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# PUBLIC REACTIONS TO CHANGES IN NOISE LEVELS AROUND SYDNEY AIRPORT

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## 1. INTRODUCTION

Change in noise exposure is a striking factor in reaction to noise. Surveys consistently show that an increase in noise exposure creates reaction which is much stronger than would be elicited by the same level of noise if it existed for a considerable time, and reductions in noise similarly create a greater reduction in reaction than would be expected from the final noise level in the absence of change [1-5]. This is called over-reaction.

The most obvious account of these effects is in terms of adaptation to the noise or the quiet. However, such an account is not supported by the data. Whether or not people adapt to noise remains a contentious issue [7, 8]. The existing evidence suggests that little adaptation to community noise occurs, even over extended periods of time [4, 8]. However, the evidence from some studies (eg. of sleep disturbance) raises the possibility that some responses to noise do adapt [9]. Overall, it would seem that adaptation is unlikely to provide a complete account of the over-reaction effect.

A number of theories have been advanced to account for this effect, based on adaptation [2], demand characteristics [6], changes in the scaling of responding [2], a combination of sensitisation and adaptation to different effects of noise [7] and changes in the modifier variable, attitude [6]. The strengths of these competing accounts largely remain to be determined.

Raw and Griffiths [7] provided some evidence in support of their model. The account in terms of the coping mechanism was directly examined with coping mechanisms behaving as required by the model. The sensitisation component of their account is more contentious and was not directly investigated. The account in terms of changed attitude [6] suggests that increased noise exposure may be interpreted by those exposed to the noise as evidence that those in charge of the noise

source do not care about the problem, while a reduction may indicate concern on the part of the decision makers. Furthermore, such changes in attitude may cause changes in reaction, leading to the over-reaction effect. The possibility that changes in attitude will cause changes in reaction is supported by the strong correlational relationship between these variables [10, 11] and support in some studies for the causal connection required by this account: attitude influences reaction [12]. This attitudinal hypothesis has not been directly examined to date. The recent changes to Sydney Airport with consequent changes (including increases and decreases) in noise have resulted in mass meetings, protests often with verbal attacks aimed at those involved with the airport as well as their political masters, and media attention [13]. These behaviours are consistent with a substantial shift in attitude regarding the relevant authorities.

**Aims**

The present study aimed to test predictions of the attitudinal hypothesis using the substantial changes in noise exposure created by the changes to the Sydney (Kingsford-Smith) Airport. In addition to the basic requirement that attitude and reaction correlate, we tested the predictions that, with sufficient publicity about impending changes in noise exposure: (1) For the same level of current noise, attitude to the noise source should be more negative in areas expecting an increase in noise than in areas expecting no change in noise. (2) For the same level of current noise, attitude should be less negative in areas expecting a decrease in noise than in areas expecting no change in noise exposure. (3) If attitude influences reaction, it is also predicted that for the same level of current noise, reaction will be higher in areas anticipating an increase in noise, and lower in areas expecting a decrease in noise compared with areas expecting stable exposure, even before the changes in exposure occur. In addition, that possibility that the other major modifier of reaction (noise sensitivity) is also influenced by anticipated changes in noise exposure, was examined.

## 2. METHODS

**Site**

The present study was conducted around Sydney (Kingsford-Smith) Airport, the main international gateway to Australia. The airport is located approximately 20 minutes drive from the centre of a city of 3.5 million inhabitants.

The airport configuration consisted of 2 runways (one North-South, and one East-West) prior to the introduction of a third runway parallel and slightly to the east of the North-South runway, in later 1994. This introduction was accompanied by a virtual closure of the East-West runway, which was subsequently only used when wind detection and speed dictated its use. The present study is of reactions before and after these changes in operation of the Airport.

**Subjects and Sample Selection**

Subjects were 1012 residents in the survey conducted before the introduction of the third runway, and 120 residents interviewed after the opening of the third runway.

Residences were selected from random start points chosen on the basis of noise levels and location relative to Sydney Kingsford Smith Airport to produce a 2x2 design. Current noise level was either "high" or "low". Future noise level was either projected to change (up or down, depending on current level) or projected to remain unchanged, due to flight-path changes with the opening of the third runway. The four areas thus produced ("high stays high", "low goes high", "high goes low", "low stays low") were approximately equally represented in the sample. Within each residence one respondent was selected using the last birthday technique, without replacement.

**Materials**

First, subjects responded to a structured interview based on previous socioacoustic survey questionnaires [14, 15] and revised on the basis of the results, and interviewer feedback, from a pilot study. The interview assessed demographic variables, reactions and sensitivity to noise, attitudes to the noise source, disturbance due to aircraft noise, and aspects of physical and mental health. Two questions assessed general reaction to the noise: (i) "Would you please ... estimate how much you personally, are affected overall by aircraft noise?"; (ii) "How dissatisfied are you with aircraft noise in this neighbourhood? Please ... estimate how much dissatisfaction you feel overall." Subjects indicated their subjective reactions using an "opinion thermometer"- a card depicting a thermometer marked with numbers from 1 to 10 and an associated verbal scale ("none", "a little", "moderate", "a lot", very much").

After being interviewed subjects completed the Grossarth-Maticek health risk personality questionnaire (70 items) and 19 items comprising the Profile of Mood States (POMS) Depression-dejection, Tension-anxiety and Anger-hostility scales.

**Procedure**

Interviews were conducted by trained interviewers at subjects' homes. First, a letter was sent to every selected residence announcing the investigation. Second, interviewers door-knocked at selected residences and asked to speak to the person over 18 living at the residence who had last had a birthday. The structured interview was conducted and questionnaires given to the subject to complete while the interviewer waited.

For all statistical tests alpha was set at .05, and tests were one-tailed where directional predictions existed.

## 3. RESULTS

**Explanation of variables employed.**

The 11 questions designed to assess attitude were rescaled where required so that larger scores reflected more negative attitudes

regarding the noise source and then subjected to factor analysis. This revealed three factors of attitude with eigen values greater than 1. The factor loadings for each item allowed the following interpretations of the factors:
Attitude factor 1 (henceforth called Attitude: Local Concerns) accounted for 33.7% of the variance and reflected local concerns with the airport. High scores on this factor included: disagreement with the claim that the airport is of value to the neighbourhood, agreement that the aircraft cause pollution, agreement that the airport should be shifted to a less populated area, etc.
Attitude factor 2 (henceforth Attitude: Financial Impact) accounted for 12.3% of the variance and generally reflected financial issues, with loadings for agreement that the airport is a waste of money, only the wealthy really benefit from the airport, disagreement that the airport brings tourists and helps the economy.
Attitude factor 3 (henceforth Attitude: Misfeasance) contained 10.0% of the variance and represented misfeasance. If loaded for agreement that the government is not doing enough to stop noise pollution, more could be done to reduce the noise, and planes could be made much quieter.

For this study reaction is measured by the combination of the score for the questions on affect and dissatisfaction. This scale will be called general reaction. It was reliable [16], and is to be preferred over measure of annoyance only [16, 17].

Only preliminary analysis of noise exposure is available at this time. It suggests similar levels of exposure in the high stays high and high goes low areas, whereas the comparability of noise exposure in the low stays low and low goes high areas is less certain. For this reason, greater emphasis of interpretation is placed on the former comparison. Areas were classified for exposure according to calculations of exposure based on the work of Bullen and Hede [15], and on projected useage of the runways after the introduction of the new runway. These projected noise exposure contours were well publicised, producing expectations of change. However, their accuracy is irrelevant to the present study which occurred before the new runway became operational.

**Attitude and Reaction.**

Consistent with previous findings [6, 11, 14, 15] attitude correlated with reaction (GR). For the three attitude scales the correlations were in order, 0.59, 0.31, and 0.42.

**Attitude and Projected Noise Exposure.**

A series of planned contrasts (by ANOVA) were conducted to test the above predictions. Residents in the area High-stays-High were compared with those in the High-goes-Low area. These areas had similar noise exposure at the time of testing (according to preliminary analyses), prior to the changes to the airport. Comparisons were made on General Reaction to the noise, and the three attitude scales.

Results supported the predictions of the attitude account of over-reaction. Reaction was lower in the area predicted to have a reduction in noise in the future ($F = 3.05$, $df = 1, 500$, $p = .04$). In similar fashion, the areas Low-goes-High and Low-stays-Low were compared. The results of these analyses, presented in Table 1, indicate that in all cases the areas expecting an improvement in their nose exposure showed less reaction to their current noise and less negative attitudes towards the noise source than did the the group expecting no improvement. The group expecting a worsening of tehir noise exposure showed more reaction to the current noise and more negative attityudes towards the noise source than did the respondents expecting their noise exposure to remain low. However, that latter comparison is not as compelling as the former because the comparibility of current noise exposure levels is not clear. Preliminary analysis suggests that the Low-goes-high areas may be experiencing more noise at baseline than the Low-stays-Low areas. No such problem is apparent in the other planned contrast.

**Table 1: Planned contrasts of the High-stays High versus High-goes-Low areas and the Low-goes-High versus the Low-stays-Low areas in Reaction to the noise (GR) and attitudes to the noise source.**

| Variable | F value | d.f. | p value | Mean | Mean |
|---|---|---|---|---|---|
| **Contrast =** | **HSH** | **vs HGL** | | HSH | HGL |
| GR | 3.05 | 1, 500 | .02 | 6.94 | 6.49 |
| Att:Local C | 56.00 | 1,470 | .000 | 3.87 | 3.28 |
| Att:Fin. Im. | 8.60 | 1, 470 | .002 | 2.15 | 1.97 |
| Att:Misf. | 26.30 | 1, 501 | .000 | 3.96 | 3.66 |
| **Contrast =** | **HSH** | **vs HGL** | | LGH | LSL |
| GR | 152.32 | 1, 506 | .000 | 5.73 | 2.37 |
| Att:Local C | 125.89 | 1, 475 | .000 | 3.64 | 2.75 |
| Att:Fin. Im. | 15.02 | 1, 475 | .000 | 2.16 | 1.90 |
| Att:Misf. | 59.34 | 1, 507 | .000 | 3.89 | 3.44 |

As a check on the expectations of individuals, each respondent was also asked if s/he expected the noise in their area to increase, decrease or remain about the same. The results were consistent with those above. There was a significant relationship between expected noise change and all three attitude scales (smallest $F = 8.10$, $p = .003$). However, there was no significant effect of expected change and GR ($F = 1.67$, $p = .99$). The reason for this single inconsistent result is not clear. However, the statistical power of the tests based on individual expectations would be reduced by the fact that only a small minority (8.3%) expected a reduction in their noise exposure (although the majority of these respondents were indeed in areas which were predicted to benefit from the changes to the airport configeration and operations).

These results provide good support for the attitude account of the over-reaction effect, with 11 of the 12 statistical tests performed producing the result predicted by the theory. are not predicted by any other theory of the effect. The present evidence that reaction to the noise changes with knowledge of future changes in exposure, even before any change in noise exposure occurs is striking. It is not explicable in terms of psychological, sensory or behavioural adaptation to the new noise level because the new level does not yet exist. Similarly, it is not explained by an account of over-reaction in terms of changes in the scaling of reaction. In short, these results indicate that with prior knowledge changes in reaction (which occur with changes in noise) occur, at least in part, before the noise itself changes.

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