

**A LEVEL**  
*Teacher Guide*

# PSYCHOLOGY

H567  
For first teaching in 2015

## Environmental Psychology Key Research Guide

Version 1



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# Aircraft noise exposure and resident's stress and hypertension: A public health perspective for airport environmental management

Black, D. A. & Black, J. A. (2007), *Journal of Air Transport Management* 13, (5), 264–276

## 1. Theory/ies on which the study is based

- The effects of aircraft noise on the health and wellbeing of the community must be understood before devising strategies and counter-measures.
- The term 'noise parameter', in relation to this study, is considered the noise gap index that distinguishes between aircraft noise and background environmental noise in a novel manner (Issarayangyun et al., 2004). It has been developed on the assumption that people living in areas of different background noise may have different reactions to the same aircraft noise level.
- Exposure to aircraft noise suggests there are several kinds of reflex responses (Spreng, 2000, 2004) that cause a stress reaction (emotional stress).
- Stress is defined as a non-specific, activation response to adversities or challenges in a person's life. Chronic (or long-term) suffering from stress may lead to health problems (Black & Black, 2007).
- Stress means that the individual is experiencing a physical reaction to something that is perceived as threatening or dangerous to their survival.
- Hypertension is the medical term for elevated blood pressure. Sound can impact on blood pressure.
- Noise sensitive people have a low capability to cope with a noise stimulus leading them to get more stressed than normal.
- Stress itself makes people less tolerant to an unwanted sound, or more sensitive to noise than people who are more mentally calm. For example, people who have psychiatric illness are most likely to be more noise sensitive than normal and people who have an auditory deficiency are less sensitive to noise because of the lack of their hearing ability.

## 2. Background to the study

- Governments, air traffic controllers and airport managers aim to minimise community exposure to aircraft noise as far as is practical. However health effects have been ignored when formulating environmental management plans at airports.
- Research by Goto & Kaneko (2002) found no evidence that aircraft noise is a risk factor in hypertension. However, Rosenlund et al. (2001), in a mail-back survey asking questions about individual's history of hypertension in two randomly selected groups—exposed near Stockholm Arlanda Airport, and non-aircraft noise exposed (N = 485; response rate, 73%)—concluded that the association between aircraft noise and hypertension was 'marginally significant.'
- A sample of children in primary schools within 20km of Sydney (Kingsford Smith) Airport in a longitudinal design (N = 1230 in 1994 and 1995; N = 628 in 1997), again using automated blood pressure measuring equipment and controlling for necessary confounding factors, found no statistically significant cross-sectional correlations between mean resting blood pressure and aircraft noise exposure (Morrell et al., 1997).
- Previous research e.g. Brozaft et al. (1998), Meister & Donatelle (2000), Miyakita et al. (2002), Franssen et al. (2004) has shown that exposure to high levels of aircraft noise had a significant negative relationship with general health status.
- The World Health Organisation (WHO) definition that health includes physical, psychological and social well-being (Berglund and Lindvall, 1995) was taken as a starting point for this research.
- The research presented in this paper aimed to develop a better understanding of the impacts of aircraft noise on community health and well-being by seeking to answer two core questions:
  - (i) Is health related quality of life worse in a community chronically exposed to aircraft noise than in a community not exposed?
  - (ii) Is long-term aircraft noise exposure associated with elevated blood pressure in adults via noise stress as a mediating factor?
- The research also considered implications for future public policy.
- Suggestions were also made in relation to stress management techniques as methods that could be employed to help individuals who suffer from health-related issues relating to long-term exposure to aircraft noise e.g. cognitive behavioural therapy.

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## 3. Research method

- This is a literary review of research undertaken by a multi-disciplinary team. A pilot study of a small suburb south of Sydney Airport, Australia is described. Subsequently, a wider-ranging study is reported that involved the selection of a highly exposed, noise-affected area and a control study area, not exposed to aircraft noise, with similar demographic and socioeconomic characteristics.
- It is a cross-sectional study with a matched control group with data gathered through the use of a questionnaire (a form of self-report).

## 4. Sample

- From the pilot study, the expected valid-response-rate of the health survey procedure from a mail-back survey (Dillman, 2000) was 50%. Consequently the sample sizes per group for the main study needed to be 274 (estimated sample size needed to detect 5-point difference in health status instrument score) divided by 50% (expected response rate), which yielded 548 participants. The total sample size for the main study therefore needed to be 1,096. However to improve findings, the researchers aimed to increase the sample size to 750 participants per group, making the total sample size 1,500, all of whom were sent questionnaires.
- 704 individuals returned completed questionnaires.

## 5. Outline of the procedure/study

### Pilot study

- A small residential suburb at Kurnell, located to the south of Sydney Airport, acted as a case study for the pilot test with a sample size of 100 (Issarayangyun et al., 2005b). The analysis of the findings showed the values of the noise stress scale and the noise sensitivity scale to be too high and therefore, the exclusion of some noise stress items and noise sensitivity items was recommended for the final study.

### The questionnaire

- Subjective health outcomes were measured by a questionnaire that was designed from validated, internationally recognised instruments, SF-36 (Ware and Sherbourne, 1992) that measured seven major characteristics of each participant: (1) health related quality of life (HRQoL); (2) hypertension condition; (3) noise stress; (4) noise sensitivity; (5) noise annoyance; (6) demographic characteristics; and (7) confounding factors. Some scales of the medical outcome study (MOS) 36-item short form (SF-36, v.2) (which are physical functioning, general health, vitality, and mental health) were also included in the research instrument to measure HRQoL. For each health measure, a summary score in the range of 0-100 was obtained using the SF-36 algorithm, with a higher score implying a more positive health status. Table 1 below, shows the lowest and highest scores of the selected SF-36 scales.

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## 5. Outline of the procedure/study . . . continued

Table 1. Interpretation of lowest and highest scores of selected SF-36 scales

	Definition	
	Lowest possible score	Highest possible score
<b>Physical functioning (PF)</b>	Very limited in performing all physical activities, including bathing or dressing.	Performs all types of physical activities including the most vigorous without limitations due to health.
<b>General health (GH)</b>	Evaluates personal health as poor and believes it is likely to get worse.	Evaluates personal health as excellent.
<b>Vitality (VT)</b>	Feels tired and worn out all of the time.	Feels full of pep and energy all of the time.
<b>Mental health (MH)</b>	Feelings of nervousness and depression all of the time.	Feels peaceful, happy, and calm all of the time.

- A set of closed-end (closed) questions for assessing hypertension were also developed for this study e.g. 'Have you ever been told by a doctor or nurse that you have high blood pressure sometimes called hypertension?' (1) Yes, (2) Yes, but only temporarily, (3) No, and then 'If YES, do you currently have high blood pressure?' (1) Yes, (2) No. Questions were also included to prevent distortion effects from the variables of hypertension history in participants' parents and cholesterol levels.
- The annoyance measurement included in the questionnaire consisted of two sections, each of which consisted of two questions assessing annoyance from traffic noise and aircraft noise:
  - (i) The first section measured participants' annoyance from daily activity disturbances (during the past 12 months) when at home
  - (ii) The second section asked participants to consider all items from the first section and rate their overall annoyance from each noise source by using an opinion scale (0-10) where zero meant not at all annoyed and 10 meant extremely annoyed.
- The questionnaire was designed to capture all potential confounding variables e.g. employment status, exercise activities, smoking status, alcohol consumption, nutrition.

### The study area

- For the aircraft noise exposure area, highly exposed areas around Sydney (Kingsford Smith) Airport were selected and were matched on the socio-economic status of the exposure areas with a control group area - a suburb (South Penrith), located in the western suburbs of Sydney (approximately 55km from Sydney Airport, a location not exposed to aircraft noise i.e. outside flight paths).

### The procedure

- When contacting potential respondents the cover letter explained that the study was one of environmental noise—not mentioning aircraft noise in an attempt to neutralise the likelihood of an increased response rate of those residents who are especially annoyed by aircraft noise. The questionnaire, cover letter, and a stamped, addressed, postage-paid envelope were sent to every home address (excluding apartments, commercial buildings, addresses for sale or lease, and abandoned addresses) located in the aircraft noise affected area and in the control area. However households located close to railway lines, industrial areas and major highways were excluded.

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## 5. Outline of the procedure/study . . . continued

- Fieldwork conducted by researchers at UNSW (University of New South Wales, Australia) is subject to clearance by an ethics committee and by occupation, health and safety considerations. Therefore noise measurements during night-time hours had to be avoided due to possible safety concerns for the recorder (researcher).
- Field measurements of environmental noise were undertaken according to Australian standards (Australian Standard, 1997) to determine noise at the points of receptors in the control and noise exposed study areas. Noise data were collected at 26 stations located around Sydney Airport and 3 stations in the control area from 7.00 am to 6.00pm on various days from October 2003 to November 2004. Twenty-minute samples per hour were measured using a Bruel and Kjaer sound level meter Type 2236. To analyse the background environmental noise level, the approach taken was to exclude all the aircraft noise and unusual noises (such as ambulance sirens, garbage trucks, lawn mowing, and dogs barking) from the noise time curves which results in a background environmental noise time curve. A 'high' noise group included those noise stations located on roads that are connected with highways or major roads with high traffic volume. The background environmental noise level in this group was highly influenced by traffic noise from nearby roads. The 'medium' noise group is defined as those noise stations located on roads that are linked to alternative roads (or roads with medium traffic volume). The background environmental noise level in this group was moderately influenced by traffic noise from nearby roads. Finally, the 'low' noise station group represented those locations located on roads that are not connected with any highways, major roads, or alternative through routes. The impacts of traffic noise from other roads were either very low or negligible.
- Univariate and multi-variate statistics were used to analyse the data collected.

## 6. Key findings

### Response rate

- 704 respondents completely filled in the questionnaire.
- The number of responses from participants in the control group area was a little lower than from the noise exposure area.
- Overall, the total response rate was slightly lower than the expected rate of 50%.

### Demographic and socio-economic states of the samples (data gathered from the questionnaires)

- In the total sample, ages ranged from 15-87. Age distribution was considered normal. The mean age in the control group was approximately four years higher than the noise exposure group (statistically significant using a t-test at  $p = 0.001$ ).
- In the control group, 66.1% of the sample was female – 10.1% higher than in the noise exposure group (chi-squared analysis showed this difference to be significant at  $p = 0.009$ ).
- In terms of socio-economic status, participants in the noise exposure group seemed to have a higher education ( $p = 0.001$ ) and better employment status ( $p = 0.003$ ) than the control group.
- Both groups were similar in terms of household income ( $p = 0.623$ ).
- The consumption of alcohol and salty food by participants in both groups were not significantly different.
- Participants in the noise exposure group were more likely to be smokers than the control group ( $p = 0.014$ ).
- In the control area, participants took proportionately less exercise than in the noise exposure group ( $p = 0.034$ ). Therefore the percentage of obesity in the control group was considerably higher ( $p = 0.006$ ).

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## 6. Key findings . . . continued

- The marital status between both groups was significantly different, with a higher proportion being married in the control group ( $p = 0.001$ ).
- Only 3% of the participants in the control group had insulated their house from noise compared to around 37% of the participants in the noise exposure group.

### Health and related measures (data also gathered through the questionnaires)

- Table 2 below summarises the descriptive statistics of health and related measures for both groups of participants.

Table 2. Descriptive statistics of health and related measures by both groups.

Variable	Noise exposure group	Control group	p-value
Mean physical functioning score	79.09	79.23	0.941
Mean general health score	64.49	66.08	0.370
Mean vitality score	54.58	57.02	0.128
Mean mental health score	68.02	73.53	<0.001
Hypertension	51 (15.0%)	55 (17.4%)	0.450
Hypertension in parents	154 (45.4%)	132 (41.8%)	0.297
High cholesterol level	62 (18.3%)	47 (14.9%)	0.215
Mean noise stress score	6.44 (SD=2.31)	4.25 (SD=1.93)	<0.001
Mean noise sensitivity score	27.76 (SD=7.92)	26.97 (SD=7.38)	0.193
Mean aircraft noise annoyance	6.27 (SD=3.04)	1.03 (SD=2.01)	<0.001
Mean traffic noise annoyance	2.61 (SD=2.57)	1.96 (SD=2.31)	0.001

- It appears that most of the health measures of the noise exposure group were lower than the control group. However, analysis of variance (ANOVA) revealed almost all of these differences (with the exception of the mental health score) were not statistically significant.
- The proportion of people with hypertension in the control group was slightly higher than in the noise exposure group. However the difference was not statistically significant.
- The proportion of hypertension in parents and high cholesterol level in the noise exposure group was higher, but not significantly different to those in the control group.
- The level of traffic noise annoyance was higher in the noise exposure group than the control group – significant at  $p = 0.001$ .
- The level of noise sensitivity between the two groups was not significantly different.
- Participants from the noise exposure group showed a higher level of noise stress than the matched control group, (significant at  $p = 0.001$ ).



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## 6. Key findings . . . continued

### Relationships between Health Related Quality of Life (HRQoL) factors and aircraft noise

- The study rejected the null hypotheses and concluded that when removing the linear effects of covariates, and controlling for potential confounding effects, the mean score of physical functioning, general health, vitality, and mental health of aircraft noise exposure group were significantly lower than the matched control group. This implies that HRQoL (in terms of physical functioning, general health, vitality, and mental health) of subjects from aircraft noise exposure group was worse than the matched control group.

### Prevalence of hypertension and aircraft noise

- The analyses of association between prevalence of hypertension and aircraft noise exposure were divided into two sub-sections: (a) aircraft noise exposure—chronic noise stress; and; (b) chronic noise stress—prevalence of hypertension, based on an assumption that “Aircraft noise has indirect impacts to hypertension. It disturbs daily activities and creates chronic noise stress which becomes a mediating factor for hypertension in the future”. The null hypotheses of each sub-section assumed no association between exposure and risk factors.
- For the first sub-section, analysis of results showed that there was a significant positive association/relationship between noise exposure and chronic noise stress.
- For the second sub-section, analysis of results showed there was a significant positive relationship between chronic noise stress and the prevalence of hypertension.
- The analysed findings led to the rejection of the null hypotheses and the following proposals:
  - (i) Individuals who have been chronically exposed to high aircraft noise level have the odds of 2.61 (95%) of having chronic noise stress
  - (ii) Individuals who suffer chronic noise stress have the odds of 2.74 (95%) of having hypertension compared to those without chronic noise stress.

## 7. Possible conclusions

- Individuals who are exposed long-term to high levels of aircraft noise are more likely to report stress and hypertension compared to those not exposed to aircraft noise.
- There is a statistically significant relationship between long-term exposure to aircraft noise and well-being.
- Long-term aircraft noise exposure is significantly related to chronic noise stress.
- Chronic noise stress is significantly related to hypertension.
- Individuals who live in areas exposed to aircraft noise are more annoyed by aircraft noise than individuals who do not live in such areas.
- HRQoL – health-related quality of life - (in terms of physical functioning, general health, vitality, and mental health) of individuals from aircraft noise exposure group is worse than that of individuals who live in areas not affected by aircraft noise.

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## 7. Possible conclusions . . . continued

### Implications for public policy

- Close down Sydney Airport and relocate it elsewhere: almost impossible as no suitable location has yet been found.
- Reduce aircraft noise level by employing different runway usage and flight paths: This could be achieved by operating parallel runway operations and simultaneous approaches and take-offs, unless wind direction and velocities dictate the use of the east-west runway. However the present government policy of sharing the noise makes this suggestion unlikely.
- Extend curfew hours to give extra relief from aircraft operations: unlikely as this would hamper the commercial interests of the airport owners – an extension of the curfew hours by two hours would, in the long-run, result in lost revenue in landing fees and aeronautical charges from the airlines equivalent to a maximum of 160 aircraft per day.
- Extend the building insulation scheme: the benefits of this for residents, community facilities and educational establishments would have to be calculated to argue for the enormous cost this proposal would incur.
- Provide an interest-free loan system for insulation treatments to residences affected by aircraft noise.
- Review the 1996 Airport Act to include strategies to mitigate the adverse impacts of noise on public health so airport managements are responsible for including a health impact assessment as part of their environmental management plans.

# Rotating shift work schedules that disrupt sleep are improved by applying circadian principles

Czeisler, C. A., Moore-Ede, M. C. & Coleman, R. H. (1982), *Science*, 217, (4558), 460–463

## 1. Theory/ies on which the study is based

- Circadian rhythms occur about once every 24 hours. The human sleep/waking cycle is a good example of a circadian rhythm. The circadian rhythm is important in determining sleeping patterns such as when we sleep and when we wake, every 24 hours. The normal circadian clock is set by the light-dark cycle over 24 hours. Circadian Rhythm Disorders can be caused by many factors including: shift work, pregnancy, time zone changes, medication, mental health problems, and changes in routine e.g. staying up late or sleeping in.
- The human sleep-wake cycle has evolved on a rotating planet with a regular 24-hour alternation between day and night.
- There are numerous medical and psychosocial problems associated with rotating shift work schedules - see research by, for example, Rutenfranz *et al.* (1977), Saldivar *et al.* (1977) and Reinberg (1979).
- Field studies indicate that there are sleep and digestive disorders among workers on rotating shifts (Rutenfranz *et al.*, 1977).
- Several different approaches to the problems associated with shift work schedules have been suggested – see research, for example by, Rutenfranz *et al.* (1976), Aschoff (1978).
- In normal human beings the endogenous free-running period of the sleep-wake cycle averages 25 hours, but that cycle can usually be entrained by periodic environmental time cues which are within 1 to 2 hours of the endogenous period, (Wever, 1979). Thus the typical range of entrainment in man easily accommodates normal synchronisation to the 24-hour period of the earth's rotation. This range allows in any one cycle only a small phase advance with respect to environmental time but a 2- to 3-hour phase delay (Czeisler *et al.*, 1981). This explains why adaptation is more rapid after westbound travel (requiring a phase delay) than after eastbound travel (requiring a phase advance) (Klein & Wegmann, 1979). Therefore 'East to West is Best'.

## 2. Background to the study

- Within the past 50 years, the need for round-the-clock operations in many industrial plants and emergency services has led to major changes in the day-night schedules to which 26.8% of the U.S. work force is exposed, many of whom work shifts which rotate between night, evening, and daytime duties.
- Previous research has shown that rotating shift workers are often dissatisfied with the features of their schedules that violate circadian principles.
- Prior to this study, three major strategies had been used to address the problems of adaptation to shift work:
  - (i) To schedule workers on straight shifts without rotation. However, it is often difficult to staff the night shift, and straight shift scheduling still results in conflicting environmental synchronisers for the night worker who adopts daytime activities for social reasons on days off.
  - (ii) To rotate from one shift to the next rapidly, in order to escape the consequences of partial temporal adaptation. However, the circadian system may be affected, even on rapid rotation regimes, since a change from the phase advance to the phase delay direction of a rapid rotation system results in some improvements in both psychological and physiological measures.
  - (iii) To take advantage of differences between individuals in measurable properties of the circadian timing system such as rhythm amplitude, to select individuals with the greatest tolerance for working or sleeping on abnormal schedules.

# Rotating shift work schedules that disrupt sleep are improved by applying circadian principles

Czeisler, C. A., Moore-Ede, M. C. & Coleman, R. H. (1982), *Science*, 217, (4558), 460–463

## 2. Background to the study . . . continued

- Because previous research has indicated that most rotating work schedules are outside the range of entrainment of the endogenous pacemaker which regulates the human circadian sleep-wake cycle, Czeisler *et al.* postulated that a practical and effective intervention would be to resolve this aspect of the shift work problem. Their aim was to show that when schedules are introduced which take into account the properties of the human circadian system, subjective estimates of work schedule satisfaction and health improve, personnel turnover decreases and worker productivity increases.
- The researchers' strategy was to take advantage of those properties of the circadian system that individuals share in common: the longer than 24-hour endogenous period and the limited range of entrainment by comparing 33 workers who continued to change shifts each week and 52 others who rotated shifts by phase delay once every 21 days on measures of job satisfaction, health indices, personnel turnover and productivity.
- The researchers hypothesised that work schedules that rotate should do so by successive phase delays and that the interval between phase shifts should be as great as is practical.
- For 10 years at the Great Salt Lake Minerals and Chemicals Corporation plant in Ogden, Utah, weekly shifts were rotated with each crew working a given eight-hour shift for seven days before rotating to the preceding eight-hour shift. Hence the scheduled work time rotated in a phase advancing direction from " (midnight to 8 a.m.) to 'swing' (4 p.m. to midnight) to 'day' (8 a.m. to 4 p.m.) shift.

## 3. Research method

- This study used the self-report method, through the use of questionnaires to gather data in relation to measures of worker satisfaction, worker health, personnel turnover, and productivity before and after the introduction of new shift work schedules. An experimental method was also used, as the researchers manipulated the shift work schedules of workers.

## 4. Sample

- 85 male rotating shift workers, aged 19 to 68 (mean + standard deviation: 3 1.4 + 10.0), with a control group of 68 male non-rotating day and swing shift workers with comparable jobs, aged 19 to 56 (mean + standard deviation : 27.3 + 8.2), at the Great Salt Lake Minerals and Chemicals Corporation in Ogden, Utah.
- Response rate was 84%.

# Rotating shift work schedules that disrupt sleep are improved by applying circadian principles

Czeisler, C. A., Moore-Ede, M. C. & Coleman, R. H. (1982), *Science*, 217, (4558), 460–463

## 5. Outline of the procedure/study

- Each worker (participant) was given the job descriptive and health indices of Smith, Kendall and Hulin (1969), and sleep-wake and schedule preferences questionnaires to complete before new shift work schedules were introduced.
- A rotating work schedule was designed and introduced that would take into account the properties of the circadian timing system which focused on two key issues: the direction of rotation and the interval between phase shifts.
- Shift workers (the participants) on phase advancing work schedules were divided into two groups and placed on phase delay schedules: 33 workers continued to change shifts each week and 52 others rotated shifts by phase delay once every 21 days. The 21-day phase delay schedule was originally designed so that work hours were shifted gradually by one to two hours per day for five days until the new shift time was attained. This procedure was eliminated after a month when it proved inconvenient for the workers' family life and car-pooling arrangements; thereafter an eight-hour phase delay was undertaken on every 21st day.
- Before implementation of the schedule, all workers and managers attended an audio-visual presentation on the basic properties of the circadian sleep-wake cycle that had suggestions for adjusting their sleep time to their schedule, and each received an educational booklet designed for the workers at this facility.
- The workers' preferences were evaluated from other questionnaires distributed three months after the introduction of the new schedules, and personnel turnover and plant productivity were analysed nine months after the introduction of the new schedules.

## 6. Key findings

### Prior to the introduction of the new shift schedules

- The rotators reported significantly more [ $\chi^2(1) = 26.4, P < .001$ ] problems with insomnia than did non-rotators.
- 29% of the rotators reported that they had fallen asleep at work at least once during the previous three months.
- A major complaint was that the schedule changed too often.
- 81% reported that it took two to four days or more for their sleep schedule to adjust after each phase advance; this included 26% who said they were never able to adjust before being rotated again.

### After the introduction of the new shift schedules

- The workers clearly preferred the phase delay direction of rotation.
- Complaints that the schedule changed too often dropped from 90% to 20% among the workers on the 21-day phase delay rotation schedule.
- There was a substantial increase on the schedule satisfaction index, improvements in the health index and a reduction in personnel turnover.
- The rate of potash harvesting by men operating front-end loaders in the evaporation ponds and the rate of processed potash production in the plant increased after the introduction of the new schedule. It was noted that these increases in productivity were maintained in the harvest season which followed the completion of this study period.

# Rotating shift work schedules that disrupt sleep are improved by applying circadian principles

Czeisler, C. A., Moore-Ede, M. C. & Coleman, R. H. (1982), *Science*, 217, (4558), 460–463

## 7. Possible conclusions

- Work schedules that rotate by phase delay with an extended interval between each rotation are most compatible with the properties of the human circadian timing system.
- The application of circadian principles to the design of schedules can maintain the temporal integrity of the circadian system and minimise for the shift worker any detrimental consequences of circadian disruption.
- The application of circadian principles to the design of schedules improves shift workers' job satisfaction.
- The application of circadian principles to the design of schedules improves shift workers' health indices.
- The application of circadian principles to the design of schedules decreases personnel turnover.
- The application of circadian principles to the design of schedules increases productivity.

# Motivating recycling behaviour: A quasi-experimental investigation of message and source strategies

Lord, K. R. (1994), *Psychology & Marketing*, 11, (4), 341–358

## 1. Theory/ies on which the study is based

- Recycling is an essential element of any long-term solution to the increasing problem of refuse disposal. Therefore how to motivate full participation in recycling programmes is a critical concern of policy makers.
- Inducing individuals to make a public commitment to environmentally responsible behaviours e.g. reduced energy consumption, increased use of public transport, newspaper recycling; results in greater compliance. (Bachman & Katzev, 1982; Burn & Oskamp, 1986; Pallak, Cook & Sullivan, 1980; Pardini & Katzev, 1984; Wang & Katzev, 1990).
- Self-monitoring (requiring individuals to keep a record of their behaviour (Pallak *et al.*, 1980) and providing financial incentives (Bachman & Katzev, 1982) can also have a positive effect on environmentally responsible behaviours.
- Fear appeals may be effective in encouraging environmentally responsible behaviours.
- Social influence may explain increased commitment (Wang and Katzev, 1990).
- Manipulated social norms can affect decision-making in relation to environmentally responsible behaviours (Cialdini, Reno and Kallgren, 1990).
- Individuals apply a cost-benefit strategy when deciding whether or not to adopt environmentally responsible behaviours.
- For any desired change in cognitive structure to occur, the persuasive claims or arguments on which the altered beliefs are to be based must become the focus of the consumer's selective attention processes. Principles of perceptual vigilance and perceptual defence suggest that highly valued stimuli are likely to be actively approached, whereas low-valued stimuli may be avoided altogether (Engel, Blackwell and Miniard, 1986). Even if influence attempts break through the barrier of perceptual defence, they may (particularly if unpleasant) become subject to reactance and thus be discounted, counter-argued or resented as a threat to individual freedom of choice (Brehm, 1966). Therefore a positively framed message should have a better opportunity of affecting beliefs than a negative appeal (Lord, 1994).
- The Lord and Putrevu (1993) information-processing model of consumer response to advertising and publicity posits a processing-motivation advantage for publicity over advertising.

## 2. Background to the study

- Refuse disposal problems have plagued America's largest cities in recent years. These problems are now being felt in smaller communities and across national borders.
- In 1990, Americans threw out 196 million tons of refuse, more than twice as much as in 1960.
- News accounts show that refuse is also making its way to American landfill sites from Canada and even foreign ports, indicating the international scope of the problem.
- It is questionable whether obtaining meaningful public commitments, the use of self-monitoring techniques, or providing financial incentives are practical and cost effective ways of motivating individuals to adopt environmentally responsible behaviours on a widespread basis. Other initiatives may be more practical. Burn and Oskamp (1986) employed written persuasive communication, incorporating a fear appeal, to increase household recycling. Wang and Katzev (1990) implicated social influence in explaining results obtained from a group-commitment manipulation. Cialdini, Reno and Kallgren (1990) found manipulated social norms to affect the decision to litter in public places. De Young (1986) identified satisfactions derived from positive recycling behaviour.

# Motivating recycling behaviour: A quasi-experimental investigation of message and source strategies

Lord, K. R. (1994), *Psychology & Marketing*, 11, (4), 341–358

## 2. Background to the study . . . continued

- This study examines the relative efficacy of:
  - (i) Two different message approaches - positively and negatively framed advocacy appeals constitute the message approaches (positively framed messages emphasise the 'relative benefits associated with compliance'; negatively framed messages draw attention to the 'detriments associated with rejection').
  - (ii) Three source strategies in enhancing citizen beliefs about, attitude towards, and behavioural compliance with community recycling programmes - message sources examined are: (a) advertising appeals (e.g. a municipal government could advertise itself or encourage environmentally responsible firms within its jurisdiction to incorporate such messages in their advertisements); (b) publicity-generated news items (which could, for example, be generated through some public-relations efforts on the part of municipal governments or other entities wanting to encourage recycling); (c) personal influence appeals (which could, for example, be stimulated by encouraging environmentally responsible citizens to invite their acquaintances to participate fully in recycling programmes).
- This study aimed to show that exposure to each of the above message and source strategies yields more favourable attitudes towards recycling and a higher level of participation in recycling programmes than no message exposure. The researchers anticipated that a positively framed message would have a better opportunity of affecting beliefs than a negative appeal – an influence that may be expected to extend to a more favourable attitude towards recycling (because individuals will respond to the feelings of satisfaction and other benefits gained from recycling).
- The study therefore had the following hypotheses:
  - (i) Attitude toward recycling is improved for households receiving an advocacy message, relative to unexposed (control) households (H1).
  - (ii) Delivery of an advocacy message yields an increase in observed recycling, with households receiving no message (control) showing no significant change in curb side (pavement) collection amounts (H2).
  - (iii) Consumer beliefs about positively balanced benefits of recycling are more readily formed upon exposure to an advocacy message than are beliefs about negatively framed consequences of failure to recycle (H3).
  - (iv) Positively framed messages result in more favourable attitudes toward recycling than negatively framed messages (H4).
  - (v) Consumer belief in negatively framed arguments about the consequences of failure to recycle is greatest when those arguments are conveyed in the form of a publicity-generated news story and least when they appear as part of an advertising message (H5).
  - (vi) Among consumers exposed to negatively framed messages, attitude toward recycling is greatest when the message is conveyed in the form of a publicity-generated news story (H6).
  - (vii) Messages conveyed via social influence (i.e. from a personal acquaintance) result in a more favourable attitude toward recycling in a positively framed than in a negatively framed condition (H7).
  - (viii) An advocacy message from a personal acquaintance elicits a greater increase in recycling behaviour than a comparable message from an advertising or news (publicity) source, with strongest behavioural change arising in the personal influence–negatively framed message condition (H8).



# Motivating recycling behaviour: A quasi-experimental investigation of message and source strategies

Lord, K. R. (1994), *Psychology & Marketing*, 11, (4), 341–358

## 3. Research method

- Lord states in the original article that this was a quasi-experimental field study.
- The design was a full-factorial three (message source: advertisement, newspaper article, personal letter from acquaintance) x 2 (message framing: positive, negative) between-subjects/participants design, plus a control condition.

## 4. Sample

- Data were obtained from 140 households in a north-eastern metropolitan community in the USA served by a curbside (pavement) recycling programme:
  - 20 households received the advertisement with a positive message
  - 20 households received the advertisement with a negative message
  - 20 households received a newspaper article with a positive message
  - 20 households received a newspaper article with a negative message
  - 20 households received a personal letter from acquaintance with a positive message
  - 20 households received a personal letter from acquaintance with a negative message
  - 20 households received no message at all.
- Quota sampling was employed for all but the personal-influence conditions, to ensure the representation of multiple neighbourhoods in the community characterised by diverse socioeconomic characteristics. (Quota requirements could not be as tightly controlled in the personal-influence as in the other conditions, because of the need to target personal acquaintances of the student assistants. Even in those conditions however, the students were asked to target households of prescribed characteristics in order to match as closely as possible the community's demographic diversity).
- The sample was somewhat upwardly skewed demographically, relative to the average socioeconomic status from which it was drawn (presumably as a consequence of a slight bias toward the inclusion of suburban neighbourhoods in the quota sample – an attempt to avoid, for safety reasons, sending student assistants into certain inner-city neighbourhoods to collect data).
- Of the questionnaire respondents:
  - 57% were female.
  - Ages ranged from 19 – 65 years, with a mean of 34.9 years.
  - Educational attainments ranged from some high school to graduate degrees (median – some college).
  - Household income ranged from \$10,000 to \$130,000 (mean \$40,920).
  - Demographic profiles did not differ significantly between conditions.

# Motivating recycling behaviour: A quasi-experimental investigation of message and source strategies

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## 5. Outline of the procedure/study

### The stimuli

- The stimuli employed as manipulations of the above factors were written persuasive communications advocating full participation in the community's curb side recycling programme. Negatively framed messages described the risks (physical, environmental and social) of failing to recycle and some of the possible measures failure could necessitate. Positive appeals focused on environmental benefits, savings to the community and personal and social satisfactions arising from full participation in the recycling programme. Both messages reminded recipients of the items that were recyclable and the mode of pickup.
- In the advertisement condition, the message had the appearance of an advert and was attributed to a fictitious company claiming to be a distributor of environmentally friendly products in the region.
- In the publicity (news article) condition, it was described as having recently appeared in a local news publication.
- In the personal influence condition, it appeared in the form of a letter, signed by a student assistant and addressed to a personal acquaintance.

### Data collection proceeded in the following stages

- (i) On curb side collection day of the first week, student assistants discreetly observed and recorded on an observation form the contents of the test household's recycling bin.
- (ii) On the following day, they left the stimulus message (the version appropriate to the condition to which the household had been assigned) at the front door of the test household, avoiding face-to-face contact (this step was omitted for the households in the control condition).
- (iii) On curb side collection day of the following week, the observation of recycling bin contents was repeated (to assess behavioural impact of the test message).
- (iv) On the day after the second observation, the student assistants contacted and delivered a questionnaire to the adult member of the household most involved with sorting and taking out the refuse (this comprised the first face-to-face contact between the student assistants and sample-household members). The respondent was assured of anonymity and was asked to return the questionnaire in a sealed envelope, which would be submitted unopened and without household identifiers to the individual responsible for data entry.

### Measures

- The observation form assessed the quantity of items placed in recycling bins by the sample households, in each of the categories accepted by the community's recycling programme (newspapers/magazines, corrugated cardboard, glass bottles/jars, etc.).
- The follow-up questionnaire:
  - (i) Assessed beliefs in the arguments raised by the messages by asking participants to evaluate the truthfulness of each of several statements, some of which were the positively and negatively framed claims made by the message in its different versions, using a 7-point scale anchored by 'definitely false' and 'definitely true' and scored such that the maximum score was attached to a 'definitely true' assessment with respect to a test message claim.
  - (ii) Four 7-point semantic differential items measured attitude toward recycling (good-bad, wise-foolish, harmful-beneficial, favourable-unfavourable). In this and other multiple-item scales, reverse coding was used as needed to attach the appropriate valence to scale anchors.

# Motivating recycling behaviour: A quasi-experimental investigation of message and source strategies

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## 5. Outline of the procedure/study . . . continued

- (iii) Demographic information was collected from the test households (gender and age of the person completing the questionnaire, highest level of education attained by any household member, and the annual household income).
- (iv) Attitude toward the message (obviously, omitted in the control condition) was measured using eight 7-point semantic-differential items (good-bad, wise-foolish, harmful-beneficial, favourable-unfavourable, persuasive-unpersuasive, uninformative-informative, weak-strong, and believable-unbelievable).

## 6. Key findings

- H1 (predicted an attitudinal benefit for advocacy messages, regardless of framing or source condition:
  - At an aggregate level this hypothesis was supported. Participants in the experimental groups demonstrated a more favourable attitude toward recycling than did respondents from control households (2.19 and 1.72 respectively;  $t = 3.42, p < 0.01$ ).
  - However a comparison of each condition with the control group revealed that not all enjoyed the expected additional advantage. Attitude was significantly more favourable in the personal-positive, advertising-positive and publicity-negative conditions (2.43, 2.24, and 2.23, respectively; all  $t$  values  $> 2.30, p < 0.05$ ), and marginally so in the ad-negative and publicity-positive conditions (2.17 and 2.15 respectively; both  $t$  values  $> 1.18, p < 0.10$ ) In the personal-negative condition, attitude toward recycling was not significantly different from that observed in the control condition (1.91;  $t = 0.76, p > 0.10$ ).
- H2 (predicted that delivery of an advocacy message would increase household participation in the recycling programme, relative to the control group):
  - The combined treatment (experimental) groups showed a significant increase in both the number of recycling categories (mean difference score from the first to the second week of 0.42;  $t = 4.00, p < 0.01$ ) and the total number of items set out for recycling (mean difference 3.93;  $t = 3.52, p < 0.01$ ).
  - The control group showed no significant change with respect to either behavioural measure (number of recycling categories or total number of items set out for recycling).
- H3 (predicted an advantage for positively framed messages (relative to negative framed messages) in affecting citizens' beliefs about recycling):
  - The data supports this hypothesis.
  - Those exposed to the positively framed message manifested a significantly higher level of belief in statements that constituted that message's rationale for participation in the community recycling programme than did individuals in the control group (5.71 and 2.50, respectively;  $t = 3.83, p < 0.01$ ) and those exposed to the negatively framed message (mean 3.20;  $F = 15.72, p < 0.05$ ).
  - Participants in the negative-appeal condition did not differ significantly in their perception of truthfulness of that message's arguments from their control-group counterparts who were not exposed to the message.
- H4 (that positively framed messages result in more favourable attitude toward recycling than negatively framed messages):
  - There was a significant effect of message framing showing that the positively framed message led to a more favourable attitude toward recycling than did the negative appeal.

# Motivating recycling behaviour: A quasi-experimental investigation of message and source strategies

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## 6. Key findings . . . continued

- H5 (predicted that consumer belief in negatively framed arguments about the consequences of failure to recycle is greatest when those arguments are conveyed in the form of a publicity-generated news story and least when they appear as part of an advertising message):
  - Findings did not support this hypothesis as no significant difference between sources was found.
- H6 (posited an interaction between framing and source, such that negative appeals would exert their most positive attitudinal impact when conveyed in a publicity-generated news item):
  - The source-framing interaction was significant ( $F = 4.18, p < 0.05$ ) and directionally consistent with the hypothesis.
  - However, although attitude toward recycling as observed in the negative appeal-publicity condition was significantly greater than then obtained for the same message conveyed by a personal acquaintance ( $p < 0.05$ ), it did not differ significantly from that generated by the advertising source so H6 was only partially supported.
- H7 (predicted messages conveyed via social influence (i.e. from a personal acquaintance) result in a more favourable attitude toward recycling in a positively framed than in a negatively framed condition):
  - Attitude toward recycling was significantly higher among households receiving the positively framed message than among those in the negative-appeal condition (2.43 and 1.91, respectively;  $t = 3.44, p < 0.01$ ).
- H8 ( predicted superior behavioural results for a message from a personal acquaintance):
  - The personal negative condition showed the greatest increase in recycling behaviour (7.68;  $t = 3.32, p < 0.01$ ).
- Overall, the pooled data from the experimental groups revealed an increase in recycling behaviour that was not observed within the control group.

## 7. Possible conclusions

- Consumers prefer positively framed messages over those that expose them to the unpleasantness of the adverse consequences of failure to recycle.
- Individuals are more likely to believe arguments raised in positive appeals than those raised in negative appeals in relation to recycling behaviours.
- Positively framed messages have a more favourable impact on attitude toward recycling than negative appeals.
- Conveying a negatively framed message via a message from a personal acquaintance exacerbates its negative attitudinal consequences.
- The most effective way to increase recycling behaviour is to convey a negatively framed message via a personal acquaintance.

# Evaluation of a configural vital sign display for intensive care unit nurses

Drews, F. A. & Doig, A. (2014), *The Journal of Human Factors and Ergonomics Society* 56 (3), 569–580

## 1. Theory/ies on which the study is based

- The intensive care unit (ICU) is a specialised hospital environment where critically ill and injured patients receive continuous physiological monitoring (Drews, 2013).
- Standard vital signs acquired continuously and displayed on patient monitors include blood pressure, oxygen saturation, and heart and respiratory rates.
- Traditional monitoring displays present vital signs numerically, whereas graphical data presentation on the main screen is often limited to pressure waveform morphology (e.g., plethysmography or arterial blood pressure). Trending data of vital signs are generally not presented on the main screen, but are accessible in a submenu.
- Graphical patient displays provide an enhanced interface between the monitored system (the patient) and the user (the clinician) with the majority being developed for cardiopulmonary monitoring during anaesthesia (Albert *et al.*, 2007; Blike, Surgenor, & Whalen, 1999; Gurushanthaiah, Weinger, & Englund, 1995; Jungk, Thull, Hoeft, & Rau, 1999). However, other patient display applications have been reported (Cole & Stewart, 1993; Mitchell, Burr, & Kirkness, 2002; Wachter, Agutter, Syroid, Drews, & Weinger, 2003).
- Anders *et al.* (2012) developed an ICU graphical information display that integrates a comprehensive array of clinical variables. The display provides a timeline for many variables and organises variables by physiological system (displaying related variables in close proximity).
- ICU nurses typically care for two patients in different rooms, intermittently monitoring their patients at the bedside and from remote monitoring displays.
- A primary cognitive task of ICU nurses is to determine whether a patient is stable. This involves the selection of relevant patient variables and their integration into a mental representation of the patient's physiological state (Doig, Drews, & Keefe, 2011).
- Although the diagnosis of medical conditions is not part of nurses' scope of practice, nurses do assess patients based on available data and identify potential causes of the patient's condition (Aitken, 2000; Doig *et al.*, 2011; Effken *et al.*, 2008; Koch, Sheeren, & Staggers, 2009; Reischman & Yarandi, 2002).
- Processing information from multiple data sources requires considerable cognitive effort as each variable is examined and integrated to form an assessment (Vicente, Christoffersen, & Pereklita, 1995). Therefore, understanding the relationships among variables and the causes of physiological changes can be time-consuming and cognitively demanding. Consequentially, non-integrated numerical displays create potentially unnecessary mental demand for ICU nurses (Drews *et al.*, 2012; Potter *et al.*, 2005).
- To cope with these challenges, nurses use cognitive strategies such as stacking (i.e., switching to another task before one is completed) and preparatory anticipation of the patient's or physician's needs (Ebright *et al.*, 2003). ICU nurses must also frequently shift attention from one to another patient (Potter *et al.*, 2005) because of staffing demands and interruptions (Biron, Loiselle, & Lavoie-Tremblay, 2009; Ebright *et al.*, 2003; Potter *et al.*, 2005; Tucker & Spear, 2006; Westbrook *et al.*, 2010). Interruptions can cause task omissions (Grundgeiger & Sanderson, 2009) and may predispose to a failure to detect physiological deterioration (Rich, 1999).
- In many clinical events (for cardiac arrest, Smith & Wood, 1998) the presentation is not sudden but rather deterioration is incremental and sometimes fluctuating. Because such changes will only be apparent in trend data, they can be difficult to detect (McDonnell *et al.*, 2013; National Patient Safety Agency, 2007; Rich, 1999), increasing their morbidity and mortality (Buist *et al.*, 2004; McGloin, Adam, & Singer, 1999; Subbe *et al.*, 2001).

# Evaluation of a configural vital sign display for intensive care unit nurses

Drews, F. A. & Doig, A. (2014), *The Journal of Human Factors and Ergonomics Society* 56 (3), 569–580

## 2. Background to the study

- Patient monitoring in the ICU is performed by nurses.
- Alarms have been used to support nurses' cognitive work. However, alarms are largely activated based on a single parameter crossing a threshold, thus reinforcing the nurses' difficulties attaining a holistic view of the patient state. In addition, alarms in the ICU are often ineffective because of the high volume of false positive notifications (Siebig *et al.*, 2009; Tsien & Fackler, 1997) and nurses' inability to consistently identify the alarm source (Crop *et al.*, 1994; Momtahan, Hetu, & Tansley, 1993). Moreover, by the time an alarm sounds, the opportunity for early intervention may be long past. For these reasons, visualisation of physiological trends has been identified as a priority for ICU patient monitoring (Doig *et al.*, 2011; Drews, 2008).
- Some limitations in the direct transfer of a graphical cardiovascular monitoring display from the operating room (OR) to the ICU were illustrated by Doig (2006), who found that ICU nurses using a graphical display had less diagnostic accuracy than when using a traditional display. In contrast, anaesthesiologists who used the graphical display were more accurate (Agutter *et al.*, 2003; Albert *et al.*, 2007).
- Effken, Kim, and Shaw (1997) found that ICU nurses performed better during medication administration when using configural displays for vital signs monitoring compared to a control condition.
- In response to the limitations of traditional, numerical displays, significant effort and expense have been invested to advance human– system interfaces for patient monitoring in health care (e.g., Doig *et al.*, 2010; Effken *et al.*, 2008; Koch *et al.*, 2013; Miller, Scheinkestel, & Steele, 2009; Zhang *et al.*, 2002).
- One limitation of current numerical displays is their promotion of a sequential and piecemeal approach to data interpretation (Drews & Westenskow, 2006), instead of supporting cognitive data integration (Koch *et al.*, 2013; Miller *et al.*, 2009; Wickens & Carswell, 1995).
- Current display technology in the intensive care unit (ICU) is not optimised for fast recognition and identification of physiological changes in patients. Therefore, according to Drews and Doig, to support nurses more effectively, graphical or configural vital signs (CVS) displays need to be developed and evaluated.
- The aim of this study was therefore to (a) develop and (b) evaluate a configural vital signs (CVS) display designed to support rapid detection and identification of physiological deterioration by graphically presenting patient vital signs data.

# Evaluation of a configural vital sign display for intensive care unit nurses

Drews, F. A. & Doig, A. (2014), *The Journal of Human Factors and Ergonomics Society* 56 (3), 569–580

## 3. Research method

- This was a laboratory experiment for which a CVS display was developed based on findings from studies of the cognitive work of ICU nurses during patient monitoring.
- The independent variable (IV) which was manipulated by the researchers - was whether the nurse was asked to interpret data presented in a traditional numerical format or whether the nurse was asked to interpret data using the CVS display.
- The dependent variable (DV) was the response time and accuracy in clinical data interpretation (assessed across four scenarios).
- The study was approved by the institutional review board (University of Utah).
- The simulation took place in the Applied and Basic Cognition Laboratory of the Department of Psychology at the University of Utah. Therefore, the environment was artificial and did not take place in the workplace.

## 4. Sample

- A total of 42 registered nurses with critical care training and a minimum of 1 year's ICU experience interpreted data.
- 21 nurses interpreted data in a traditional, numerical form (the control group).
- 21 nurses interpreted data on the CVS display (the experimental group).

Table 1. Age, experience, and ICU experience for all participants and for participants in both conditions

	Age in years			Experience in years			ICU experience in years			% Female	% Male
	Mean	Median	Range	Mean	Median	Range	Mean	Median	Range		
<b>All participants (n = 42)</b>	44.59	46	25-64	10.44	10	2-35	8.48	8	2-30	69	31
<b>CVS display group (n=21)</b>	45.42	47	25-64	10.40	10	2-35	8.45	8	2-30		
<b>Control group (n = 21)</b>	43.76	46	29-57	10.47	10	2-26	8.52	8	2-26		

# Evaluation of a configural vital sign display for intensive care unit nurses

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## 5. Outline of the procedure/study

### The development of a CVS suitable for nurses in an ICU

- Based on nurse interviews, a literature review, and interviews with data visualisation experts, the design requirements for the graphical display were identified as including trend data, numerical data, and variability (parameter range) data reflecting changes in the patient's vital signs. General principles of graphical and configural display design such as the reduction of visual clutter, inclusion of higher order visual properties (e.g., emergent features), and variably sized elements were followed. Colour coding and geometric shapes visually conveyed vital signs.
- Three experienced ICU nurses iteratively reviewed display design prototypes, resulting in the final version of the CVS display. See the design on page 572 of the article here: <http://hfs.sagepub.com/content/56/3/569.full.pdf>
- The centre panel (numerical data) is identical to the control display.
  - CSO = current state object
  - Trend data: this shows trend data in relation to heart rate; blood oxygen saturation; systolic (SBP), diastolic (DBP) and mean arterial (MAP) blood pressures.
  - Variability/CSO: the solid white rectangle shows a continuously updated representation of high and low values (range) for patient physiology over the past hour.

### The scenarios developed to test the hypothesis that the design elements incorporated in the CVS display better support the interpretation of vital signs data

- Scenarios were developed and validated by an ICU physician and an ICU nurse who were not involved in the display design.
- Three clinical scenarios examined if the CVS display supported nurses' decision making better than the traditional display – one relating to early sepsis, one to septic shock and one to pulmonary embolus. In all three scenarios, the information required to make a correct assessment was available on both displays.
- A fourth scenario represented a stable patient and was included to determine whether the CVS display facilitates more rapid recognition of a "normal" patient, that is, one without acute physiological changes or deterioration.

### Procedure

- The four scenarios served as a within subjects factor in the experimental design, with each participant dealing with each scenario once.
- To control for sequence or training effects, scenario presentation order was randomised and equivalent for both display conditions. Thus, each participant in one display condition received a random order of scenarios that matched the scenario order received by another participant in the second display condition.
- Participants were randomly assigned to either one or the other of the two display conditions until one condition had its full complement of participants. Post hoc analyses controlling for differences in nurse experience, experience in the ICU, and age of participants in both conditions did not reveal any group differences (all  $F$  values  $< 0.1$ ).
- All participants received a standardised 20-min training that included procedural instructions and explained elements and functionality of the CVS and the control display.



# Evaluation of a configural vital sign display for intensive care unit nurses

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## 5. Outline of the procedure/study . . . continued

- Each study lasted a total of approximately 90 mins.
- Prior to beginning the experiment, participants were instructed to verbally evaluate the patient's physiologic status, interpret the data, and recommend appropriate interventions as quickly and accurately as possible.
- Next, participants received scenario-specific patient information containing medical diagnoses, past medical history, and previous and current administered medications.
- Then, they were presented with the scenario-specific clinical information.
- Participants were given 300 seconds (5 mins) to complete each scenario.
- The last two steps were repeated until completion of all four scenarios.
- For each scenario, a paper patient record was provided for clinical context. The vital signs displays were presented on a 15-inch desktop computer screen.
- Upon completion of all scenarios, all participants performed the NASA-TLX to assess workload (Hart & Staveland, 1988) and answered on a 7 point Likert-type scale (1 = *lowest* to 7 = *highest*) questions concerning the clinical desirability of the CVS display and the realism of the study scenarios.
- Response time was measured from the start of the scenario to the time when the nurse verbalised her or his assessment. If the nurse did not verbalise an assessment within 300 seconds, 300 s was coded as that response time.
- Accuracy was determined by whether or not the nurse correctly identified the patient state.
- For the control display condition, the frequency with which trend information was accessed was measured to assess the impact of information access costs on seeking out trending information.

## 6. Key findings

### Data analysis

- To analyse the overall effect of the display condition, an ANCOVA was conducted for the response time dependent variable with display condition as the between-subjects factor, scenario as the within-subjects factor, and nurses' years of work in the ICU and years of work as covariates. This comparison of display effectiveness was performed for the clinical scenarios with a separate analysis performed for the stable scenario, since the latter involved the detection of the absence of vital signs changes, whereas the former required the detection of the presence of vital sign changes. Post hoc independent t tests determined how response time was affected by display condition. Because the "accuracy" results were measured as percentage scores, non-parametric Mann-Whitney *U* tests were conducted. Mean NASA-TLX scores for each subscale were compared across display conditions using t tests. Finally, the percentage of nurses in the control display condition who accessed the trend screen was calculated.

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## 6. Key findings . . . continued

### Response time

- Overall, there was a significant difference in response time between the two display conditions,  $F(1, 40) = 21.33, p < 0.001, \eta_p^2 = 0.35$ , with participants in the CVS display condition identifying the patient's state more rapidly ( $M = 188.9$  s,  $SE = 11.6$ ) than in the control display condition ( $M = 264.4$  s,  $SE = 11.6$ ). This was a 30% improvement in response time in the CVS display condition compared to the control display condition.
- A significant effect of scenario,  $F(2, 40) = 18.1, p < 0.001, \eta_p^2 = 0.48$ , indicated differences in performance among the three scenarios independent of display condition.
- The interaction between display and scenario was significant,  $F(2, 40) = 5.3, p < 0.01, \eta_p^2 = 0.22$ , indicating that in some of the scenarios the nurses using the CVS display correctly identified the patient state more rapidly than in others, compared to the nurses using the control display.
- None of the covariates reached significant levels.
- The scenario specific analyses indicated that nurses in the CVS display condition were significantly faster in the septic shock,  $t(40) = 3.4, p < 0.01, \eta_p^2 = 0.23$ , and pulmonary embolism,  $t(40) = 3.0, p < 0.01, \eta_p^2 = 0.18$ , scenarios. These differences represent a 48% and 38% improvement in performance, respectively. In the stable scenario the CVS display also yielded faster responses of participants,  $t(40) = 2.39, p = 0.02, \eta_p^2 = 0.13$ , compared to the control display.

### Accuracy of data interpretation

- Nurses using the CVS display correctly identified the patient's condition more frequently than nurses in the control condition.
- Statistically significant differences were found for the septic shock scenario,  $U(40) = 147.0, p = 0.03$ , and the pulmonary embolism scenario,  $U(40) = 136.5, p = 0.01$ , but were not quite significant for the stable scenario,  $U(40) = 178.5, p = 0.08$ .
- No difference between display conditions was found in the early sepsis scenario.

### Information access costs

- In the control display condition, in each scenario only a single nurse (5%) accessed the trend information. In each scenario this was a different individual i.e. nurses rarely accessed vital signs trend information in the control display condition.

### Workload and questionnaire data

- There were no differences in the NASA-TLX on five of the six subscales between display conditions, with overall average ratings of 3.7 ( $SE = 0.1$ ) for the CVS display and of 4.1 ( $SE = 0.1$ ) for the control display.
- There was a significant difference for the NASA-TLX Mental Demand scale,  $t(40) = 2.3, p = .03, \eta_p^2 = .11$ , with lower mental demand reported by nurses in the CVS display condition ( $M = 3.95, SE = 0.23$ ) than by those in the control display condition ( $M = 4.71, SE = 0.24$ ).
- Nurses rated the realism of the scenarios highly, with a median of 6 ( $M = 6.1, SD = 0.43$ ) on a 7-point Likert-type scale and the desirability of the CVS display with a median of 6 ( $M = 6.2, SD = 0.57$ ).

# Evaluation of a configural vital sign display for intensive care unit nurses

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## 7. Possible conclusions

- Providing patient information in a configural display with readily visible trends and data variability can improve the speed and accuracy of data interpretation by ICU nurses.
- A display that integrates vital signs information (CSO, variability) and displays trending data can enhance nurses' assessment of a patient's state in at least some clinical conditions.
- Nurses using a CVS display can perform faster tactical monitoring and status change detection than nurses using a traditional numerical monitoring display system and may therefore be able to detect earlier more subtle changes in vital signs trends, avoiding potential patient harm.
- Presenting trend information on a primary ICU display screen (a CVS) can facilitate more rapid trend detection.
- The provision of integrated vital signs, variability information as spatial patient state, and trend information, can improve nurses' performance.

# View through a window may influence recovery from surgery

Ulrich, R. S. (1984), *Science, New Series*, 224, (4647), 420–421

## 1. Theory/ies on which the study is based

- Views of vegetation and especially water appear to sustain interest and attention more effectively than urban views of equivalent information rate (Ulrich, 1981).
- Most natural views apparently elicit positive feelings, reduce fear in stressed individuals, hold interest, and may block or reduce stressful thoughts; they might also foster restoration from anxiety or stress (Altman & Wohlwill, 1983).
- Surgical patients often experience considerable anxiety (e.g. Chapman & Cox, 1977) and a hospital confinement limits their access to outdoor environments almost entirely to views through windows.
- Views to the outside may be especially important to individuals who have unvarying schedules and spend a great deal of time in the same room (Collins, 1975).
- It is therefore possible that a hospital window view could influence a patient's emotional state and might accordingly affect recovery (Ulrich, 1984).

## 2. Background to the study

- Investigations of aesthetic and affective responses to outdoor visual environments have shown a strong tendency for American and European groups to prefer natural scenes more than urban views that lack natural elements (e.g. Zube *et al.*, 1975; Weidemann & Anderson, 1978).
- For this study, the restorative effect of natural views on surgical patients was examined in a suburban Pennsylvania hospital. Records of patients assigned to rooms on the second and third floors of a three-storey wing of the hospital between 1972 and 1981 were examined to determine whether assignment to a room with a window view of a natural setting might have restorative influences.

## 3. Research method

- 46 patients who had undergone cholecystectomy (a common type of gall bladder operation) in a suburban Pennsylvania hospital between 1 May and 20 October 1972 and 1981. (May- October were selected because the trees have foliage on them during those months).
- (Patients younger than 20 years or older than 69, patients who developed serious complications and those with a history of psychological disturbances were excluded.) Therefore participants were:
  - 23 (15 female, 8 male) patients who had been assigned to rooms with windows looking out over a natural scene.
  - 23 (15 female, 8 male) patients matched on sex, age (within 5 years), being a smoker/non-smoker, obese/within normal weight limits, general nature of previous hospitalisation, year of surgery (within 6 years), and floor level who had been assigned to similar rooms with windows facing a brick building wall.
  - Patients on the second floor were also matched by the colour of their rooms (rooms on that floor alternated between blue and green).
  - An attempt was made to match patients by physician, but this was possible for only seven pairs because the number of doctors was so large. However, for the remaining pairs the distribution of different physicians was similar in the two groups. For example there was no instance when patients of the same doctor all had rooms with the same view.

# View through a window may influence recovery from surgery

Ulrich, R. S. (1984), *Science, New Series*, 224, (4647), 420–421

## 5. Outline of the procedure/study

- Records of patients assigned to rooms on the second and third floors of a three-storey wing of the hospital between 1972 and 1981 were obtained.
- The same nurses had been assigned to the rooms on a given floor.
- The rooms were all for double occupancy and were nearly identical in terms of dimensions, window size, and arrangement of beds, furniture and other major physical characteristics. Each room had a single window 1.83m high and 1.22m wide with the lower edge 74 cm above the floor. The size and placement of the window allowed an unobstructed view out for a patient lying in bed on either side of the room. The only real difference in the rooms was therefore what could be seen through the windows.
- Patients were assigned to rooms as they became vacant.
- Recovery data was extracted from patients' records by a nurse with extensive surgical floor experience.
- The nurse did not know which scene was visible from a patient's window.
- Five types of information were taken from each record:
  - (i) Number of days of hospitalisation, defined as day of surgery to day of discharge)
  - (ii) Number and strength of analgesics each day
  - (iii) Number and strength of doses for anxiety, including tranquilisers and barbiturates, each day
  - (iv) Minor complications, such as persistent headache and nausea requiring medication – symptoms which are considered to result frequently from conversion reactions
  - (v) All nurses' notes relating to a patient's condition or course of recovery.

## 6. Key findings

- Records showed that patients with window views of trees spent less time in the hospital than those with views of the brick wall: 7.69 days compared with 8.70 days per patient. (Wilcoxon matched-pairs signed-ranks analysis,  $T(17) = 35$ ,  $z = 1.965$ ,  $p = 0.025$ ).
- Nurses notes consisted of comments about the patient's condition written during the postsurgical period ending at midnight of the seventh recovery day after the day of surgery. Notes were classified as 'positive' (e.g. 'in good spirits', 'moving well') or 'negative' (e.g. 'upset and crying', 'needs much encouragement').
  - More negative notes were made on patients with the brick wall view: 3.96 per patient compared with 1.13 per patient with the tree view. (Wilcoxon matched-pairs signed-ranks analysis,  $T(21) = 15$ ,  $z = 3.49$ ,  $p < 0.001$ ).
  - Although more positive comments were recorded for the tree-view patients, the difference was not statistically significant.
- The two groups were compared for analgesic intake. The results are shown in the following table.

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## 6. Key findings . . . continued

Table 1. Comparison of analgesic doses per patient for wall-view and tree-view groups

Number of doses						
Analgesic strength	Days 0-1		Days 2-5		Days 6-7	
	Wall group	Tree group	Wall group	Tree group	Wall group	Tree group
<b>Strong</b>	2.56	2.40	2.48	0.96	0.22	0.17
<b>Moderate</b>	4.00	5.00	3.65	1.74	0.35	0.17
<b>Weak</b>	0.23	0.30	2.57	5.39	0.96	1.09

- It was expected that for the first period no difference in analgesic intake would be found between the two groups because patients would be feeling the effects of the drugs or too absorbed by intense pain to attend to the windows. It was also expected that there would be no significant variation across groups in the final two days. In fact, only 45% of the patients took any analgesics after the fifth day.
- For the primary period of interest (days 2-5), there were statistically significant variation between the tree-view and wall-view patients in the mean number of analgesic doses ( $T^2 = 13.52$ ,  $F = 4.30$ ,  $p < 0.01$ ). In the other two periods there were no significant differences.
- During days 2-5, patients with the tree view took fewer moderate and strong pain doses than did the wall-view group and more doses in the weak category. The wall group was therefore given many more doses of potent narcotics, whereas the tree group more frequently received such drugs as aspirin.
- With respect to doses of anti-anxiety drugs: there was no significant variation between the groups. Wall-view patients were given more doses of narcotic analgesics, which produce drowsiness or sedation as side-effects, therefore possibly reducing their need for sleeping pills or tranquillisers.
- A weighted score of minor postsurgical complications was computed for each patient. Although tree-view patients had lower scores, the difference was not statistically significant.

### To summarise

- In comparison with the wall-view group, the patients with the tree view had shorter post-operative hospital stays, had fewer negative evaluative comments from nurses, took fewer moderate and strong analgesic doses, and had slightly lower scores for minor postsurgical complications.

# View through a window may influence recovery from surgery

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## 7. Possible conclusions

- A natural scene has positive therapeutic influences (for patients recovering from cholecystectomy).
- Patients (recovering from cholecystectomy) who can see a natural view from their hospital window have shorter post-operative hospital stays, than patients who only have featureless views such as brick walls.
- Patients (recovering from cholecystectomy) who can see a natural view from their hospital window display more positive behaviours than patients who only have featureless views such as brick walls.
- Patients (recovering from cholecystectomy) who can see a natural view from their hospital window take fewer moderate and strong analgesic doses than patients who only have featureless views such as brick walls.
- Patients (recovering from cholecystectomy) who can see a natural view from their hospital window tend to experience fewer minor post-operative complications than patients who only have featureless views such as brick walls.

# Office clutter or meaningful personal displays: The role of office personalisation in employee and organisational well-being

Wells, M. M. (2000), *Journal of Environmental Psychology*, 20, (3), 239–255

## 1. Theory/ies on which the study is based

- Socio-cultural trends impact the way in which Americans conduct business (Wells, 2000).
- Communications technology has created major changes in today's offices (Wells, 2000).
- Advances in communications have allowed many workers to work at home, on the road, or at neighbourhood work centres rather than driving to the office, thereby making it easier for them to juggle work and family responsibilities (Lueder, 1986; Christensen, 1994; Werts, 1996).
- Socio-cultural changes have a significant impact on office designs (Wells, 2000).
- With the changing nature of offices (from permanent offices to temporary workspaces), employee personalisation of office environments takes on special significance.
- Personalisation is the deliberate decoration or modification of an environment by its occupants to reflect their identities (Sommer, 1974; Sundstrom, 1986; Heidmets, 1994).
- Personalisation is said to have three different classifications (Heidmets, 1994):
  - (i) Personalisation may be done by (a) individuals to their own spaces e.g. their bedrooms or workspaces (b) groups to their collective spaces e.g. their school or office building
  - (ii) Personalisation can be done to places (e.g. bedrooms, offices, hospital rooms); or objects (e.g. computers, work instruments, clothing)
  - (iii) Personalisation may be done to a place or an object that that belongs to the user either permanently (e.g. their house or their computer); or temporarily (e.g. their seat on a bus or their library books).
- Personalisation is generally considered a form of territorial behaviour by which people use their personal belongings to mark and defend their territories and to regulate their social interactions (Altman, 1975; Brown, 1987).
- It is also thought that personalisation may guard against the negative physiological and psychological consequences of inadequate privacy regulation (e.g. illness, stress and anxiety) (e.g. Altman, 1975; Scheiberg, 1990).
- Personalisation makes places more pleasing to inhabit (Carrère & Evans, 1994).
- Personalisation e.g. of one's home, enhances an individual's attachment to their environments (Brown, 1987).
- Men and women employ different personalisation practices.
- Organisational well-being may be defined as the overall health of an organisation which is comprised of many constructs including organisational climate; social climate; employee productivity, performance, turnover and absenteeism. Organisational consultants have suggested that allowing employees to personalise their workspaces is very important to organisational climate (Becker, 1990).



# Office clutter or meaningful personal displays: The role of office personalisation in employee and organisational well-being

Wells, M. M. (2000), *Journal of Environmental Psychology*, 20, (3), 239–255

## 2. Background to the study

- The American office is going through a period of great transition (Wells, 2000). For example, the internet and e-mailing are becoming increasing popular methods of communication, often replacing the use of the telephone and letters (Wells, 2000).
- Advances in communications have allowed many workers to work at home, on the road, or at neighbourhood work centres rather than driving to the office, thereby making it easier for them to juggle work and family responsibilities (Lueder, 1986; Christensen, 1994; Werts, 1996).
- Increased female employment over the past couple of decades (Quinn et al., 1995), has resulted in many companies adopting more family-friendly policies e.g. flexitime which allows employees to choose their own working hours (Lueder, 1986; Werts, 1996).
- A design technique that is becoming increasingly common among large companies that frequently have a large percentage of their employees working at home or in the field rather than in the office is 'hotelling' - a type of officing in which employees are not given permanent offices. (Brill & Keable, 1998). Instead, on the days they are in the office, employees are assigned one of several temporary workspaces.
- Personalisation of a space may lead to feelings of personal control (Edney & Buda, 1976) which has been found to increase satisfaction, reduce stress, enhance work performance and enhance well-being and mental health e.g. Averill, 1973; Halper, 1995.
- Research by Carrère & Evans (1994) conducted in isolated and confined environments found that residents of monotonous, low-stimulus environments often personalised to provide novelty, humour or whimsy to the environment.
- Goodrich (1986) found that personalisation of one's work environment to fit one's own tastes and needs led to an emotional attachment to the work environment. Other studies have shown that personalisation is related to satisfaction with the physical work environment and job satisfaction (e.g. Sundstrom *et al.*, 1980, 1982; Brill *et al.*, 1984).
- Despite the findings of previous research, some facilities managers adopt policies that restrict workspace personalisation. However, studies have indicated that even when companies have clear policies restricting personalisation, employees do it anyway (Clearwater, 1980; Becker, 1981; Brill *et al.*, 1984).
- Research has shown that women tend to personalise their homes in a more intimate manner than men. Vinsel *et al.* (1980) found that female students tended to personalise with symbols of personal relationships e.g. photos, whereas male students tended to personalise with such things as sports themes and entertainment equipment.
- The focus of this paper is on individuals' personalisation of their permanent places, specifically employees' personalisation of their workspaces. The paper poses four research questions and hypotheses:
  - (i) **Q:** Do men and women personalise their workspaces differently?  
**H:** Men and women will personalise their offices differently.
  - (ii) **Q:** Is personalisation associated with enhanced employee well-being?  
**H:** Personalisation will be positively associated with satisfaction with the physical work environment, which will be positively associated with job satisfaction, which will be positively associated with employee well-being.
  - (iii) **Q:** Is personalisation more important to women's well-being than to that of men?  
**H:** Workspace personalisation will be more integral to the well-being of women than men.

# Office clutter or meaningful personal displays: The role of office personalisation in employee and organisational well-being

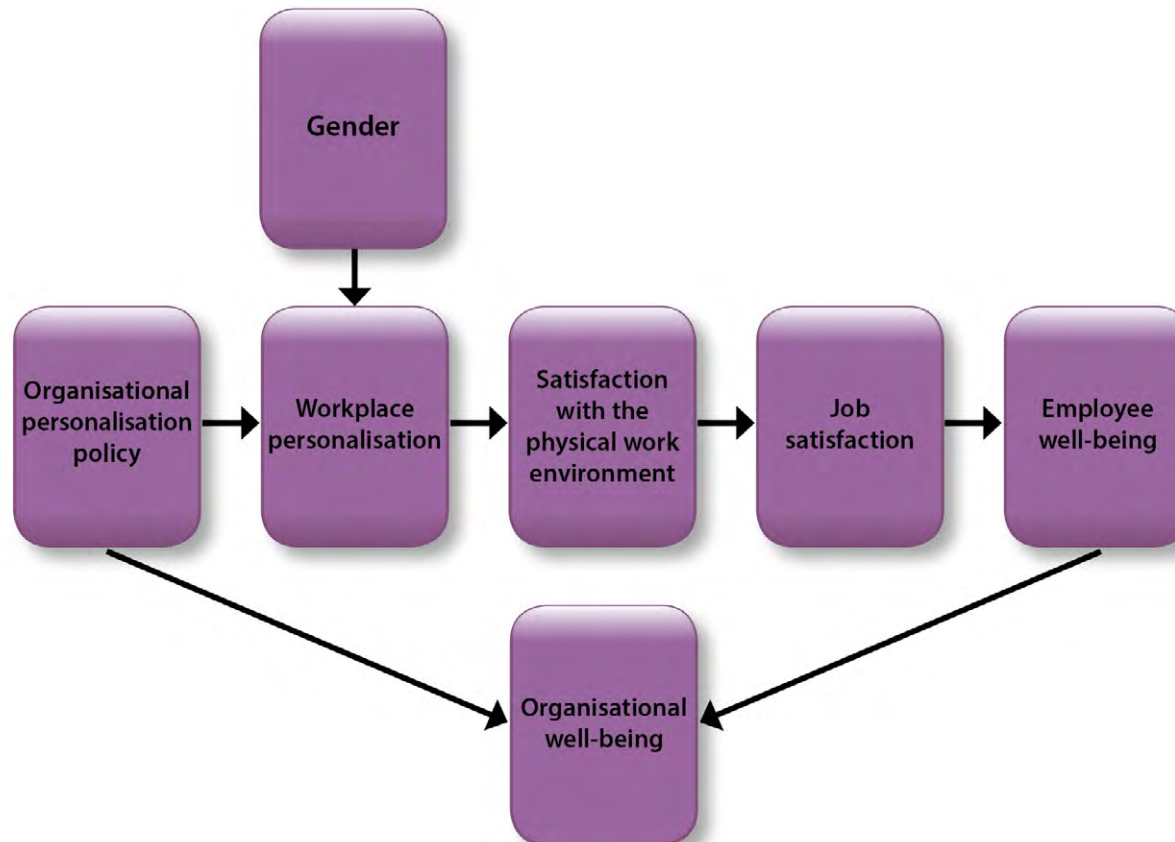
Wells, M. M. (2000), *Journal of Environmental Psychology*, 20, (3), 239–255

## 2. Background to the study . . . continued

(iv) **Q:** Is a company's personalisation policy associated with organisational well-being?

**H:** Companies that have more lenient personalisation policies will report higher levels of organisational well-being (i.e. lower turnover, lower absenteeism, higher employee morale, and higher productivity) than companies having stricter personalisation policies.

- This study used the following model of office personalisation and employee well-being to examine the above questions and test the above hypotheses:



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## 3. Research method

- This study used the self-report method to gather data in relation to the four research questions and hypotheses to determine whether office personalisation is associated with employee well-being and to determine the effect of gender on this relationship.
- The self-reports included:
  - (i) An employee survey
  - (ii) A co-ordinator survey
- The researcher also observed and photographed workspaces and interviewed some employees at five of the companies who agreed to participate as case studies.

## 4. Sample

### The participating companies

- A survey of office workers was conducted at 20 companies in Orange County, California during the winter and spring of 1997: The participants were 20 companies and their employees who were recruited from 2000 companies participating in the Small Business Workplace Wellness Project (SBWWP). All companies involved in this project that employed at least 30 employees were selected. This yielded 763 companies.
- The SBWWP contact person at each of the 763 companies was then sent a letter explaining that this was a study of office environments and employee well-being and asking all interested companies employing at least 15 office employees to fill out the enclosed participant interest form and fax it back to the researcher. The letter also explained that, in return for their participation, companies would receive a report of the study's findings, a report of the findings specific to their company, and recommendations for simple changes to their work environment that may improve employee and organisational well-being. Of the 763 letters sent, 652 were deemed eligible after omitting 99 due to a small sample size of office workers and 12 which were returned by the postal service. Twenty-seven (4.1%) companies returned their participant interest forms indicating a willingness to participate in the study. The low response rate was not deemed problematic due to the exploratory nature of the research and the extensive documentation of the difficulty of getting businesses to participate in research (Jewell, 1998).
- Each of the 27 volunteering companies was called to explain that the study consisted of written surveys to be completed by office employees and management and to verify its interest. For various reasons seven companies were omitted from the final study.
- The 20 participating companies included two manufacturing companies, two real estate agencies, three distributors, an air conditioning company, a law firm, a relocation firm, an automobile dealership, a soft-ware developer, a home medical equipment company, a building materials distributor, a health care office, an electronics repair company, a traffic engineering firm, a vocational counselling office, a non-profit agency and a hands-on learning science centre.

### The human participants

- 338 respondents of which 187 (55%) were male and 138 (41%) were female. 13 people (4%) did not report their gender.
- Most of the participants (62%) were between the ages of 25 and 44.
- The sample was 69% Caucasian/white, 13% Hispanic, 10% Asian-American, 3% African-American, 1 % Native American, and 4% 'other'.
- Most of the respondents (55%) were married, whereas 24% were single, 14% divorced, 6% living with a partner, 1% widowed.
- The average number of years the respondents had spent at their companies was 5.6 years.
- 23 employees (15 women, 8 men) agreed to be interviewed as part of the case studies.

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## 5. Outline of the procedure/study

- Employees were asked to complete an employee survey. This had several sections:
  - The first assessed workspace personalisation (e.g. the number of personal items displayed)
  - The second assessed satisfaction with the physical work environment (using a nine-item, five-point scale with items such as 'I like my workplace')
  - The third assessed job satisfaction using a job-satisfaction scale (a five-item, five-point scale with items such as 'In general I like my job')
  - The fourth assessed well-being using measures of global well-being, physical health and psychological well-being (all used rating scales)
  - The fifth assessed employee perceptions of organisational well-being, including social climate, organisational climate, employee morale, productivity, performance and absenteeism (again using rating scales)
  - The sixth assessed personality traits predicted to be associated with office personalisation e.g. need for affiliation, need for privacy, and creativity (all again assessed using rating scales)
  - The final section consisted of personal demographic information including gender, age, ethnicity, marital status, parental status, education, salary, job title, full / part-time employment, length of time with the company and length of time at the present workplace. Other questions assessed the employee's type of workspace (enclosed or open) and the quality of their workspace.
  - The final section consisted of personal demographic information including gender, age, ethnicity, marital status, parental status, education, salary, job title, full / part-time employment, length of time with the company and length of time at the present workplace. Other questions assessed the employee's type of workspace (enclosed or open) and the quality of their workspace.
- Coordinators at each company completed the employee survey with the addition of several questions regarding the company's personalisation policy and organisational well-being (assessed using rating scales).
- Case studies. To add depth and richness to the survey data, five of the 20 companies agreed to participate as case studies. After completing the surveys, these companies allowed the researcher to interview some employees and observe and photograph their workspaces.
- The interview. Participating employees were interviewed at their workspaces for 10-15 minutes. The interviews were structured interviews with open-ended questions and were tape-recorded. The questions asked about the personal items participants had displayed and the importance of those items to them. They were also asked whether they thought that being able to personalise their workspace affected their satisfaction with the physical work environment, their job satisfaction, and their overall well-being. They were also asked how they would feel if their company prohibited personalisation. After the completion of all of the interviews, the interview tapes were transcribed and analysed using qualitative analysis.
- The observation check list. Once the interview was complete, the researcher examined the workspace using an observation check list which consisted of: (a) a list of personalisation categories so that the number of items pertaining to each category could be counted, (b) space to list unusual items and themes, (c) a scale measuring aesthetic quality of the workspace, (d) the gender of the workspace occupant. Upon completion of the checklist, the workspace was photographed.

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## 6. Key findings

### Hypothesis 1

- Over half (56%) of respondents indicated that they personalised their workspace to express their identity and individuality, 30% to improve the feel of the workplace, 16% to express their emotions, 15% to show that the workspace belonged to them, 6% to show their status within the organisation, 5% to control their interactions with co-workers, 3% because everyone else did.
- Chi-square analysis showed that men and women tend to personalise for different reasons. More women than men reported personalising to express their identities and their individuality  $p < 0.006$ , to express their emotions  $p < 0.017$ , and to improve feel of the workplace  $p < 0.012$ . However more men than women reported personalising their workspace to show their status within the company  $p < 0.006$ .
- Gender differences also appeared in the extent of personalisation with women personalising their workspaces significantly more than men  $p < 0.015$ . The average number of items displayed by men was 7.68, whereas for women this was 11.2. The women interviewed displayed an average of 18.5 personal items compared with an average of 8.3 by men.
- The types of items displayed also varied by gender. Results indicate that most people (68%) display symbols of personal relationships. Other personal items displayed included trinkets and knick-knacks, art, plants, cartoons, sports, music. The average number of items displayed was 9.6. Results showed that women's displays contained significantly more symbols of personal relationships e.g. friends and pets, than men's. Women's displays also included more plants and trinkets than men's but that men's displays contained more sports-related items than women's. These gender differences were also supported by the observational data e.g. women tended to display figurines, posters, greetings cards, whereas men tended to display diplomas, trophies, training programme certificates.
- Therefore both the survey and observational data supported the first hypothesis.

### Hypothesis 2

- Three measures showed that, as predicted, personalisation is significantly associated with satisfaction within the physical work environment:
  - (i) The number of personal items on display ( $p < 0.0002$ )
  - (ii) The association between how much the employee would like to personalise and how much s/he was allowed to personalise ( $p < 0.001$ )
  - (iii) The extent to which the employee determined the arrangement of his/her workspace ( $p < 0.001$ ).
- The extent to which an employee had rearranged his or her space and the extent to which employees and their co-workers had personalised team spaces were not significantly associated with satisfaction with the physical work environment.
- The association between satisfaction with the physical environment and job satisfaction was found to have a positive correlation ( $p < 0.001$ ).
- Job satisfaction was found to be positively associated with employee well-being in relation to global well-being, physical health, psychological well-being.
- Using the partial regression coefficient for personalisation, results indicated that personalisation was not directly associated with employee well-being when satisfaction with physical work environment and job satisfaction were controlled for.

# Office clutter or meaningful personal displays: The role of office personalisation in employee and organisational well-being

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## 6. Key findings . . . continued

### Hypothesis 3

- Survey results showed that personalisation was no more important to the well-being of women than to that of men, thus not supporting the hypothesis.
- However the hypothesis was supported by the interview data. When asked whether personalisation improved their well-being, women consistently replied 'Yes'. Men were not so sure that personalisation enhanced their well-being.
- When asked how they would feel if their company strictly prohibited workspace personalisation, women consistently replied that they would feel restricted, controlled and that management did not care about them. Men, however, were divided on the issue.

### Hypothesis 4

- Results indicated that companies that allow more personalisation, have a more positive organisational climate ( $p < 0.03$ ), a more positive social climate ( $p < 0.002$ ), greater levels of employee morale ( $p < 0.0003$ ) and reduced turnover ( $p < 0.04$ ).

### Secondary analyses

- The extent to which employees personalise their workspace was positively correlated with the amount of personalisation allowed by the company.
- Organisational well-being was positively correlated with employee well-being.
- There was a good fit between the proposed model of the relationships between office personalisation, gender, employee well-being and organisational well-being and the data gathered.
- People who personalise the most tended to be managers as opposed to supervisors or lower-level staff members. They also tended to be older and married.
- Correlational analysis showed that people personalised more in companies having employee-friendly policies e.g. telecommuting, flexitime.
- The company owner's ethnicity was significantly associated with the amount of personalisation allowed, with companies owned by Asian-Americans allowing less personalisation than companies owned by Caucasian/white Americans.

# Office clutter or meaningful personal displays: The role of office personalisation in employee and organisational well-being

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## 7. Possible conclusions

- Men and women personalise their workspaces differently.
- Women personalise their workspaces more than men.
- Employee well-being is enhanced if individuals are allowed to personalise their workspace.
- Individuals are more satisfied with their physical work environment if they are allowed to personalise their workspace.
- Women place more importance on personalisation (of their workspace) than men.
- The workplace organisational climate and social climate have significant implications for employee well-being.
- Companies with lenient personalisation policies have greater levels of organisational well-being than companies with strict personalisation policies.
- Companies with lenient personalisation policies have greater levels of employee morale, a more positive organisational and social climate and lower staff turnover than companies with strict personalisation policies.



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