show you how to use the instant messenger once you have finished reading this. You are free to ask as many or as little clues as you wish. You are not allowed to make contact with anyone during the course of this experiment. You are not allowed to start the experiment until I send you an instant message to your screen saying “start” and you will be required to stop the exercise when I message you to “stop”. You are not allowed any physical indicator of the time during this experiment please give me your watch, phone, i-pod or any other possession you have that displays the time now. You are also required to wear earplugs, which you should insert once I have shown you how to operate the instant messenger, and you are required to wear them during the entire course of the experiment. You insert your answers on the paper crossword provided. All contact during the experiment will be made through the messaging service. If you have any further questions please ask them now.
A.2 Blank Crossword

![Blank Crossword](image)

Figure 28: An example of Crossword with no answers
A.3 Crossword with answers

Figure 29: An example of Crossword with answers
A.4 Set up of Instant Messaging Service

Figure 30: Screenshot showing set up of internet relay chat instant messaging service, one is asked to enter their name
Figure 31: Screenshot showing set up of internet relay chat instant messaging service, one is asked to enter the server details
Figure 32: Screenshot showing how one can edit whether the internet relay chat instant messaging service displays a timestamp or not
Figure 33: Screenshot showing how one can edit whether the internet relay chat instant messaging service displays a logfile of the conversation or not.
Figure 34: Screenshot showing the messages between sent and received with instant reply and timestamp on my screen

Figure 35: Screenshot showing the messages between sent and received with instant reply and no timestamp on participant’s screen
A.5 Set up of Online Experimenter Tool

Figure 36: Screenshot showing how to enter the details of the experiment one is setting up, including username, password, description and instructions.
Figure 37: Screenshot showing how to set up experiment 1
Experiment System

Experiment section 1, slide 1

Enter passage below:

Howth and Raheny played a match last night. Raheny were awarded a penalty in the dying minutes of the game. Raheny took the penalty, but Howth's goalie made a great save to block the ball from going into the goal. Unfortunately, the ball still carried great momentum and smashed the window of Raheny's team van.

Question 1

Please provide a newspaper-style headline that you feel adequately describes the passage above.

☐ Display questions on this slide in a random order?

<table>
<thead>
<tr>
<th>Add Passage</th>
<th>Add Graphic</th>
<th>Add Question</th>
<th>Add Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next Slide</td>
<td>Next Section</td>
<td>End Experiment</td>
<td></td>
</tr>
</tbody>
</table>

Figure 38: Screenshot showing how to set up experiment 2
Experiment System

Experiment section 1, slide 1

Enter passage below:

John’s mother knew that on the morning of John’s exam flights to London for a very important job interview, he would sleep through his alarm which was set to wake him at 5 a.m. It was for this reason that she took it upon herself at 4:30 a.m. to enter his room and to shake him awake.

Question 1

Please indicate the number of events you feel the passage is about.

☐ Display questions on this slide in a random order?

<table>
<thead>
<tr>
<th>Add Passage</th>
<th>Add Graphic</th>
<th>Add Question</th>
<th>Add Answer</th>
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<tr>
<td>Next Slide</td>
<td>Next Section</td>
<td>End Experiment</td>
<td></td>
</tr>
</tbody>
</table>

Figure 39: Screenshot showing how to set up experiment 3
A. APPENDICES

John's mother knew that on the morning of John's 7am flight to New York for a very important job interview, he would sleep through his alarm which was set to 4:30am. Due to this reason, she took it upon herself to enter his room and to shake him awake.

Question 1
Please indicate the number of events the passage is about.

Please type your answer in the box below:

Next Slide
A.6 Headlines Produced for Events Experiment II

A.6.1 Non-Enabling

1. Unusual soccer game
2. Howth’s Goalie Saves the Game but Breaks a Window
3. Howth goalie smashed Raheny team’s van window
4. Raheny’s Ricochet Kick!
5. Raheny Missed the Shot, but Smashed Glass
6. Goalie Saves Howth from Last Minute Penalty Kick
7. Team van gets damaged at Howth and Raheny soccer match
8. soccer ball smashes window at a town soccer game.
9. One step forward and two steps back for Raheny.
10. Breaking news: Howth and Raheny
11. Last Second save wrecks havoc on losing team.
12. Upset City Baby
13. Successful soccer goalie restricts ball to smash the team vans window=
14. Howth defeat Raheny with a smash of a kick
15. Game Disaster
16. Take penalty - break window
17. Raheny makes great block but loses window
18. A Crashing Save
19. Block by Howth’s Goalie Smashes Raheny’s Window
A.6.2 Enabling

1. Grocery shopper turned millionaire
2. Convenience Store Shopper Hits it BIG!
3. John Hagan wins the $6 million jackpot
4. Six-Hagen’s Lucky Number!
5. Local Convenience Store Sells $6 Million Lottery Ticket
6. Man Picks Winning Lottery Number While Grocery Shopping
7. Man goes local store and wins the 6 million dollar jackpot
8. Quick grocery stop earns quick cash for one lucky man.
9. Local man wins lottery after going for apples, bread, and milk.
10. local man wins lotto!
11. Lucky 6 For John Hagan
12. Lucky Night for the average John!
13. First time player wins jackpot.
14. John Hagan wins 6 million dollars with lottery ticket
15. The Lucky Ticket
16. Just popping out for six million...
17. Last minute tickets wins man six million
18. Shopping for Six Million
19. Local Wins $6 Million Jackpot During Routine Grocery Shopping
A.6.3 Direct

1. A mom’s intuition
2. Mother’s: A Human Alarm Clock
3. John’s Mother takes it upon herself to awaken her son
4. Wake Up Sleepy Head!
5. Mom Shakes Son for Wake-up Call
6. Heavy sleeper waken by heavy hands of mother
7. Mother awakes son early so not to miss interview
8. Sometimes a backup plan can be really helpful.
9. The human alarm clock
10. Mother knows best
11. Angry man assaults mother
12. Mom- She’s More Reliable than an Alarm Clock
13. Wake up call!
14. Mother shakes son awake to prevent missing his flight to New York
15. The 7 am Flight
16. An early start
17. John Misses alarm, Mother wakes him
18. Early Morning Shake
19. Mother Shakes Over-sleeping Son Awake
A.6.4 Definitional

1. Sigerson cup football season in review
2. DCU Wins It All
3. Queens University wins against Jordanstown, but loses to DCU by a point
4. The Siegerson Cup Football Results
5. DCU TAKES THE TITLE
6. Usual football lead to unusual outcome
7. Siegerson Cup Football Finals
8. DCU defeats Queens by one in the final game held on Saturday.
9. DCU celebrates as Queens is cry after losing by a single point.
10. sports latest
11. DCU sweeps victory in Sigerson Cup
12. Winning is Winning- Even by 1 Point
13. The Sigerson Cup Final Four
14. I’m sick of sports
15. Winner of The Sigerson Cup
16. Sigerson Cup roundup
17. One Point Wins DCU Sigerson Cup
18. DCU wins Sigerson Cup
19. DCU undefeated in Sigerson Cup
A.6.5 Arbitrary

1. Weekend college football scores
2. U.S. College Football Scores
3. Saturday’s U.S. College Football Winners were Oklahoma, LSU, Texas, Washington, TCU, Purdue, Toledo, Michigan, Miami, Arkansas and Missouri
4. Saturday’s U.S. College Football Results
5. College Football Scores
6. Towering Scores in College Football
7. Saturday Night Football
8. High scoring results in the football games held on Saturday.
9. Middle Tenn escapes the beating shared by other losing teams this week
10. Sports
11. Scores of the games Saturday
12. True Athletes Prevail!
13. College Football Blowouts
14. Half the U.S. is losing to the other half
15. Who Won the College Football Game?
16. Wipeout in weekend college games
17. LSU Delivers Hammering to Georgia
18. College Football Scores
19. Several U.S. College Football Teams Put To Shame