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# The Time Variable that Reliably Separates Anxious and Non-Anxious Individuals

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**Abstract**

**Background:** It is well-recognized that emotions and emotional disorders may alter the experience of time. Yet relatively little is known about different aspects of psychological time in relation to anxiety. The purpose of the present study was to explore several aspects of temporal processing, including time perspective, prospective and retrospective time estimation, in persons with anxiety symptoms.

**Methods:** A total of 110 individuals with varying degrees of anxiety participated in two studies. They were assigned to two groups (anxiety–control) based on their scores on anxiety measurements. Participants also completed an inventory of time perspective and several time estimation tasks which were analyzed on a group-level. Depressive symptoms were assessed and used as a covariate in the second study.

**Results:** Anxiety was significantly associated with Past Negative and Future Negative time perspectives as measured by the Swedish Zimbardo Time Perspective Inventory (S-ZTPI), even when controlling for the effect of depressive symptoms. No other significant differences were found.

**Conclusion:** Exploring time perspective in persons with anxious symptoms may provide important insights into features of anxiety. These findings may offer new ways of conceptualizing anxiety and provide suggestions for treatment strategies.

**Keywords:** Anxiety; depression; mental health; temporal processing; time assessment; time estimation; time perspective

## Introduction

Time is a abecedarian part of mortal actuality. We make sense of our diurnal lives, particular histories and gests using the temporal frames of history, present and unborn( 1). Different timing functions also play a vital part in speech, cognition and movement( 2).

While objective time progresses linearly in constant units, private processing of time may be affected by internal torture or the emotional state of the existent( 3- 6). Studying different aspects of temporal processing can therefore contribute to a better understanding of the cerebral experience of feelings and emotional diseases and underpinning mechanisms of temporal processing in normal and clinical populations.

In the present study we aimed to explore different aspects of temporal processing, including time perspective and prospective- and retrospective time estimation in persons with anxiety symptoms. former exploration in the area is rather meager , and has substantially concentrated on colorful time estimation paradigms(). Extending this exploration, our study assessed multiple aspects of cerebral time in relation to anxiety; from the introductory capability to estimate chronometric time intervals( time estimation) to time perspective, a construct that refers to an existent's habitual approach the history, the present and the future as a personality particularity(,9).

Social psychologist Kurt Lewin( 10) regarded time perspective as a dynamic process, where an existent's view of her/ his history and expectation for the future affects current geste .

Zimbardo and Boyd( 1) extended on Lewin's view of time perspective and defined it as a cognitive frame that gives meaning and consonance to everyday gests . In this environment, time perspective is regarded as an important individual difference variable that affects cerebral and societal functioning.

A central supposition of this description and operationalization of time perspective is that a private well- being reflects a flexible use of the three temporal confines( once-present- future) or a balanced time perspective( 11). On the other hand, a prejudiced time perspective, with an overemphasis on one or further of the might have direct impact on a person's private well- being and social functioning.

**Anxiety and time perspective**

To assess time perspective, Zimbardo and Boyd( 1) developed the Zimbardo Time Perspective Inventory( ZTPI), a tone- report instrument which contemporaneously captures an existent's exposures to the history, the present and the future. ZTPI measures time perspective in five different factors( measured through five scales) history Negative which reflects a negative or aversive view of the history; once Positive which covers a nostalgic and positive view of one's history; Present Fatalistic which reflects a fatalistic and hopeless view of the present; Present sybaritic which glasses an station towards the present where pleasure and enjoyment in the now is more important than unborn issues; and eventually, the unborn factor which reflects a general future exposure, characterized by seeking for unborn pretensions and prices.

Anxiety has preliminarily been described as a unborn acquainted emotion( 12), involving torture about what may be( 13) and expectation of unborn trouble or detriment(,15). Zaleski( 16) introduced the conception of unborn Anxiety( FA) and regarded it as a personality characteristic where a negative unborn time perspective precedes the development of anxiety. Taken together, these findings suggest that anxiety is associated with a generally unborn acquainted time perspective.

Still, former exploration with the ZTPI didn't demonstrate a link between the unborn time perspective and anxiety( 1). In their study, anxiety was rather significantly associated with the history Negative time perspective and the Present Fatalistic time perspective. We argued that thisnon-significant relationship was a consequence of the content of the unborn scale of the ZTPI being appreciatively poisoned. The unborn scale measures a general thing- acquainted and positive outlook on the future, while ignoring negative stations and passions associated with the future, similar as fear of the uncertain and solicitude.

To regard for the double emotional valence associated with the future, we employed the Swedish ZTPI( S- ZTPI)( 9) for assessing time perspective. The S- ZTPI extends the original interpretation of the ZTPI by dividing the future into two factors the unborn Positive scale and the unborn Negative scale. The unborn Positive is largely identical to the unborn scale of the ZTPI, while the unborn Negative scale is constructed to measure a negative outlook on the future. Anxiety and time estimation is involved in everyday mortal conditioning, similar as estimating whether to decelerate for a unheroic light or not, or estimating the quantum of time needed to finish a design. Experimenters generally distinguish between prospective and retrospective time estimation(,18). In prospective time estimation, subjects are asked beforehand to estimate time from now into some point in the future. In retrospective time estimation, subjects are asked for unanticipated duration estimation after the interval has ended.

Prospective estimates of duration may vary vastly dependent on the cognitive and emotional state of the existent(,5). For illustration, in situations similar as when we're wearied or anticipating an unwelcome event to be, time subjectively slows down and we tend to overrate time. On the other hand, when we're engaged in conditioning that are satisfying or intriguing, time appears to pass more snappily and we tend to underrate time( 18).

Cognitive models of prospective time estimation emphasize the significance of arousal position and attention to time in prognosticating the direction( i.e., under- or overestimation of time) in prospective time estimation tasks. In these models, a heightened thrill position or increased attention to time may affect in longer duration judgments. The relationship between prospective time estimation and anxiety was a fairly popular exploration content in the 1960's and 1970's. These aged studies in general set up that anxiety was associated with judging time intervals as longer than they chronometrically were, that is, overestimation of time( 19- 21). In these studies, overestimation was explained in terms of heightened thrill which increased the pace of a hypothecated internal timepiece medium( 22). In a more recent study, Wittman, Vollmer, Schweiger and Hiddeman set up that in a group of rehabilitated cancer cases, high anxiety situations were also associated with overestimation of time in a prospective time estimation task( 23). In this study, overestimation was interpreted as performing from increased attention to time as the cerebral torture these cases endured made it delicate for them to engage in meaningful studies and therefore, their attention was drawn to time causing longer duration estimates. In discrepancy to prospective time estimation, retrospective time estimation relies on apropos enciphered temporal information, memory processes and contextual change. To our knowledge, veritably many studies have delved retrospective time estimation in relation to anxiety. still, there's some substantiation that anxiety is associated with longer retrospective time estimations( i.e., overestimation of the time interval). For case, Sarasoon and Stoops( 7) set up that individualities with high anxiety( specifically test anxiety) tended to overrate time compared to a control group in a situation where they were staying to perform a test. These findings were explained as performing from cognitive hindrance and obsession, which made the anxious actors witness that time had passed more sluggishly.

Purpose of the present study In the current study we set out to explore the complex relationship between anxiety and temporal processing, fastening on time perspective, prospective time estimation and retrospective time estimation, in persons with anxiety symptoms. harmonious with earlier work(,23) we prognosticated that persons with anxiety symptoms would show more overe- stimation in prospective time estimation tasks. also, we prognosticated that anxiety would be associated with overestimation of time in retrospective time estimation( 7). We also anticipated anxiety to be associated with the history Negative scale and the Present Fatalistic scale, harmonious with former exploration( 1). Eventually, grounded on the thesis that anxiety is associated with solicitude and negative expectation of the future, we hypothecated that anxiety would be associated with advanced scores on the unborn Negative scale of S- ZTPI.

**Styles and results Study 1 Actors**

Fifty- six persons ranging from 19 to 60 times old shared in the study. They were signed through pamphlets( n = 32) and among guests on a waiting list for psychotherapy at a psychology clinic for trainee therapists in northern Sweden( n = 24). guests at the clinic correspond of persons seeking psychotherapy on a voluntary base, not appertained by health care professionals. Implicit guests are completely assessed upon admission and persons with more severe psychopathology( similar as personality diseases, severe depression or anxiety, eating diseases or schizophrenia) aren't admitted to the clinic. The maturity of the guests at this clinic have moderate difficulties with anxiety and/ or depression.

The actors were divided into two groups; anxiety group – control group grounded on their scores on the Swedish interpretation of the Symptom Check List 90( SCL- 90) subscales for anxiety diseases( Anxiety, Phobic Anxiety and compulsive-obsessive complaint)( 24). Actors scoring above the threshold for clinical symptoms on any of the anxiety subscales( 24) were assigned to the anxiety group( n = 22; 17 ladies; mean age = 29.7 times, SD = 11.19; mean SCL- 90 score = 1.45 SD = 1.07). Fifteen of those were waitlist actors and the remaining seven were actors signed through pamphlets. The control group comported of 34 persons( 25 ladies; mean age = 25.3 times, SD = 5.31; mean SCL- 90 score = 0.43, SD = 0.25). Nine of those were actors from the waiting list while 25 were actors signed through pamphlets. The groups differed significantly on their SCL- 90 scores, t( 54) = 22.48, p<0.01, but not on gender distribution( p = 0.64) or age( p = 0.17). The study was approved by the indigenous ethics commission at the authors' institution and written informed concurrence was attained from all actors.

Procedure and measures All actors were tested collectively in a quiet room at the psychology clinic and given the same oral instructions. Actors were informed that the end was to examine individual differences in time perception. Wall timepieces were removed and actors were asked to remove wrist watches. The tasks and measures were presented in the same order as follows.

Time estimation tasks Time estimation was measured by a prospective time reduplication task, a prospective time product task and a retrospective time estimation task.

The prospective time reduplication task comported of motorized task( programmed ine-prime) where a neutral encouragement picture( a" smiley- face") appeared on a 15" computer screen at a aggregate of 4 different trials( 4, 8, 24 and 32 s). Each trial was presented doubly, in the same arbitrary order for each block, except for three practice particulars( 6, 3 and 9 s) which were presented at the morning of the session. The actors were asked to reproduce the encouragement by pressing the space bar doubly formerly to signal the morning of the reduplication interval and formerly to gesture its end( 25).

In the prospective time product task the actors were asked to prospectively judge when two twinkles had passed. In order to help the actors fromsub-vocal counting, they had to perform a distracting task by reading audibly aimlessly appearing figures( 1- 9) from a computer screen.

In the retrospective time estimation task the actors were asked 17 twinkles into the experimental session to estimate( in twinkles) how important time that had ceased since the experimental session begun( i.e.," How important time do you suppose have passed since we first sat down in this room?"). The applicable length of the interval was established after conducting a airman study and it was chosen for two main reasons. First, the target interval demanded to be sufficiently long to produce variation( as it was estimated in twinkles). Second, it demanded to extend after the actors had performed the prospective time estimation tasks so that each task would not intrude with the other.

**Time perspective tone- report**

The Swedish Zimbardo Time Perspective Inventory( S- ZTPI)( 9) was used for assessing time perspective. This instrument contains 64 particulars and actors are asked how characteristic or true the item is for them using a 5- point Likert scale( 1 = veritably symptomatic and 5 = veritably characteristic). Internal thickness ranges from0.84 for the history Negative scale to0.70 for the unborn Positive scale and test- pretest trustability ranges from0.85 to0.60( 9).

**Data analysis 1**

Analysis of Variance( ANOVA) was carried out for assessing differences between the groups. The reason for employing a between-group design wastwo-folded. First, numerous studies in this area( internal torture and time estimation and specifically anxiety and time estimation) have used between- group designs, either grounded on being groups or on cut- off scores. A between- group design therefore facilitates comparisons with these studies(- 28). Second, the groups were divided on the base of clinical situations versusnon-clinical situations of anxiety, which further motivates the use of a between-

group analysis. Mean rates were calculated for all the time estimation tasks by dividing the estimated duration in every condition by the factual duration of the same condition. In this procedure, a value< 1 indicates underestimation and a value> 1 indicates overestimation of the time interval( 28). There was one missing value in the S- ZTPI data and it was replaced using the multiple insinuation function inSPSS.Table 1 summarizes the main findings of the study. As presented in the table, the between groups analysis( ANOVA) showed that the anxiety group scored significantly advanced on the history Negative scale and the Future

| **Group** | | | | | |
|---|---|---|---|---|---|
| | **Anxiety** | **Control** | | | |
| | **M (SD)** | **M (SD)** | ***F*** | ***p*** | **Cohen's *d*** |
| ***S-ZTPI*** | | | | | |
| Past Negative | 2.81 (0.69) | 2.35 (0.53) | 8.03 | 0.01 | 0.78 |
| Past Positive | 3.67 (0.54) | 3.61 (0.65) | 0.12 | 0.73 | 0.10 |
| Present Fatalistic | 2.60 (0.42) | 2.36 (0.58) | 2.59 | 0.11 | 0.44 |
| Present Hedonistic | 3.06 (0.54) | 3.07 (0.53) | 0.00 | 0.96 | 0.01 |
| | | | | | |
| Future Negative | 3.24 (0.45) | 2.92 (0.41) | 7.54 | 0.01 | 0.76 |
| 4 seconds | 0.93 (0.17) | 0.88 (0.16) | 1.66 | 0.20 | 0.35 |
| 8 seconds | 0.97 (0.11) | 0.98 (0.11) | 0.05 | 0.82 | 0.06 |
| 24 seconds | 0.92 (0.14) | 0.98 (0.13) | 2.54 | 0.12 | 0.44 |
| 32 seconds | 0.95 (0.08) | 0.93 (0.11) | 0.44 | 0.51 | 0.18 |
| ***Prospective time production*** | | | | | |
| 2 minutes | 0.94 (0.35) | 0.90 (0.30) | 0.15 | 0.70 | 0.11 |
| ***Retrospective time estimation*** | | | | | |
| 17 minutes | 1.03 (0.34) | 1.02 (0.36) | 0.00 | 0.98 | 0.01 |

**Table 1** summarizes the main findings of the study. As presented in the table, the between groups analysis (ANOVA) showed that the anxiety group scored significantly higher on the Past Negative scale and the Future

**Results 1**

Negative scale. There were no significant differences between the groups on any of the duration intervals( p>0.05) in the prospective time reduplication task and both groups tended to underrate time( mean relative error< 1). The same pattern was observed in the prospective time product task, both groups tended to underrate the time interval. In the retrospective time estimation task, both groups overrated the time interval slightly. The ANOVA revealed no significant differences between the groups on neither the prospective time product task nor the retrospective time estimation task.

**Study 2**

Study 2 was designed to address some of the limitations of the first study. Specifically, we intended to control for possible confounding goods of depression. Anxiety and depression frequentlyco-occur and depression is the most generally comorbid complaint associated with anxiety( 29). Although the relationship between anxiety and depression is well honored( 30), anxiety and depression may nonetheless be associated with different causes and consequences( 31). For case, they may differ in terms of time perspective. Depressed individualities may be poisoned towards once exposure, with reflection over once failures and loss, while anxious individualities are more acquainted towards the future, with expectation of unborn pitfalls and negative issues( 32).

Our results from Study 1 suggested a link between unborn Negative time perspective and anxiety symptoms; still, there was also a relationship between once Negative time perspective and anxiety symptoms. We argued that depressive symptoms in the actors( specifically in the anxiety group) could incompletely explain this finding. To further disentangle the relationship between time perspective and anxiety, we assessed depressive symptoms in Study 2. To grease isolation of anxiety symptoms from depression, the dimension of anxiety was changed from SCL-90 to Beck Anxiety force( BAI)( 33). The reason behind this methodological change was that the discriminant validity and perceptivity of the SCL- 90 scales may be questionable(,34). BAI on the other hand, was specifically developed to give an anxiety dimension that minimally overlaps with depression( 33).

Actors

Forty- four persons ranging from 18 to 51 times old shared in the study. They were signed among guests on a waiting list for psychotherapy at a psychology clinic for trainee therapists in northern Sweden( n = 20) and through pamphlets( n = 24). The actors were divided into two groups( anxiety group – control group) grounded on their scores on the Beck Anxiety force( BAI)( 33). Actors scoring above the threshold for mild anxiety( BAI ≥ 8) were assigned to the anxiety group. Actors scoring below this threshold were assigned to the control group. The anxiety group comported of 19 persons( 15 ladies; mean age = 25.58, SD = 5.18, mean BAI score = 16.11, SD = 6.4) and the control group comported of 25 persons( 18 ladies; mean age = 26.36, SD = 7.37, mean BAI score3.60, SD = 2.02). The

anxiety group comported of 11 actors signed through pamphlets and 8 waiting list actors. The groups differed significantly on BAI score, t( 42) = 9.2, p<0.01, but not on gender distribution( p = 0.22) or age( p = 0.80). Actors were assessed for depressive symptoms using the Beck Depression Inventory- II( BDI)( 35). The study was approved by the indigenous ethics commission at the authors' institution and written informed concurrence was attained from all actors.

Procedure and measures All actors were tested collectively in a quiet room at the psychology clinic and given the same oral instructions. Actors were informed that the end was to examine individual differences in time perception. Wall timepieces were removed and actors were asked to remove wrist watches. The tasks and measures were presented in the same order as follows.

Time estimati

on tasks

Time estimation was measured using a prospective time product task and a retrospective time estimation task.

The prospective time product task was identical to the task included in Study 1( see Method 1). In the retrospective time estimation task the subjects were asked 12 twinkles into the experimental session to estimate how important time they allowed had ceased since the session begun( i.e.," How important time do you suppose have passed since we first sat down in this room?").

The explanation

behind the target length of the retrospective time interval was the same as in Study 1( see Method 1).

Time perspective tone- report Time perspective was assessed with the Swedish Zimbardo Time Perspective Inventory( S- ZTPI; see system 1).

**Results 2**

As presented in Table 2, the between subjects analysis( ANOVA) showed that the anxiety group differed significantly on the history Negative and unborn Negative scale, with the anxiety group scoring significantly advanced on those subscales. As anticipated, the anxiety group scored significantly advanced than the control group on BDI( see Table 2). thus, in the coming step of the analysis, depressive symptoms were included as a covariate. The separate ANCOVA's revealed a remaining effect of anxiety on both the history Negative, F( 1, 42) = 6.8, p<0.05 and the unborn Negative scale, F( 1, 42) = 5.8, p<0.05. In the prospective time product task, the anxiety group slightly overrated the time interval, while the control group undervalued the time interval. A analogous pattern was observed in the retrospective task, where the anxiety group slightly overrated the time interval and the control group undervalued the time interval. There were no significant differences in time estimation between the groups on either of the tasks.

**Discussion**

The end of the two studies presented in this composition was to probe several aspects of temporal processing in persons with anxiety symptoms. The results constantly showed that persons with anxiety symptoms are more prone to look at their future with solicitude and negative expectation( unborn Negative time perspective) and recall their history with remorse and aversive passions( history Negative time perspective). Although conceptualizations of anxiety focus on the unborn negative exposure(,14) our studies show that persons with anxiety are also affected by a history Negative time perspective. One could argue that these findings only reflect the negative valence of the unborn Negative scale and the history Negativescale.However, we should also have set up a significant association with the Present Fatalistic scale since it also has a negative emotional valence, If this was true.

The history and the future have been linked in former neuropsychological exploration. Neuroimaging studies examining the conception of internal time trip(,37) which refers to the capability to imagine once or unborn events, suggest that people use analogous brain areas when allowing about their history and imagining their future. When imagining the unborn scripts, people tend to place these scripts by well- known( history) surrounds( 37). This explanation is also supported by studies on cases with lesions or psychopathology associated with episodic memory problems( 38). In these cases, cases parade both difficulties in recalling episodic recollections, as well as imagining their particular future( 38). For the anxiety group, there are likely negative once gests in their life histories( for case a traumatic event responsible for their current anxiety) that impact their unborn prognostications. It's also still likely that they subjectively estimate their once negatively( because of current anxiety) which would also affect their prognostications and views of the future.

We didn't find any significant patterns of time estimation poverties related to anxiety in either of our two studies independent of time estimation paradigm( prospective and retrospective) and duration length.

These results are however not harmonious with once exploration.(). For prospective time estimation, these findings can be understood in the frame of the attentional gate model( AGM)( 17). The AGM is a extensively used cognitive model for explaining prospective time estimation. It poses an internal timepiece with a trendsetter that emits beats at a constant rate. When attention is drawn to time, an attentional gate opens, and time

units are fed into an accumulator. The number of beats in the accumulator is also compared with stored representations of time intervals. The association between anxiety and duration overestimation can be explained in two ways according to the AGM(,23).

Originally, increased thrill which can be associated with anxiety leads to advanced rates of the trendsetter which means a lesser accumulation of beats( or time units) during a given time period( 3). Secondly, anxiety may be associated with lower meaningful studies and fear of the future, which may lead to an increased attention to time( 23) performing in overestimation of time in prospective time estimation tasks. In the environment of AGM, the most probable explanation for our findings is that the samples comported of persons with overall mild to moderate symptoms of anxiety. That is, the actors weren't sufficiently anxious during the experimental session for significantly affecting time estimation.

The lack of significant results in our studies is similar to the findings by Lennings and Burns( 39) concerning prospective time estimation and high tone- reported impulsivity in anon-clinical sample of scholars. Whereas other studies probing impulsivity in clinical populations have set up pronounced overestimations associated with impulsivity(,26), the former study didn't find an association between impulsivity and time estimation. The results of the present studies glasses this finding as it isn't probe conducted on severe cases of psychopathology. This means that our results concerning time estimation are presumably not generalizable to individualities suffering from severe anxiety.

Conclusions

Although the present study revealed some intriguing findings, it has several limitations. First, the small sample size renders it delicate to descry small group differences, as seen in the time estimation tasks. still, given the small effect sizes for the group differences( see Tables 1 and 2), it's doubtful that we'd have set up any significant differences indeed with a larger sample. As bandied in former sections, these results were more likely due to sample characteristics of the anxiety group. Second, time perspective was tone- reported.

unborn exploration should include fresh measures of time perspective to give further robust findings, similar as the Circles Test( 40) or the more lately developed Time relation test( 41). Both of these instruments offer ways to measure aspects of time perspective that differs from tone- report questionnaires. In the Circles Test( 40), actors are asked to draw three circles illustrating the emphasis they place on each time frame( history, present and unborn). The Time relation test is developed on the base of the Circles Test and offers a promising result to the scoring difficulties associated with the original test( 41) In this instrument, actors are offered a set of circles of standardized sizes to choose from. The Time relation test has still so far only been validated in adolescents. Using these types of instruments in combination with the ZTPI may offer more substantial findings and is a fruitful future exploration area. Eventually, the psychometric parcels of the ZTPI( and accordingly the S- ZTPI) have been blamed(,43). nevertheless, to date, the ZTPI is the preferable option for multidimensional assessment of time perspective in grown-ups and a step forward regarding limitations of former scales(,44).

Despite the limitations, our study yielded some intriguing findings. First and foremost, time perspective stands out as the time variable that reliably separates anxious and nonanxious individualities. The temporal bias towards negative aspects of the history and the future but not the present reveals intriguing features of anxiety and provides some perceptivity into the relationship between time and psychopathology. These findings also raise an important question Does anxiety lead to a prejudiced time perspective or does a time perspective with high degrees of history Negative and unborn Negative lead to increased vulnerability for anxiety? The ultimate would mean that time perspective is an important variable to consider in precluding internal health problems. This issue, concerning the direction of reason, farther highlights the significance of longitudinal studies probing the relationship between time perspective and symptom position over time. likewise, assessing time perspective biographies in persons with anxiety, depression or other conditions of internal torture, may offer a new way of conceptualizing internal torture that could give suggestions for new treatment strategies.

Unborn exploration should try to further disentangle the links between time perspective- biographies in anxiety, symptom position and possible beginning mechanisms.

## Competing interests

The authors declare that they have no competing interests

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