Perceptions of noise exposure, information overload, and the well-being of workers

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ABSTRACT

The present research considers noise exposure as a component of information overload which may have a negative impact on well-being. Two hundred fifty-two workers completed a survey consisting of an information overload scale (IOS) and the well-being process questionnaire. The IOS scale included questions relating to noise exposure, and these were compared with other factors increasing information overload. Univariate analyses showed that 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). Well-being is 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 predictors were statistically controlled, the effects of noise and information overload were no longer significant predictors of the well-being outcomes.

INTRODUCTION

Noise may act as a source of information that requires extra resources. These resources are then not available for the task that has to be performed, which leads to impaired performance [1, 2]. Information overload has been widely studied, and the general aim of the present study was to investigate the effects of information overload on the well-being of workers. Another aim, which is described in the present paper, was to compare information overload from noise with information overload due to other sources.

Toffler [3] defined information overload as "the difficulty a person may have in understanding an issue and making decisions because of the high presence of information". Other definitions consider information overload (IO) as "the state of stress experienced when the amount of information given exceeds the limit of information user processing capacity" [4]. This results in impaired decision-making, which can affect overall work quality [5]. Several concepts are related to information overload and include sensory overload, cognitive overload, knowledge

overload, communication overload, information fatigue syndrome, infobesity, information avoidance, information anxiety, and social overload due to media use.

Information overload leads to psychological and economic consequences, which can have severe implications at the organisational and individual level. Information overload can act as a cognitive barrier, which limits, blocks, or interferes with the information-seeking process, which then causes frustration to the user [6]. Information overload has been estimated to cost the US economy US$900 billion annually [7] and results in work stress, anxiety, depression, high blood pressure, and heart disease [8]. More recently, information overload has been attributed to the extensive use of and reliance on internet activities, which result in even greater distraction and excessive flow of information. A heavy information load may confuse the user, affects the setting of priorities, and make it harder to recall prior information [9]. Although one can select where and when to focus attention, this is a limited cognitive resource that can be impaired by information overload [10]. Miller [11] showed that when information flow increases to threshold levels, there is a cognitive decline in the ability to process new information.

Information overload at work has been widely studied, and its negative effects on organisations and employees are well known. However, there is little research on the relationship between information overload and well-being. Many things cause information overload, and a questionnaire has been developed to measure exposure to these risk factors. Misra and Stokols [12] developed the Perceived Information Overload Scale, which has good internal consistency ($\alpha = .86$), and validity. The scale has 16-items that measure two types of information overload, cyber-based and environment-based information overload. The first scale has nine items that assess information overload from cyber-based sources in the last month, using 5-point Likert scales (0 = never and 4 = very often). The questions ask about how often the person felt overwhelmed by having to answer emails/ instant messages quickly; how often they felt they had too many emails/messages or other social network notifications. The second part of the scale has seven items surveying measuring effects of environmental information overload in the last month. The questions cover excessive workplace demands and noisy and distracting work and home environments. The items in each scale are summed to give a total cyber-based information overload score and a place-based information overload score. Information overload is a risk factor for stress, but the findings of Misra and Stokols [12] showed that the Perceived Information Overload Scale score and the Perceived Stress Scale score did not overlap, which shows that cyber-based and place-based information overload scales are different concepts from perceived stress.

Information overload and well-being have been examined in five studies [13-17]. The results confirm the negative impact of information overload on well-being, although two studies demonstrated a positive effect if the use of the internet was controlled. Well-being is hard to define and involves many different factors. The "well-being process model" is a holistic approach to well-being that attempts to provide a theoretical framework that could lead to a measuring instrument that could be useful in policy and practice. The beginning of this research was the Demands-Resources-Individual Effects (DRIVE) model that was developed to carry out research in occupational stress [18-22]. This model included job characteristics, perceived stress, individual characteristics (e.g. coping styles) and negative outcomes such as anxiety and depression. Development of the model [23-26] led to the inclusion of positive characteristics (e.g. self-esteem, self-efficacy and optimism) and positive appraisals (job satisfaction) and outcomes such as positive affect and happiness. Positive outcomes are the basis of many of the approaches to subjective well-being. However, it is important to include both negative and positive aspects of well-being as they involve different CNS functions.

The well-being process model required using many variables and, if these involved a lot of items, the questionnaire became very long, which was not very acceptable to the respondents. Short scales were developed to remove this problem, and these were generally significantly correlated with the longer original scales [27-31].

The main objective of this study was to examine whether perceptions of information overload due to noise influenced the well-being of workers when other types of information overload and established predictors of well-being were statistically controlled.

METHOD

Ethical approval

The research received approval from the Ethics Committee, School of Psychology, Cardiff University and was conducted with the informed consent of the participants. A consent form, instructions and debrief form were included with the questionnaires. The aim of the study was described prior to completion of the survey.

Design

This was a cross-sectional online survey.

Sample size calculation

Tabachnick and Fidell [32] suggested the following formula for sample size calculation, which is based on the number of independent variables used in the regression analyses: $N \geq 50 + 8m$ (m = number of independent variables). A medium-size relationship between dependent and independent variable was assumed, with $\alpha = .05$, $\beta = .20$ and ten independent variables in the regression model, $N \geq 50 + (8)\ (10) = 130$. The formula suggested a sample size of 130 would be appropriate.

Participants

Two hundred fifty-four UK based employees were recruited from the Qualtrics participation panel. Qualtrics research has a project management tool that allows one to get data from specified demographics and sample size. The Qualtrics team then recruit the required sample to fulfil the research purposes by answering online questionnaires presented using the Qualtrics platform. The targetted sample were UK based employees and regular internet users. Each participant was paid £5 pounds for completing the questionnaires. Fifty-one per cent were males. Their mean age was 42 years (range= 18-65, SD= 12.7). Education levels varied from O-Level/ GCSE to PhD. Participants' annual income ranged from £13,000-£80,000. The mean number of hours spent at work each week was 37 hours.

The Survey

The survey included the perceived information overload scale, which consists of 16 items [12]. The well-being process questionnaire (WPQ short form) consisting of 15 items measuring work characteristics, demands, resources, and well-being outcomes was also completed [33]. The key noise questions were:

In the last month, how often have you felt that your home environment is too noisy?

In the last month, how often have you felt that your work environment is too noisy?

Statistical analysis

IBM SPSS 25.00 was used to conduct all statistical analyses. Data met the assumption of normality. Pearson correlations were conducted to evaluate the strength of the relationships between information overload, noise variables and well-being. Regressions were carried out to assess the impact of the information overload measures on well-being while controlling for established predictors of well-being, information overload, SNA, and positive and negative well-being variables.

RESULTS

Initial analyses examined the correlations between the Noise IO score, the general IO scores and the WPQ predictors and outcomes. The information overload score was significantly correlated with the NoiseIO score ($r=0.77$ $p < 0.001$). Noise IO was negatively associated with positive wellbeing ($r=-0.14$ $p < 0.05$) and positively associated with negative wellbeing ($r=0.48$ $p < 0.001$). Noise IO was also significantly correlated ($r=0.55$ $p < 0.001$) with negative job characteristics (e.g. high demands) and negative coping (e.g. wishful thinking; blaming self; and avoidance; $r =0.46$ $p < 0.001$). Two regressions were then carried out, with positive and negative well-being scores as the dependent variables. The predictors were: IO; NoiseIO; positive coping; negative coping; negative and positive job characteristics. The results of the positive well-being regression are shown in Table 1. Positive job characteristics and positive coping were the only significant predictors. The results of the negative well-being regression are shown in Table 2. Negative job characteristics, negative coping, general IO and low positive coping were the significant predictors.

Table 1: Predictors of positive outcomes

Model	Unstandardised Coefficients		Standardised Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	3.941	.622		6.339	.000
To what extent does your job have positive characteristics	.376	.071	.391	5.281	.000
To what extent does your job have negative characteristics	-.016	.057	-.020	-.275	.783
To what extent do you try to cope with problems in a positive way	.172	.073	.163	2.364	.019
To what extent do you deal with problems in a passive way	-.060	.051	-.078	-1.175	.241
Information overload	-.017	.014	-.113	-1.236	.217
NoiseIO	.053	.085	.058	.623	.534

Table 2: **Predictors of negative outcomes**

Model		Unstandardised Coefficients		Standardised Coefficients		
		B	Std. Error	Beta	t	Sig.
	(Constant)	1.204	.765		1.574	.117
	To what extent does your job have positive characteristics	-.004	.087	-.003	-.044	.965
	To what extent does your job have negative characteristics	.345	.071	.315	4.880	.000
	To what extent do you try to cope with problems in a positive way	-.181	.090	-.123	-2.020	.044
	To what extent do you deal with problems in a passive way	.274	.063	.255	4.347	.000
	Information Overload	.042	.017	.201	2.485	.014
	NoiseIO	.026	.105	.020	.245	.807

DISCUSSION

The present study examined whether information overload due to noise was related to well-being, and information overload from noise was compared with other sources of information overload. The exposure to noise and other aspects of information overload were correlated with each other and also with predictors of well-being such as job characteristics and negative coping. Information overload due to noise was positively associated with negative well-being and negatively with positive well-being. Exposure to noise was also correlated with negative job characteristics such as job demands and with negative coping. When established predictors of well-being were included in the regressions, there were no significant effects of the noise exposure measure on negative or positive well-being. The established predictors of well-being had their usual associations with well-being, 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 [34] suggest that it is possible to demonstrate associations between noise exposure and well-being in office workers, with the effect of noise remaining significant when environmental satisfaction and established predictors of well-being and were controlled. Office workers may be exposed to different sources of noise from the present sample, which could explain the different pattern of results. In addition, the present study included ratings of noise at home. Further research investigating noise and other types of information overload in workers is now required to address these possibilities.

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