

WestminsterResearch

<http://www.westminster.ac.uk/westminsterresearch>

**Time Perception in First Year Undergraduates: Correlation with
Stress, Anxiety and Depression**

Koebeli, C., Edginton, T.L., Morgan, K.D. and Boubert, L.

A paper presented at the 17th International Technology, Education and Development Conference, Valencia, Spain, 06 - 08 Mar 2023, published in INTED2023 Proceedings, pp. 5932-5937.

The definitive version is available online at:

<https://doi.org/10.21125/inted.2023.1559>

The WestminsterResearch online digital archive at the University of Westminster aims to make the research output of the University available to a wider audience. Copyright and Moral Rights remain with the authors and/or copyright owners.

TIME PERCEPTION IN FIRST YEAR UNDERGRADUATES: CORRELATION WITH STRESS, ANXIETY AND DEPRESSION

C. Koebeli¹, T. Edginton², K. Morgan¹, L. Boubert¹

¹*University of Westminster (UNITED KINGDOM)*

²*City University (UNITED KINGDOM)*

Abstract

Students' transition from school to university is a very complex time for many students particularly when they experience many stressful life events. One key skill associated with academic success is time management, yet research suggests that anxiety and depression are associated with changes in the ability to perceive time accurately. Here, we investigated the relationship between stressful life events measured by the Undergraduate Stress Questionnaire; state anxiety measured with the State Trait Anxiety Inventory; depression measured by the Beck Depression Inventory II coupled with the ability to perceive 3 different types of time in a temporal order task, a temporal bisection task, and a prospective movement time estimation task in first year undergraduate psychology students. The study revealed a correlation between scores on the Undergraduate Stress Questionnaire and prospective time estimations, which suggests that students tend to underestimate the time tasks will take when they are experiencing stressful situations, which could in turn impact their studies. We discuss the findings in the context of how universities can better support students to transition more effectively from school to university.

Keywords: Time perception, stress, USQ, transition, first year undergraduates.

1 INTRODUCTION

The transition from school to university is a period of intense change for young adults (1). For many, it means moving away from home for the first time, learning to manage many aspects of independent living for the first time, alongside integrating with a new social circle of friends and adapting to new more independent ways of studying (2). All of these difficulties contribute to whether a student will complete the first year of their studies and progress through their degree or drop out from university (3). Over recent years, the demographics of university starters has changed dramatically, as a result of government policy and the subsequent increase in access. As the student population has become more similar to the general population, the needs of the student population have become more complex and diverse (4,5), to which universities are slowly responding by exploring new ways of supporting students, for instance with increase student support, grit programs and even additional mental health training and support. (6)

More students than ever are reporting symptoms of depression and anxiety, the causes of which are multifactorial including changing academic demands during secondary school education, awareness of challenging geopolitical issues, pressures associated with social media, financial difficulties and future prospects all of which contribute to the development of their coping skills in adapting to the change associated with moving to university (3,4,7). The transition is made harder for those who are first generation to study at university, students from a minority background and students with learning differences and this is exacerbated by the need to move away from their home and their support networks (8). Traditionally seen as part of the experience of growing up, it is becoming clear that for many this can lead to a range of mental health difficulties, from anxiety and depression, which can persist beyond university to become long term mental health conditions (9–11). It is therefore crucial that we better understand the needs of this new generation of students to inform the support offered to them so they can complete their studies to progress to employment and financial and emotional independence (2)

One area often reported to cause difficulty for students is time management, a skill which ultimately relies heavily on a person being able to make realistic cognitive judgements about time passing, which is crucial in planning study time and in particular working to assessment deadlines. Yet time perception is subjective and can be affected by a wide range of variables (12), such as a task's

cognitive load (13) task demand (14), or the arousal or valence of the activity (14). As well as the nature of the task and the environmental context, emotion (15,16), neurodiversity such as ADHD or autism (17) or mental health such as bipolarity (18); anxiety (16,19) and/or depression (20–22) have all been shown to alter time perception.

There are several ways in which we measure time: we can measure time passing, for instance while watching a film or a television programme it is possible to estimate how much time has passed, or we can predict how long a task is going to take, for instance waiting for the start of a class or an appointment, or we can compare different event durations (23). A number of experimental paradigms have been developed to allow researchers to measure an individual's performance on each type of time perception, revealing that time perception varies not only from person to person but also from one type of time perception event to another (23,24). Here we focussed on 3 different time perception tasks 1) the cognitive ability to perceive **temporal order**, or the order within which visual stimuli appear, 2) **temporal bisection** which measures the ability to compare the lengths of 2 different events and 3) **prospective movement estimation** which measures the ability to predict the passing of time.

AIMS

It has been established that time perception is different in people with depression and anxiety compared to healthy participants however our studies were designed to explore whether the cognitive ability to perceive temporal order, temporal bisection and prospective movement might be correlated with the experience of stressful life events, depression and state anxiety. The level of stress experienced by a student was measured using the Undergraduate Student Questionnaire (25), anxiety and depression were measured using the State Trait Anxiety Text and the Beck's Depression Inventory, respectively.

2 METHODOLOGY

2.1 Design

Students took part in 3 separate time perception experiments investigating a temporal order task (study 1), a time bisection task (study 2) and a prospective movement time estimation task (study 3). They also completed the Undergraduate Student Questionnaire (25) anxiety and depression were measured using the State Trait Anxiety Text and the Beck's Depression Inventory, respectively. Correlational relationships between the questionnaire scores and the time perception performances were tested. The studies were approved by the University of Westminster Psychology Research Ethics Committee

2.2 Participants

Participants were first year undergraduate students on a psychology degree at the University of Westminster, they were recruited through the Student Participation Scheme and participated for course credit. Each study included different participants, following the same recruitment process. Participant numbers and ages were as follows: Study 1 temporal order task: N=71, aged 18-25, mean age= 19.87 (SD=1.70); Study 2 temporal bisection: N=71, aged 18-25, mean age= 19.70 (SD=1.72); Study 3: anticipation of movement N=77, aged 18-25, mean age= 19.87 (SD=1.70).

2.3 Materials and Procedure

2.3.1 Questionnaires

The Undergraduate Stress Questionnaire (25) participants select which stressful life events associated with being an undergraduate student they have experienced from an 82-item checklist. The scoring consists of the total number of events reported to have been experienced. Scores range from 0 to 82, where a higher score indicates a higher number of stressful life events.

Beck Depression Inventory-II (26): this is a 21 item questionnaire where participants self-report how well each item describes how they have felt for the last week, ranging from 0 (not at all) to 3

(frequently). The total score is an indication of symptoms of depression at mild, moderate or severe levels.

State Trait Anxiety Inventory (27): State and trait anxiety are each measured with 20 statements which participants rate as to how accurately they describe their experience on a 4 point Likert scale from 1 (not at all) to 4 (very much so). Scores range from 20-80, where a higher score indicates higher anxiety levels.

2.3.2 Time Perception Tasks

2.3.2.1 Study 1: Temporal Order Task:

A computerised temporal order task was constructed using the experiment generator Superlab. All the tasks ran in Superlab on a Macintosh computer, participants responded by key presses on a serial response box (Psychology Software Tools).

There were 180 trials where participants were presented with a fixation cross in the centre of the screen for 500ms, followed by two squares which appeared either side of the fixation point, one after the other in quick succession, with an inter stimulus interval (ISI) of 0ms, 24ms, 48ms, 72ms or 96ms (fig 1). The participant's task was to decide which square appeared first and to respond using the correct key on the response box. The dependent variables were the number of correct responses, number of errors and reaction time (in ms).



Figure 1: Stimuli and sequence of presentation for the temporal order task design

2.3.2.2 Study 2: Temporal Bisection Task

Participants compared two timed intervals to decide which one was longer (fig 2). The stimuli consisted of identical auditory tones played in pairs, with a varying pause between the two tones in each pair sequence. In each trial, participants first heard a reference pair of tones separated by 400ms (Reference Stimulus Interval, RSI). This was followed by a 200ms ISI before the presentation of two further tones, played 310ms, 355ms, 370ms, 430ms, 445ms, 460ms or 490ms apart (Experimental Stimulus Interval, ESI). Participants were asked to decide which pair of tones had the longer interval by pressing the correct key on the response pad.

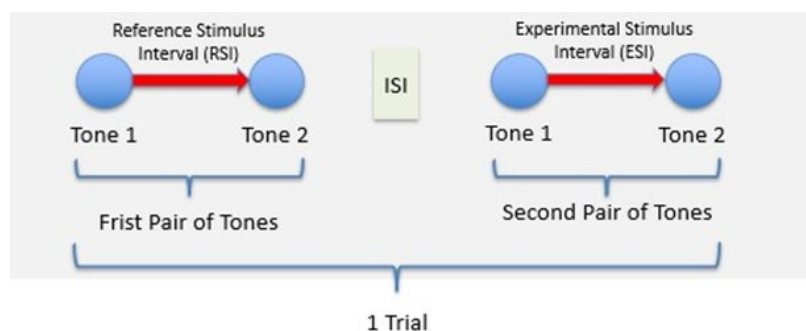


Figure 2: design of the Temporal Bisection Task. The participant was required to decide whether the ESI was longer or shorter than the RSI.

2.3.2.3 Study 3: Prospective Time Estimation: Anticipation of Movement Task:

Participants' prospective time estimation was measured with an anticipation of movement task. In each of 88 randomised trials, participants were asked to decide when a target dot moving from left to right across the screen would reach a specific vanishing area (Fig. 3). The target dot moved at one of 3 speeds (slow, medium or fast) and disappeared at one of two possible vanishing points. In half the trials, a yellow vertical line indicated the location of the vanishing point, in the remaining trials, there was no mark on the screen to indicate the vanishing areas and the participant was required to visualise it. The participant pressed the keypad when they thought the target dot was about to disappear. Performance was measured as a time estimation accuracy score, this was the difference between the actual movement duration and the participant's reaction time. Positive scores reflected overestimation and negative scores estimated underestimation of movement time.

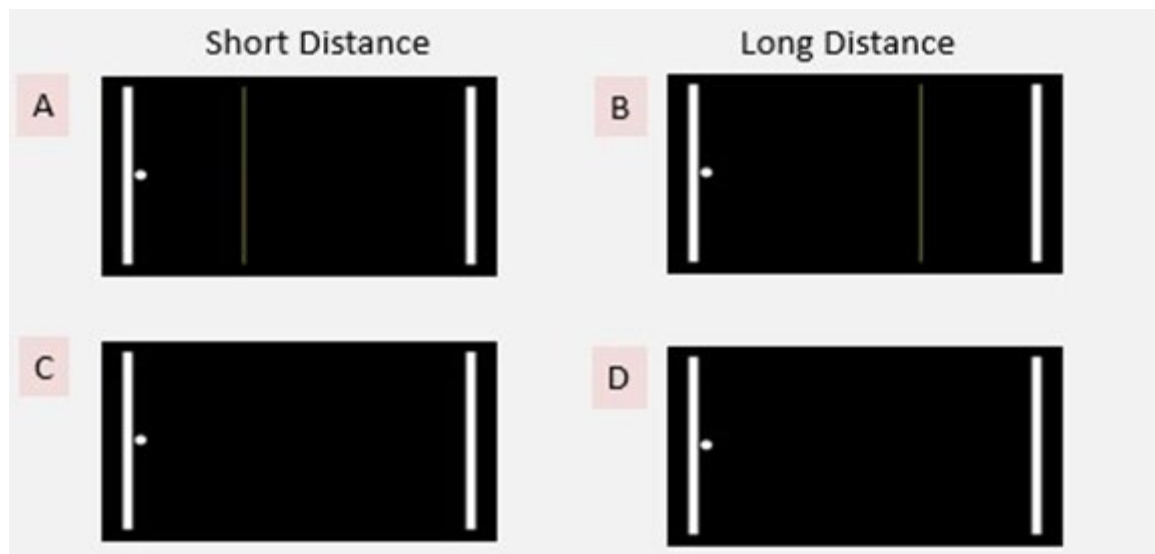


Figure 3: Prospective time estimation task design. The white target point disappeared while traveling from left to right at one of two different vanishing points (short A & C or long B & D). Half the trials provided a yellow line as a vanishing point cue (A & B).

3 RESULTS

Spearman's correlations were performed between the questionnaire scores and all the time perception scores. No significant correlations were found for either study one or study two. The correlational coefficients for study 3 are reported in Table 1 broken down according to each level of difficulty. There were significant correlations at the 1% level between scores on the USQ (SLES: number of reported stressful life events) and time estimation accuracy in the most cognitively demanding tasks, specifically fast conditions without a cue line and the fast condition with a line but a short distance to the vanishing area. Only one other correlation reached the 5% significance level between state anxiety and a lower cognitive load condition, when the dot moved at the medium speed with a cue line on the longer distance.

Table 1: Matrix of Spearman correlation coefficients from study 3 between time estimation accuracy scores from the perception of movement task and scores on the USQ, BDI and State Anxiety from the STAI. Key: Speed of the target dot: S (slow) M (medium) F (fast); presence (WL) or absence (NL) of the cue line; distance between the start of the movement and the vanishing line: short (S), long (L)

	FastNL_L	FastNL_S	FastWL_L	FastWL_S	SlowNL_L	SlowNL_S	SlowWL_L	SlowWL_S	MidS-NL_L	MidS-NL_S	MidS WL_L	MidS WL_S
USQ	.301**	.412**	0.177	.461**	0.094	-0.164	-0.073	-0.107	0.014	-0.128	0.091	-0.01
SA	0.084	0.13	0.107	0.119	0.005	0.17	0.118	0.133	-0.088	-0.167	-.272*	0.047
BDI	0.018	0.094	-0.128	0.115	0.035	0.092	0.076	0.131	0.069	-0.113	0.005	-0.04

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

4 CONCLUSIONS

The present study explored the relationship between measures of stressful life events, anxiety and depression and performance on 3 different types of time perception tasks in first year undergraduate students. Findings revealed no significant correlations between the questionnaire scores and performance on either the order task or the time bisection task, however there were significant correlations between prospective time perception accuracy in the higher cognitive load conditions and number of stressful life events. Specifically, students who reported experiencing a high level of stressful events on the USQ overestimated the time it would take an object in motion to reach its destination. The task included 3 variables to create experimental conditions of varying levels of difficulty or cognitive load as follows: 1) As the target speed increase from a slow, to medium or to a fast pace, there was more pressure to make a fast decision, 2) presence or absence of a cue line to indicate the location of the vanishing point and 3) the distance between the start and finish of the movement was short or long, the shorter distance increased the pressure for a fast response. The most difficult conditions were when the target moved fast, without a cue to indicate the vanishing point, USQ correlated with performance in both these conditions as well as the fast condition with a line, but over a short distance.

Associations between time perception and depression have been found in clinical populations who experience more severe symptoms than those seen in this population, yet we still found significant correlations between a measure of stress and time perception in these students who were overall sub-clinical. It should be noted that this correlational relationship is non-directional and does not infer causality, therefore we cannot conclude that the stress is causing the time perception errors, as these students might have come to university with poor time perception skills, which could be causing poor time management which in turn could lead to daily hassles and life events being more stressful for these students. This lack of causality in no way diminishes the importance of our findings, as they strongly highlight a link between cognitive time perception abilities and stress, which in turn can impact a student's academic performance and long-term mental health. It is the responsibility of universities to adapt to the needs of student by recognising that time perception and stress are linked, to provide resources for students to learn about their cognitive challenges and develop strategies to compensate for them, but universities must also provide a supportive environment that fosters a sense of belonging and facilitates students' integration into their new life to reduce stress.

A novel challenge for university students is managing their time to juggle and complete a wide range of competing time-sensitive and cognitively demanding activities such as navigating a new physical, social and emotional landscape, which can mean that studying and managing assessment deadlines are only a small component of what they are dealing with. Students are suddenly in a position where they need to plan to allow themselves sufficient time and mental space to focus on studying and this is often a difficult skill to acquire. Our findings suggest that while students are experiencing the transition into higher education, they are encountering more stressful life events, and this is closely linked to their ability to judge how long tasks take, and ultimately this can significantly impact their ability to cope with multiple demands, multiple deadlines and assessments. These findings should also be extended to investigate the link in neurodiverse students to provide them with customised appropriate support. In conclusion, how easily students can transition to their new surroundings and their new life

alone at university can directly impact their fundamental cognitive ability to predict how long tasks will take to complete and any attempt to improve student experience and retention must find ways to support their time management with extensions for assessment deadlines or reduce the number of stressful life events they experience during their transition.

REFERENCES

- [1] Duffy A, Keown-Stoneman C, Goodday S, Horrocks J, Lowe M, King N, et al. Predictors of mental health and academic outcomes in first-year university students: Identifying prevention and early-intervention targets. *BJPsych Open*. 2020;6(3):1–8.
- [2] Worsley JD, Harrison P, Corcoran R. Bridging the Gap: Exploring the Unique Transition From Home, School or College Into University. *Front Public Heal [Internet]*. 2021 Mar 17 [cited 2021 Mar 24];9:211. Available from: <https://www.frontiersin.org/articles/10.3389/fpubh.2021.634285/full>
- [3] Verger P, Combes JB, Kovess-Masfety V, Choquet M, Guagliardo V, Rouillon F, et al. Psychological distress in first year university students: Socioeconomic and academic stressors, mastery and social support in young men and women. *Soc Psychiatry Psychiatr Epidemiol*. 2009;44(8):643–50.
- [4] Blanco C, Okuda M, Wright C, Hasin DS, Grant BF, Liu SM, et al. Mental health of college students and their non-college-attending peers: Results from the national epidemiologic study on alcohol and related conditions. *Arch Gen Psychiatry*. 2008 Dec;65(12):1429–37.
- [5] Winstone NE, Hulme JA. 'Duck to Water' or 'Fish Out of Water'? Diversity in the Experience of Negotiating the Transition to University. *Engag Student Voices High Educ [Internet]*. 2019 [cited 2023 Feb 2];159–74. Available from: https://link.springer.com/chapter/10.1007/978-3-030-20824-0_10
- [6] Duffy A, Saunders KEA, Malhi GS, Patten S, Cipriani A, McNevin SH, et al. Mental health care for university students: a way forward? *The Lancet Psychiatry [Internet]*. 2019 Nov 1 [cited 2023 Feb 2];6(11):885–7. Available from: <http://www.thelancet.com/article/S2215036619302755/fulltext>
- [7] Vázquez FL, Blanco V. Prevalence of DSM-IV major depression among Spanish university students. *J Am Coll Heal*. 2008 Sep 1;57(2):165–72.
- [8] Turashvili T, Japaridze M. COPING STRATEGIES OF UNIVERSITY STUDENTS IN GEORGIAN CONTEXT. 2013;56.
- [9] Mazure CM. Life stressors as risk factors in depression. *Clin Psychol Sci Pract*. 1998;5(3):291–313.
- [10] Liu RT, Alloy LB. Stress generation in depression: A systematic review of the empirical literature and recommendations for future study. Vol. 30, *Clinical Psychology Review*. Pergamon; 2010. p. 582–93.
- [11] Kessler RC. THE EFFECTS OF STRESSFUL LIFE EVENTS ON DEPRESSION [Internet]. Vol. 48, *Annu. Rev. Psychol*. 1997 [cited 2020 Sep 2]. Available from: www.annualreviews.org
- [12] Eagleman DM. Human time perception and its illusions. *Curr Opin Neurobiol*. 2008;18(2):131–6.
- [13] Block F, Gellersen H. The impact of cognitive load on the perception of time. Nord 2010 Extending Boundaries - *Proc 6th Nord Conf Human-Computer Interact*. 2010;607–10.
- [14] Angrilli A, Cherubini P, Pavese A, Manfredini S. The influence of affective factors on time perception. *Percept Psychophys*. 1997;59(6):972–82.
- [15] Lake JI. Recent advances in understanding emotion-driven temporal distortions. *Curr Opin Behav Sci*. 2016;8:214–9.
- [16] Bar-Haim Y, Kerem A, Lamy D, Zakay D. When time slows down: The influence of threat on time perception in anxiety. *Cogn Emot*. 2010;24(2):255–63.
- [17] Zheng Q, Wang X, Chiu KY, Shum KK man. Time Perception Deficits in Children and Adolescents with ADHD: A Meta-analysis. *J Atten Disord*. 2022;26(2):267–81.
- [18] Northoff G, Magioncalda P, Martino M, Lee HC, Tseng YC, Lane T. Too Fast or Too Slow? Time and Neuronal Variability in Bipolar Disorder - A Combined Theoretical and Empirical Investigation.

Schizophr Bull. 2018;44(1):54–64.

- [19] Mioni G, Meligrana L, Grondin S, Perini F, Bartolomei L, Stablum F. Effects of emotional facial expression on time perception in patients with parkinson's disease. *J Int Neuropsychol Soc* [Internet]. 2015 Aug 7; Available from: <http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2015-36848-001&site=ehost-live&scope=site>
- [20] Sévigny MC, Everett J, Grondin S. Depression, attention, and time estimation. *Brain Cogn.* 2003;53(2):351–3.
- [21] Mioni G, Stablum F, Prunetti E, Grondin S. Time perception in anxious and depressed patients: A comparison between time reproduction and time production tasks. *J Affect Disord.* 2016;196:154–63.
- [22] Choi JW, Lee GE, Lee JH. The effects of valence and arousal on time perception in depressed patients. *Psychol Res Behav Manag.* 2021;14:17–26.
- [23] Block RA, Gruber RP. Time perception, attention, and memory: A selective review. *Acta Psychol (Amst).* 2014;149:129–33.
- [24] Aufschnaiter S, Kiesel A, Thomaschke R. Humans derive task expectancies from sub-second and supra-second interval durations. *Psychol Res.* 2020;84(5):1333–45.
- [25] Crandall CS, Preisler JJ, Aussprung J. Measuring life event stress in the lives of college students: The Undergraduate Stress Questionnaire (USQ). *J Behav Med* [Internet]. 1992 Dec [cited 2023 Feb 2];15(6):627–62. Available from: <https://link.springer.com/article/10.1007/BF00844860>
- [26] Beck AT, Steer RA, Brown G. Beck depression inventory–II." *Psychological Assessment.* 1996;
- [27] Spielberger C. State–Trait Anxiety Inventory for Adults. 1983;