

Perceptions of noise exposure, information overload, wellbeing and academic attainment

Hasah Alheneidi¹, Andrew P Smith¹

¹ Cardiff University, School of Psychology, Cardiff, UK (corresponding author)

Corresponding author's e-mail address: smithap@cardiff.ac.uk

ABSTRACT

The present research considers noise exposure as a component of information overload which may have a negative impact on wellbeing and academic attainment. 179 university students completed a survey consisting of an information overload scale (IOS) and the wellbeing process questionnaire. Their academic attainment scores were also added to the database. The IOS scale included questions relating to noise exposure and these were compared with other factors increasing information overload. Both the noise scores and non-noise IOS scores were associated with greater negative well-being (more stress, anxiety and depression) and lower positive well-being (happiness, positive affect, and life satisfaction). There were no significant effects of noise or IOS scores on academic attainment. Well-being has been shown to be predicted by a number of factors such as exposure to stressors, negative coping, social support and psychological capital (self-efficacy, self-esteem and optimism). When these established factors were included in the analyses, the effects of noise and other aspects of IOS could be accounted for by exposure to other stressors and were no longer significant predictors of negative or positive wellbeing.

INTRODUCTION

One explanation of the negative effects of noise on performance is that the noise acts as an extra source of information that requires extra resources. These resources are then no longer available for the task being performed and performance is impaired [1, 2]. Information overload has been studied extensively and the aim of the present research was to examine the effects of information overload on the wellbeing and academic attainment of university students. Another specific aim, which forms the basis of the present paper, was to compare information overload due to noise with information overload from other sources.

The term "information overload" was mentioned by Toffler [3] in his book "Future Shock". Toffler described information overload as the difficulty a person may have in understanding an issue and making decisions because of the high presence of information. Information overload (IO) is the state of stress experienced when the amount of information given exceeds the limit

of information user processing capacity [4]. This results in an impaired decision-making process, which can confuse the user and affect their overall work quality [5]. Several concepts, synonyms and related terms of information overload have been provided and include: cognitive overload, information fatigue syndrome, communication overload, sensory overload, knowledge overload, information anxiety, infobesity, information avoidance and social overload due to social networks services.

Numerous psychological and economic consequences of information overload result in severe implications at an individual and organisational level. Information overload is a form of cognitive barrier, whereby it blocks, limits or hampers the information-seeking process and causes frustration to the information user [6]. Research has revealed that information overload costs the US economy US\$900 billion annually [7], with resulting work stress triggering depression, anxiety, heart disease and high blood pressure [8]. However, more recent information overload implications are attributed to the evolving use of, and emerging reliability on, different internet activities, resulting in more distraction and excessive information flow. A heavy load of information confuses the user, affects their ability to set priorities, or makes prior information harder to recall [9]. Although the user can select where to focus their attention, paying attention is a cognitive limited resource that can be defective in overload situations [10]. Miller [11] hypothesised that processing performance of information is positively correlated with the received amount of information. When the information flow rises to the threshold, it leads to a cognitive decline in the ability to process the information.

Information overload in the workplace has been widely investigated and its negative consequences on employees and companies have been documented. However, there is a lack of research about information overload on students and its association with wellbeing. There is also insufficient research on whether the large amount of information students receive from academic/scholarly as well as non-scholarly/academic sources influence their wellbeing and academic performance. There are many causes of information overload and a questionnaire has been developed to measure exposure to these. The Perceived Information Overload Scale was developed by Misra and Stokols [12] and has good internal consistency ($\alpha = .86$), and validity. The scale consists of 16-items that measures two subscales of information overload, environment based and cyber-based information overload. The first part consists of nine items that explore the user's experience of information overload from cyber-based sources in the previous month, through a Likert scale of 5-points (0 = never and 4 = very often). Information users are asked about how often they felt overwhelmed to answer emails/ instant messages quickly; how often they felt that they had too many messages/emails or any social network notifications. The second part of the scale consists of seven items surveying participant's experience of the environment or place based on information overload in the last month. The questions explored include: the workplace demands exceeding the user's ability to work, as well as a noisy and distracting work and home environment. The items are summed to produce a total cyber-based information overload score and place-based information overload score. Although information overload is an indicator of stress, the findings of Misra and Stokols [12] indicate that the Perceived Information Overload Scale score and the Perceived Stress Scale score are not overlapping, which suggests that cyber-based and place-based information overload scales measure different concepts from perceived stress. Information overload and wellbeing have been investigated in five studies [13-17]. All the findings confirm the negative effect of information overload on wellbeing, although two studies demonstrated a positive effect if the internet connection is controlled.

Wellbeing is difficult to define and involves many different factors. The "wellbeing process model" we use is a holistic approach to wellbeing and attempts to provide a theoretical

framework that could lead to the development of a questionnaire that could be useful in practice and policy. The initial research was based on the Demands-Resources-Individual Effects (DRIVE) model which was developed to conduct research in occupational stress [18-22]. This model included job characteristics, perceived stress, personal characteristics such as coping styles and negative outcomes (e.g. anxiety and depression). The next version of the model [23-26] included positive characteristics such as self-esteem, self-efficacy and optimism, and positive appraisals (e.g. job satisfaction) and outcomes (e.g. positive affect and happiness). Positive outcomes form the basis of a wide number of approaches to subjective wellbeing. However, it is important to include both positive and negative aspects of wellbeing as they involve different CNS mechanisms.

An initial problem was that the wellbeing process model required measurement of many variables and that use of long scales which led to a questionnaire that was very lengthy and not very acceptable to the respondents. In order to remove this problem, short scales were developed and these were found to be significantly correlated with the longer scales from which they were derived [27-31]. The questionnaire has been modified to use in research with students [32]. The outcome measures have also been increased to include academic attainment and perceptions of workload, work efficiency and course stress [33, 34].

The general rationale behind the present study was to examine whether perceptions of information overload due to noise influence wellbeing and academic attainment when other types of information overload and established predictors of wellbeing were statistically controlled.

METHOD

Participants

One hundred and seventy-nine first year psychology undergraduate students participated in the study as part of their course requirements. The majority of the sample population (91%) were females. The age range was 18-50 years; 89.9% were 18-21 years old. Course and exam scores were collected at the end of the semester using students' ID numbers.

The Survey

Questionnaires were completed electronically in a computer laboratory at the beginning of the academic year. Consent with the key features of voluntary participation, freedom to withdraw, anonymous databases, instructions and debrief forms were provided at the start and the end of the study. The ethics committee at Cardiff University's School of Psychology approved the study.

Measuring Instruments

The survey included the Perceived Information Overload Scale (IOS) and the Student Wellbeing Process Questionnaire (WPQ). Attainment scores (examination and coursework marks) were obtained at the end of the first semester.

RESULTS

Initial analyses examined the correlations between the IOS scores and the WPQ predictors and outcomes. The three information overload scores were significantly correlated (IO due to noise/IO due to environment: $r = 0.55$; IO due to noise/IO due to media: $r = 0.30$; IO due to environment/IO due to media: $r = 0.34$). IO due to noise was negatively correlated with positive wellbeing ($r = -0.20$) and positively correlated with negative wellbeing ($r = 0.26$). IO due to environmental factors was negatively correlated with positive wellbeing ($r = -0.21$) and positively correlated with negative wellbeing ($r = 0.25$). IO due to media was not significantly correlated with positive wellbeing but was correlated significantly with negative wellbeing ($r = 0.17$). The three IO measures were also positively correlated with exposure to stressors (IO noise: $r = 0.25$; IO environment: $r = 0.30$; IO media: $r = 0.25$) and negative coping (IO noise: $r = 0.23$; IO environment: $r = 0.21$; IO media: $r = 0.23$). There were no significant correlations between the IO measures and the academic attainment scores.

Regressions were conducted with positive outcomes, negative outcomes and examination and coursework scores as the dependent variables. The three IO scores and the established predictors from the WPQ (exposure to stressors, negative coping, positive personality and social support) were the independent variables. There were no significant predictors of the attainment scores. Negative outcomes were predicted by positive personality, exposure to stressors and negative coping but not by any of the information overload scores. These results are shown in Table 1. Positive outcomes were predicted by positive personality and social support but not by any of the IO measures. This is shown in Table 2.

Table 1: Predictors of negative outcomes

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|-----------------------------|-----------------------------|--------------|---------------------------|---------------|-------------|
| | B | Std. Error | Beta | | |
| (Constant) | 37.288 | 4.952 | | 7.530 | .000 |
| IO noise | .379 | .328 | .072 | 1.155 | .250 |
| IO environment | .109 | .140 | .050 | .780 | .437 |
| IO media | .020 | .094 | .012 | .216 | .830 |
| Stressors | .257 | .056 | .281 | 4.558 | .000 |
| Social support | -.197 | .129 | -.083 | -1.533 | .127 |
| Negative coping | .310 | .123 | .148 | 2.530 | .012 |
| Positive Personality | -.690 | .086 | -.461 | -7.981 | .000 |

Table 2: Predictors of positive outcomes

| Model | Unstandardized Coefficients | | Standardized Coefficients | | Sig. |
|-----------------------------|-----------------------------|--------------|---------------------------|---------------|-------------|
| | B | Std. Error | Beta | t | |
| (Constant) | 2.955 | 1.704 | | 1.734 | .085 |
| IO noise | -.055 | .113 | -.030 | -.487 | .627 |
| IO environment | -.090 | .048 | -.116 | -1.873 | .063 |
| IO media | .028 | .032 | .048 | .879 | .381 |
| Stressors | -.023 | .019 | -.071 | -1.179 | .240 |
| Social support | .164 | .044 | .195 | 3.696 | .000 |
| Negative coping | -.020 | .042 | -.026 | -.465 | .642 |
| Positive personality | .331 | .030 | .626 | 11.138 | .000 |

DISCUSSION

The aim of the present study was to examine whether information overload due to noise was related to wellbeing and academic attainment. Information overload from noise was compared with information overload from media, such as the internet, and other demands due to work or leisure time activities. The three types of overload were correlated with each other and also with predictors of wellbeing such as stressors and negative coping. Information overload due to noise was correlated positively with negative wellbeing and negatively with positive wellbeing. There were no significant correlations between information overload from noise and attainment measures. When established predictors of wellbeing were included in the regressions there were no significant effects of any of the information overload variables for either negative or positive wellbeing. The established predictors of wellbeing had their usual associations with wellbeing which gives one confidence in the noise results.

The pattern of results is similar to other findings that show that initial effects attributed to noise actual reflect associated factors. Other recent results [35] suggest that it is possible to demonstrate associations between noise exposure and wellbeing in a sample of office workers. This effect of noise remained significant when established predictors of wellbeing and environmental satisfaction were co-varied. The exposure of the office workers may be much higher than that of students which could plausibly explain the different pattern of results. Further research investigating information overload in workers is now required to address this possibility. Alternatively, the results may reflect the fact that the students were only just starting at university when they completed the survey. Other results with student samples [36] shows that information overload from the internet is associated with poorer academic attainment and it is possible that this effect takes time to develop.

REFERENCES

- [1] Smith, A. P. (1989). A review of the effects of noise on human performance. *Scandinavian Journal of Psychology*, 30, 185 - 206.
- [2] Smith, A. P. & Jones, D. M. (1992). Noise and performance. In: *Handbook of human performance, Vol.1: The physical environment*. (eds) A. P. Smith & D. M. Jones. London: Academic Press. Pp.1-28.
- [3] Toffler, A. (1970). *Future shock*. New York: Bantam Books.
- [4] Eppler, M.J., & Mengis, J. (2004). The concept of information overload: A review of literature from organization science, accounting, marketing, and related disciplines. *The Information Society*, 20(5), 325-344.
- [5] Chewing Jr, E. G., & Harrell, A. M. (1990). The effect of information load on decision makers' cue utilization levels and decision quality in a financial distress decision task. *Accounting, Organizations and Society*, 15(6), 527-542.
- [6] Savolainen, I., Kaakinen, M., Sirola, A., & Oksanen, A. (2018). Addictive behaviors and psychological distress among adolescents and emerging adults: A mediating role of peer group identification. *Addictive Behaviors Reports*, 7, 75-81. doi:10.1016/j.abrep.2018.03.002
- [7] Spira, J., & Burke, C. (2009). Intel's war on information overload: Case study. Basex. Retrieved from <http://iorgforum.org/wp-content/uploads/2011/06/IntelWarIO.BasexReport1.pdf>
- [8] Guarinoni, M., Belin, A., Oulès, L., Graveling, R., Crawford, J., Lietzmann, J., Kaminskas, K. A. (2013). Occupational health concerns: Stress-related and psychological problems associated with work. Brussels: European Parliament's Committee on Employment and Social Affairs.
- [9] Schick, A. G., Gorden, L. A., & Haka, S. (1990). Information overload: A temporal approach. *Accounting Organizations and Society*, 15(3), 199-220.
- [10] McLeod, S. A. (2008). Selective attention. Retrieved from <http://www.simplypsychology.org/attention-models.html>
- [11] Miller, G.A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, 63(2), 81-97.
- [12] Misra, S., & Stokols, D. (2011). Psychological and health outcomes of perceived information overload. *Environment and Behavior*, 44(6), 737-759. doi: 10.1177/0013916511404408
- [13] LaRose, R., Connolly, R., Lee, H., Li, K. & Hales, K.D. (2014) Connection Overload? A Cross Cultural Study of the Consequences of Social Media Connection, *Information Systems Management*, 31:1, 59-73, DOI: 10.1080/10580530.2014.854097
- [14] Lee, H., Connolly, R., Li, K., Hales, K., & LaRose, R. (2013). Impacts of social media connection demands: A study of Irish college students. Available from <https://aisel.aisnet.org/amcis2013/SocialTechnicalIssues/GeneralPresentations/6/>
- [15] Saunders, C., Wiener, M., Klett, S., & Sprenger, S. (2017). The impact of mental representations on ICT-Related overload in the use of mobile phones. *Journal of Management Information Systems*, 34(3), 803-825.
- [16] Sonnentag, S. (2017). Being Permanently Online and Being Permanently Connected at Work: A Demands-Resources Perspective. In *Permanently Online, Permanently Connected* (pp. 258-267). Routledge.
- [16] Schafer, R. M. (1977). *The tuning of the world*. New York: Knopf.
- [17] Swar, B., Hameed, T., & Reyhav, I. (2017). Information overload, psychological ill-being, and behavioral intention to continue online healthcare information search. *Computers in Human Behavior*, 70, 416-425.
- [18] Mark, G.M. & Smith, A.P. (2008). Stress models: A review and suggested new direction. In J. Houdmont & S. Leka (Eds.), *Occupational health psychology: European perspectives on research, education and practice* Nottingham: Nottingham University Press. Pp. 111-144.
- [19] Mark, G. & Smith, A.P. (2011). Effects of occupational stress, job characteristics, coping and attributional style on the mental health and job satisfaction of university employees. *Anxiety, Stress and Coping*, 25, 63-78. Available:<https://doi.org/10.1080/10615806.2010.548088>

- [20] Mark, G. & Smith, A.P. (2012). Occupational stress, job characteristics, coping and mental health of nurses. *British Journal of Health Psychology*, 17, 505-521. Available:<https://doi.org/10.1111/j.2044-8287.2011.02051.x>
- [21] Mark, G. & Smith, A.P. (2018). A qualitative study of stress in university staff. *Advances in Social Sciences Research Journal*, 5(2):238-247. Available:<https://doi.org/10.14738/assrj.52.4195>
- [22] Mark, G. & Smith, A.P. (2018). Coping and its relation to gender, anxiety, depression, fatigue, cognitive difficulties and somatic symptoms. *Journal of Education, Society and Behavioral Science*, 25(4), 1-22. Available:<https://doi.org/10.9734/jesbs/2018/41894>
- [23] Smith, A.P. (2011). A holistic approach to stress and well-being. *Occupational Health (At Work)*, 7(4), 34-35.
- [24] Smith, A.P. & Wadsworth, E. (2011). A holistic approach to stress and well-being. Part 5: what is a good job?, *Occupational Health (At Work)*, 8(4), 25-27.
- [25] Smith, A.P., Wadsworth, E.J.K., Chaplin, K., Allen, P.H. & Mark, G. (2011). The relationship between work/well-being and improved health and well-being. Leicester: IOSH.
- [26] Wadsworth, E.J.K., Chaplin, K., Allen, P.H. & Smith, A.P. (2010). What is a Good Job? Current Perspectives on Work and Improved Health and Well-being. *The Open Health & Safety Journal*, 2, 9-15.
- [27] Williams, G.M. & Smith, A.P. (2016). Using single-item measures to examine the relationships between work, personality, and well-being in the workplace. *Psychology: Special Edition on Positive Psychology*, 7, 753-767. Available:<https://doi.org/10.4236/psych.2016.76078>
- [28] Williams, G.M. & Smith, A.P. (2012) A holistic approach to stress and well-being. Part 6: The Wellbeing Process Questionnaire (WPQ Short Form). *Occupational Health (At Work)*, 9(1), 29-31.
- [29] Williams, G.M. & Smith, A.P. (2018). Diagnostic validity of the anxiety and depression questions from the Well-Being Process Questionnaire. *Journal of Clinical and Translational Research*, 10. Available:<https://doi.org/10.18053/jctres.04.201802.001>
- [30] Williams, G.M., Pendlebury, H. & Smith, A.P. (2017). Stress and well-being of nurses: An Investigation using the Demands-Resources- Individual Effects (DRIVE) model and Well-being Process Questionnaire (WPQ). *Jacobs Journal of Depression and Anxiety*, 1:1-8.
- [31] Williams, G., Thomas, K. & Smith AP. (2017). Stress and well-being of university staff: An investigation using the Demands-Resources- Individual Effects (DRIVE) model and Well-being Process Questionnaire (WPQ). *Psychology*, 8, 1919-1940. Available:<https://doi.org/10.4236/psych.2017.812124>
- [32] Williams, G.M., Pendlebury, H., Thomas, K. & Smith, A.P. (2017). The student wellbeing process questionnaire (Student WPQ). *Psychology*, 8, 1748-1761. Available:<https://doi.org/10.4236/psych.2017.811115>
- [33] Smith, A.P. & Firman, K.L. (2019). Associations between the wellbeing process and academic outcomes. *Journal of Education, Society and Behavioural Science*, 32(4), 1-10.. Article number: JESBS 53119. ISSN: 2456-981X. DOI:10.9734/JESBS/2019/v32i430185
- [34] Smith, A.P. (2019). Student Workload, Wellbeing and Academic Attainment. In L. Longo and M.C. Leva (eds) *H-WORKLOAD 2019*. Communications in Computer and Information Science 1107. © Springer Nature Switzerland AG. https://doi.org/10.1007/978-3-030-32423-0_3 Print ISBN 978-3-030-32422-3. Online ISBN 978-3-030-32423-0
- [35] Langer, J., Taylour, J. & Smith, A.P. (in press). Noise exposure, satisfaction with the working environment, and the wellbeing process. *ICBEN 2020*.
- [36] Smith, A.P. & Izadvar, S. (2020). Effects of the internet, other media and study time on wellbeing and academic attainment of university students. *International Journal of Education Humanities and Social Science*, Vol. 3, No. 02, 1-13, ISSN: 2582-0745. <http://ijehss.com/view2.php?issue=2>