

Timing Narrative Events: The Effect of Characters' Emotions on Readers' Estimations

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Abstract- Time is a central topic in social sciences and humanities. Whereas it is well-known that subjective time is affected by emotion, i.e., the duration of “unhappy” real-life events is overestimated and the duration of “happy” events is underestimated, little is known about the effect of emotion on logical temporal reasoning. Our research focused on temporal reasoning in an everyday activity, that is, in reading. We investigated whether emotion evoked by texts influenced the estimation of the described events' duration. Based on an original text, we constructed three a-temporal texts, aiming to trigger different emotional states to the readers: positive, negative, and flat emotions. The emotional valence of the texts was validated in a sample of 124 students. Participants were randomly placed in three groups, according to the type of text (Negative=40, Positive=44, and Flat=40 participants, respectively). Participants were also asked to estimate the duration of the described events in the text. Results showed that, although participants garnered emotional information from text, this did not affect their estimations of the narrative events' duration. Our results reveal that, in contrast to real life, time estimations are not affected by emotion in the case of narrative events. These findings support the distinction between “subjective” and “logical” time. We postulate that when reading, an objective time line is created by the reader. It might be argued that the estimation of the subjective time resides at a first-order-representation (the reader represents, on a time line, the duration of the event, with him/herself being the agent). In contrast, the estimation of a logical-narrative time resides at a higher-order-representation level (the reader re-represents the events that are represented on a time line in the text). For skilled readers, such as the ones in our sample, the construction of the later representation resides at the implementation of reasoning procedures, which are activated even in the case of absence of any temporal markers in the text.

Keywords- Time Estimation; Temporal Reasoning; Narrative Events; Text Reading; Emotion

I. INTRODUCTION

Time has been of continuing concern to scholars ever since the period of the ancient Greeks ^[1]. This is probably because time is, by definition, a basic parameter of human life and activity. Its experimental studying started in 1890 ^[2] and the first approaches emphasized on the cognitive behavior of the person. In accordance, time was conceived as information to be processed and studies focused mainly on the estimation of temporal duration of events as these varied along various processing conditions (that is, structure, content, and context) of temporal information. Recently, there is a grown research interest in time estimation, with its focus replaced on the manipulation of

various experimental conditions, measuring how these may affect duration estimations ^[3]. In this line of research, the dependent variable is often the participants' estimation of duration, that is, the psychological/subjective time.

Psychological/subjective time can often be inaccurate in comparison to objective time. It can be influenced by various factors. Emotionality is one of them, affecting critically time perception and estimation. It is a common belief that time flies during pleasant events, but drags during unpleasant ones. Numerous studies have demonstrated this effect, showing that the duration of stimuli or events that evoke positive feelings are underestimated, while stimuli or events that evoke negative feelings are overestimated ^[4-17].

Another line of research on time, concerns the construction of logical time ^[18]. This refers to our comprehension of time as a construction that we can reason about. Most of the studies in the domain of temporal reasoning have dealt with *kinematic frames of time* (time-space-velocity relationships). Research also focuses on *non kinematics time*. This refers to the succession-duration relations and temporal duration estimations based on the successive beginnings and endings of events. For example, we know for sure that an event that starts later than another one and ends before it, it definitely endures shorter. In an analogous way, an event that starts before another one and ends after it, it definitely endures longer.

Understanding and manipulating the various temporal components that comprise non kinematics time (initial order, final order, and relative duration of events) pose different difficulty to children during problem solving. For example, it is shown that it is easier for children to infer the final order of events when the initial order and the duration are known, than the opposite (to judge the initial order, when the final order and the duration are known). This is due to the fact that it is easier to represent temporal events following the “natural” direction: beginning-duration-ending, than a “non natural” one: ending-duration-beginning. Also, children encounter difficulties when asked to represent the temporal component of “equal duration”, because, in this case, they are misled to erroneously infer a simultaneous beginning or/and ending of events.

It is clear so far that, in psychological research, the estimation of events' duration has been heavily studied. This is not only because disentangling this mechanism would be important for theoretical purposes, but also because accurate time estimations have major, and in some

cases, life-saving, practical applications (e.g., when crossing a road, when testifying in a jury, when called to manage your time^[1, 15-17]).

In all relevant studies, events of various durations and content are presented, manipulated or reasoned about. All types of events share three common dimensions. The first is that events are temporally organized. That is, they are embedded within a temporal context^[19-21]. The second common dimension concerns the role of our previous knowledge. That is, when we explain past events or when we anticipate future ones, we are all affected by our past temporal experiences^[19-20; 22-23]. Finally, the third common dimension is that when an event occurs (real, imagined or media-based), it evokes emotions^[5, 20, 23-27].

As mentioned above, emotionality plays a significant role on the subjective estimation of the duration of events. Given that (a) events are inextricably present in a narrative text^[28; 29] and (b) narrative texts elicit emotions^[30-33], it would be interesting to examine whether these two variables are intertwined.

This question becomes even more intriguing given the finding of a previous study, showing that readers cannot always accurately estimate the duration of their reading activity, as they are affected by the text's-emotional content. The duration of reading a positive text was estimated rather accurately, whereas reading a negative text seemed to last longer. However, the processing of temporal information in a narrative text has not yet been adequately studied^[22], nor related to its emotional content.

In other words, although it has been shown that readers (a) garner the emotional tone of a narrative text^[30-33], (b) are affected by this emotionality in the duration estimations of their reading activity per se (that is, in their subjective time)^[34], (c) construct a representation of a time-line in a narrative text (that is, they construct a narrative time)^[28, 29], we still do not know anything about the effect of emotionality on the later. That is, it has not been investigated whether readers' emotionality affects the construction and estimation of the narrative time in a similar way that it affects subjective time.

Two alternative approaches can be put forward. The first could posit that narrative time, as it is a subjective construction, would be affected by readers' emotionality. In this case, the estimation of the duration of the narrative events will be distorted by the emotional state of the reader (pleasant narrative events would be conceived as enduring shorter compared to negative narrative events that would be conceived as enduring longer). This would mean that time subjectivity^[10-13] is such a strong and universal mechanism that it will be activated even in the case of a narrative time construction.

The second approach, which is the one that we support due to its more robust theoretical background, is based on the assumption that the construction and indexing of narrative time is a logical procedure^[19-20]. As such, it emanates from readers' previous knowledge and representational ability^[26, 28-29]. In this case, the construction of narrative time, and the subsequent

estimation of the narrative events' duration, will be unaffected by the emotional state of the reader. Moreover, given the above, it is also reasonable to expect that readers' construction of a narrative time will not be hindered in the absence of overt temporal markers in a text. This is so, because the construction of a narrative time-line emerges mainly from readers' tendency to temporally organize narrative texts on the basis of their previous experiences.

Consequently, we hypothesize that (1) readers will be able to construct a logical-narrative time, even in the absence of overt temporal markers, and (2) as a logical construction, narrative time will not be subjected to distortion as an effect of readers' emotionality^[26]. Thus, we expect that the emotional state of the reader, as induced by the tone of the text will not affect the duration estimation of the described events.

In order to examine the effect of emotionality on the construction of narrative time, two pre-requisites must be satisfied. The first concerns the type and intensity of emotions conveyed by the texts, which should be properly manipulated, in order to ensure that different texts convey different type of emotions (i.e., pleasant vs. unpleasant). The second pre-requisite refers to the construction of the narrative time by the readers. The texts presented must be manipulated in such a way that would not include any overt temporal markers. In other words, readers must be presented with a text that would allow them to freely construct their own narrative time.

For this purpose, we constructed three isomorphic texts that did not contain any temporal markers, and that aimed to induce three different emotional states to the readers: positive, negative, and flat. Also, we constructed a self-reported inventory, aiming to measure participants' emotional state after reading the texts, and, also, we asked participants to estimate the duration of the described events.

II. CONSTRUCTION AND VALIDATION OF ATEMPORAL, EMOTIONAL NARRATIVE TEXTS AND DURATION ESTIMATIONS OF NARRATIVE EVENTS

A. Method

1) Material:

The text we presented to participants was based on a "Harry Potter" text (from "Harry Potter and the Goblet of Fire"). The original excerpt described three characters walking in the woods and confronting an enemy. In this original text, we removed all overt temporal markers (e.g., temporal adverbs, etc). We proceeded to the construction of two isomorphic texts. Keeping the structure of the text the same, we altered the text content and situations to positive and to flat, respectively. This was achieved by altering certain words in the original text. In the *positive* text, the same characters were walking in the woods and meeting with a friend, whereas in the *flat* text, the characters' encounter was indifferent (see Appendix). We have chosen to use a well-known text, such as Harry Potter, in order to reassure familiarity of the readers with the characters.

The three texts were of equal length (about 510 words, 3,100 characters). All texts did not convey any explicit temporal information, and they were analogue as far as the temporal succession (evolution of events) is concerned. They consisted of ten paragraphs, describing three events that occurred while a group of children was taking a walk in a forest. The break points of each unit were clearly defined.

Participants were also presented with a 15-items self-reported Emotionality Inventory, including three subscales: the Positive (pleasure, relaxation, happiness, sensitivity, and calmness), the Negative (terror, anguish, stress, threat, and fear), and the Flat Emotions (monotony, indifference, boredom, dullness, and hypotonicity), appearing randomly in the inventory. Participants were reporting the intensity of their evoked emotions on a seven – point Likert-type scale (with -1- corresponding to ‘not at all’ and -7- to ‘absolutely’). Finally, they were asked to estimate the duration of the described events.

2) Participants:

One hundred and twenty-four adults took part in this research. Our sample was first-year University students at the Department of Psychology, aged from 18 to 21 years old. Participants were randomly placed in three groups (Negative Text=40, Positive Text=44, and Flat Text=40 participants, respectively). Each group received the corresponding text (negative, positive, or flat).

3) Procedure:

Each participant was presented with one of the texts, with the instruction to read it carefully, and, then, to state on a seven – point Likert-type scale the degree to which the text made them experience the fifteen different emotional states, e.g.,

At what degree do you think that the text you just read made you:

1. Feel terror

Not at all 1 2 3 4 5 6 7
absolutely

2. Feel pleasure

Not at all 1 2 3 4 5 6 7
absolutely

3. Feel indifference

Not at all 1 2 3 4 5 6 7
absolutely

Right after the completion of this questionnaire, participants were asked to answer the following open – ended question: “In your opinion, the events described in the text you read, in how much time did they take place?”

B. Results

Results of Exploratory Factor Analysis (Extraction Method: Principal Component Analysis, Rotation: Varimax) applied on the participants’ answers in the Emotion Questionnaire revealed three factors accounting for 68.22%

of the total variance (see Table 1). The first factor (F1) accounted for 26.075% of the total variance and loaded positively on Items 1 (terror), 3 (anguish), 9 (stress), 12 (threat), 14 (fear), and negatively on Items 4 (relaxation), and 15 (calmness). The structure of this factor denoted a “negative-unpleasant” emotional outcome. The second factor (F2) accounted for 25.11% of total variance and comprised of Items 5 (monotony), 7 (indifference), 8 (boredom), 10 (dullness) and 13 (hypotonicity). Thus, it denoted a “flat” emotional outcome. Finally, the third factor (F3) accounted for 17.03% of the total variance and comprised of Items 2 (pleasure), 4 (relaxation), 6 (happiness), 11 (sensitivity) and 15 (calmness), thus reflecting a “positive-pleasant” emotional outcome (Means and Standard Deviation of each item are presented in Table 1 and factor loadings are presented in Table 2).

TABLE I MEANS AND STANDARD DEVIATION OF THE FIFTEEN ITEMS COMPRISING THE EMOTIONALITY INVENTORY

Emotions	Mean	S.D.
1. Terror	2.19	1.66
2. Pleasure	3.90	1.77
3. Anguish	3.82	1.98
4. Relaxation	3.73	1.87
5. Monotony	3.15	1.98
6. Happiness	3.27	1.89
7. Indifference	3.43	2.01
8. Boredom	3.11	2.01
9. Stress	2.59	1.92
10. Dullness	2.89	1.89
11. Sensitivity	3.63	1.92
12. Threat	3.04	2.00
13. Hypotonicity	2.95	1.66
14. Fear	2.40	1.87
15. Calmness	3.65	2.05

TABLE II RESULTS OF THE FACTOR ANALYSIS APPLIED ON THE EMOTIONALITY INVENTORY

Emotions	F1 (negative)	F2 (flat)	F3 (positive)
1. Terror	.846	-.082	-.050
2. Pleasure	.066	-.367	.664
3. Anguish	.744	-.318	-.003
4. Relaxation	-.462	.043	.609
5. Monotony	-.112	.811	-.152
6. Happiness	.008	-.164	.747
7. Indifference	-.173	.829	-.209
8. Boredom	-.187	.880	-.156
9. Stress	.819	-.067	.083
10. Dullness	-.096	.844	-.219
11. Sensitivity	.251	-.094	.690
12. Threat	.784	-.025	-.059
13. Hypotonicity	.013	.795	.073
14. Fear	.891	-.124	-.034
15. Calmness	-.442	-.050	.742

In order to examine whether the type of text affected the intensity of the different emotions experienced by the participants, the mean score was computed for the items loading on each factor (Cronbach's alpha for the negative emotions = .889, for the flat emotional state = .901, and for the positive emotions = .761). Then, a 3 (the three texts: positive, negative and flat) $\times$ 3 (the three emotional states: positive, negative, and flat) multivariate analysis of variance was run. Results revealed that the type of text did not affect the emotions experienced by the participants [$F(2, 120) = 1.233, p > .05$], emotions were statistically significantly differentiated [$F(2, 119) = 13.735, p < .001$], and the interaction text $\times$ emotionality was also statistically significant [$F(4, 240) = 17.295, p < .001$]. This interaction reveals, as shown in Figure 1, that (a) the Positive and the Flat texts elicited stronger positive emotions, compared to the Negative text, and (b) the Negative text elicited stronger negative emotions compared to the other two conditions.

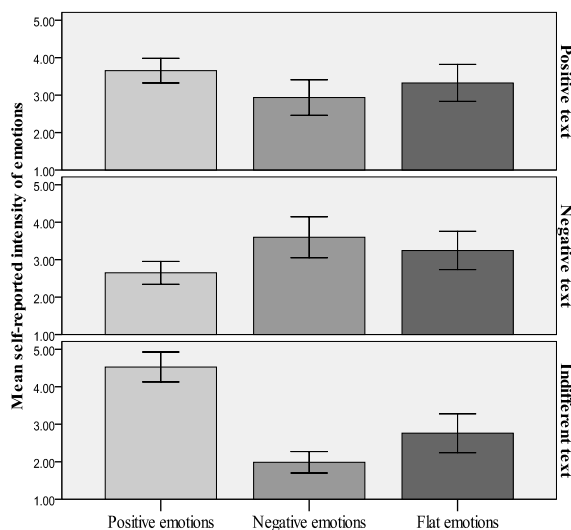


Fig. 1 Emotionality as a function of reading Harry Potter texts. Bars are standard error of the mean.

Finally, Analysis of Variance was applied on the participants' estimations of the events' temporal duration. Results of the analysis showed that estimations did not varied across conditions [$F(2, 123) = .255, p > .05$]. More specifically, in all text conditions, the mean estimation of the events' duration was around thirty minutes (for the negative text the mean duration estimation was 29.53 minutes, for the positive text 33.11 minutes, and for the neutral text 26.00 minutes).

C. Discussion

In this study we focused on the effect of readers' emotionality on the construction of narrative time. More specifically, we investigated whether pleasant narrative events would contract and unpleasant narrative events would expand in their duration, as it is the case for real-life events. The question posed in our study is a novel one, since up to date, it has not been examined how emotionality affects the construction of readers' representations. In our study, by manipulating the emotional state of the reader, we

revealed that humans, despite their vulnerability to distort time duration as an effect of emotionality, remain perfectly able to logically construct time, overriding any emotional obstacles.

Until now, it is rather unclear whether the emotionality effect on time estimation of real-life events^[5, 14, 27] applies in the case of reading about events. Specifically, although the distortion of time applies when reading positive and negative texts - in other words, it applies on the reading activity per se - it has not been investigated whether this effect is also reflected on the construction and representation of the narrative time^[34].

Recently, it has been reported that the emotional tone imparted through narrative texts has no effect on the estimation of narrative time^[26]. However, the question concerning the interrelations among time, emotion and reading has not yet been adequately answered, nor has it been investigated whether flat emotionality alters the construction of readers' representations. In order to answer the above question, we implemented our experiment.

In this experiment, we constructed three isomorphic texts aimed to evoke different emotions (positive, negative, and flat). We validated that the corresponding texts indeed induced negative and positive emotional state, respectively, whereas it was shown that it is rather difficult to induce flat emotions. Also, we measured readers' estimations of the duration of the narrative events. Our results showed that duration estimations of the narrative events are not affected by the emotions induced by the texts.

This study indicated that narrative time is a logical construction^[19-20]. As shown from our results and predicted by our first hypothesis, this construction, although arbitrary, is possible, even in the absence of overt temporal markers in a narrative text. Also, as predicted by our second hypothesis, it seems that this logical construction of narrative time is unaffected by the readers' emotional state.

Thus, reading narrative texts probably fails to convey an experiential dimension. Readers in our study garnered the emotionality of the positive and the negative text. Still, they were shown to keep distance between their own experienced feelings and those of the characters of the text. Just as for Samartzi et al.^[26], we failed to find any reliable effect of emotionality on the construction of narrative time. Overall, this study demonstrated that emotionality does not necessarily affect our temporal reasoning. However, it must be noted that, in this research, the term *temporal reasoning* refers exclusively to participants' answers about events' duration. It is possible that, a different experimental procedure asking participants to justify their answers could be more informative about the main notions emerging in temporal reasoning and about the way that readers estimate narrative time, in general.

One possible interpretation for the findings outlined here relies on the levels of representation during the process of text reading and understanding. It might be argued that, in contrast to the estimation of the subjective time that resides at a first-order-representation (we represent, on a

time line, the duration of the event, with us being the agents), the estimation of the logical-narrative time resides at a higher-order-representation (the reader re-represents the events that are represented on a time line in the text). The construction of such a representation requires the activation and implementation of reasoning procedures deriving from the text's temporal information^[35-37].

In the case of reading texts that do not contain temporal information (such as the texts used in this study), the reader still constructs a re-representation of the narrative-logical time, as clearly demonstrated by our results. The above approach is consistent with (a) the principal quality of temporal organization of real-life and narrative events^[19-21], and (b) the contribution of previous knowledge and representation to the construction of situation models, that is, models specific to the situation^[24, 28-29].

III. CONCLUSIONS AND FUTURE RESEARCH DIRECTIONS

The present study contributed to the clarification of the phenomenon of time subjectivity in combination with the processes activated during reading. It mainly showed that the cognitive process of time representation is differentiated as a function of the event-to-be-estimated. Whereas time representation of our personal life events and activities is distorted by our emotionality, time re-representation of events that are media-based is not influenced by our emotionality. One limitation of the present research was that the estimation of narrative time could be affected by the plot (i.e., during or at the end of the narrative event). This possible effect was not investigated in this study. Also, it might be possible to observe some effects of situational factors before or during reading the texts (for example, in the case where participants are experimentally engaged in a frustrating situation). This interesting parameter could be investigated in a future research. Another limitation of our study concerned the difficulty to evoke flat emotions when reading narrative texts. This is also an interesting issue for a future research, as it may be the case that narrative texts always evoke some type of emotionality. Also, the arbitrariness in the construction of the narrative time needs further investigation. Personal interviews may highlight the procedures that lead readers to the construction of the narrative time.

Future research can address the issue of the construction of the narrative time by involving less familiar texts. Moreover, it would be interesting to examine whether the same logical construction of narrative time applies in the case of narrative events presented through another media (i.e., in filmed events). Also, it would be interesting to investigate whether gathering neuropsychological measures (e.g., arousal), will highlight and explain the process of re-representing narrative time.

Another interesting issue for future research would be the effect of reading experience on the construction of narrative time. Given that our participants were rather experts in reading, it would be highly informative to re-examine the above issues involving samples of younger age

or of less reading experience. Finally, it would be interesting to explore whether the narrator's perspective influences readers' narrative time estimations, i.e., when the events are described by a narrator – observer (a third-person narrative perspective) versus a narrator experiencing him/herself the narrative events (a first-person narrative perspective). In such a case, the degree of readers' identification with the narrator is an issue meriting further investigation in future research.

APPENDIX

Examples of Excerpts of The Three Texts

"NEGATIVE" TEXT	"POSITIVE" TEXT	"FLAT" TEXT
She stopped suddenly and looked behind her. And the boys did the same. A noise was heard, as if someone was coming stumbling towards the clearing .	She stopped quietly and looked behind her. And the boys did the same. A noise was heard, as if someone was taking a walk in the clearing .	She stopped and looked behind her. And the boys did the same. A noise was heard, as if someone was coming to the clearing .
They waited hearing with all their hears the unsteady footsteps between the trees.	They continued, hearing the footsteps of the stranger between the trees.	They clearly heard the footsteps between the trees.
Suddenly* the footsteps stopped. "Who is it?" Harry shouted.	In a while* , the footsteps stopped. "Who is it?" Harry shouted.	In a while* , the footsteps stopped. "Who might that be" they wondered.
Silence. Harry stood up and peeked behind a bole. In the darkness he could not see very far away but he felt someone standing a little further from his vision range.	He did not get a reply. Harry stood up and looked behind the bole. He could not see far but he felt someone standing a little further from his vision range.	They continued their walk, trying at the same time to discover their new visitor, but they could not see clearly .
"Who is it?" he shouted. And then, all of a sudden, silence was smashed by a voice never heard in the woods before, a voice that was not a frightened cry, but spelled something like a conjuration	"Who is there " he asked again. Then, a sweet voice reached them, an unfamiliar voice. It was peaceful and calm and spelled something like a wish	" Who might be there? " Harry said. Then, a young female voice reached them. A voice that was not completely unknown to them greeted them loudly
"SIGN OF DEATH!" Etc...	"SIGN OF LIFE!" Etc...	"HELLO KIDS!" Etc...

*The terms "suddenly" (negative text) and "in a while" (positive and neutral texts) are not considered as temporal markers, because they do not convey any specific information about the duration of the event

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