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AN INVESTIGATION INTO HABITUATION NOISE AND ANNOYANCE

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INTRODUCTION

In order to cope with the task of prioritizing, the information processing networks through which individuals structure incoming stimuli have evolved a primary weighting ability. This ability has two psychophysical parameters: Selective Attention and Habituation. These two processes combine to produce the functions of information gain/update and monitor/storage. These functions seem to operate around the principle of redundancy. Features of a signal will be assigned various degrees of status ranging from low to high redundancy, if high then signals can be held in an attenuated form (selected attention) or perhaps after repeated sampling in an habituated condition. If the signal is of low redundancy then access will be provided to deeper and more directed levels of processing.These are useful information extraction tools but they are also defensive and enable the preservation of priority status signals and processing procedures. Any ability to process information in is matched by the capacity to process information out thereby maximizing the availability of 'expensive' processing procedures to high status signals. When stimuli are present but provide no further information gain or advantage then they will be held in an attenuated form of some kind. Some signals seem to corrupt elements of this defence system which then results in a subjective response being assigned which in turn reflects the negative status of the signal. In acoustic terms, this is noise annoyance. Do some acoustic forms contain psychophysical features that produce annoyance levels disproportionate to their simple physical characteristics (eg Intensity) and results from an interaction between the primary defences and the physical form?

Consequently an investigation was undertaken into the extent to which individual's ability to habituate to acoustic signals can be influenced by an interaction between personality and the acoustic signal's frequency. A total of fourteen subjects (male/female) were exposed to low Intensity acoustic stimuli comprised of constant and intermittent signals.

Hypotheses: subjects ability to habituate to acoustic signals of equal loudness will vary in a frequency dependent manner.

Subjects will be more able to habituate to a constant acoustic signal than an intermittent acoustic signal.

Subjects ability to habituate to constant and intermittent acoustic signals will degrade with decreasing frequency.

SIGNALS EMPLOYED

Low frequency pure tones (100Hz/250Hz)	35 Phons
Mid frequency pure tones (3000Hz)	35 Phons
High frequency pure tones (8000Hz)	35 Phons

Subjects personality was assessed using the Eysenck Personality Inventory while anxiety and annoyance states were both measured by a 7 point self report scale. The physiological parameter of Pulse Rate was measured using a Pleithysmograph.

A within group (repeated measures) design was employed.

Subjects each produced phon contours for the relevant Sound Pressure Level (SPL) and Frequencies (Hz). This procedure enabled the presentation of stimulus frequencies at different SPL's that yielded constant loudness values. Therefore any measured response bias would not be the result of varying hearing thresholds found within the experimental group.

The stimulus frequencies were presented in random order in two stages. The first stage was a continuous (signal) presentation of three minutes duration with a two minute interval between presentations. The second stage was a randomly intermittent (signal) presentation (70% on 30% off) with a two minute interval between presentations.

The results shown in Figure 1 confirm that as a whole the experimental group produced a wider mean standard deviation for heart rate variance under the intermittent tone condition (IT) than for the constant tone condition(CT). In brief, the work of Kitney and Rompleman(1969) established the inverse relationship which exists between pulse rate variance and habituation, consequently Figure 1 (and others) may be read as showing that the IT condition was the most difficult to habituate to. Further support for this view can be found in the results shown in Figures 2 and 3 which show that, for all the frequencies used, the difference in habituation is maintained between the CT and IT conditions. Moreover, there is some indication that habituation is frequency dependent as the Low Frequency (LF) tone leads to decreased habituation for both conditions, particularly the IT condition.

Both the Extraverts (E) and the Introverts (I) produced similar response magnitudes and trends for the CT condition shown in Figure 4. However,as shown in Figure 5, under the IT condition greater separation of response occurs between E and I groups with the introverts habituating less well.

A Spearman's Rho Correlation for the relationship between E-scale and Mean Anxiety and Annoyance scores was computed the results of which are shown in Table 1.

TABLE 1 (SIGNIFICANCE AT 0.05 LEVEL=0.54)

	E-SCALE SCORE
MEAN ANNOYANCE CONTINUOUS	-0.73
MEAN ANNOYANCE INTERMITTENT	-0.88
MEAN ANXIETY CONTINUOUS	-0.79
MEAN ANXIETY INTERMITTENT	-0.67

These scores show that a significant negative correlation exists between anxiety and annoyance with E-scale scores. This indicates that subjects with high E-scores (Extraverts) showed lower annoyance and anxiety scores than subjects with lower E-scores (Introverts). Annoyance scores were ranked and the LF condition was consistently scored as the most annoying condition,a Wilcoxon test supported this finding at the 5% level for the IT condition but not for the CT condition.

CONCLUSION

This Pilot study was able to demonstrate the following:

1) An Intermittent tone poses more difficulties for the habituation process than a constant tone, for all personality types and all tones employed.

2)Where habituation was possible Introverts habituated better than Extraverts (in the CI condition).

3)Extraverts exhibited less stress to noise than Introverts.

4)Low frequency tones pose more difficulties to the habituation process than do High frequency tones.

5)Annoyance scores were highest for Low frequency tones.

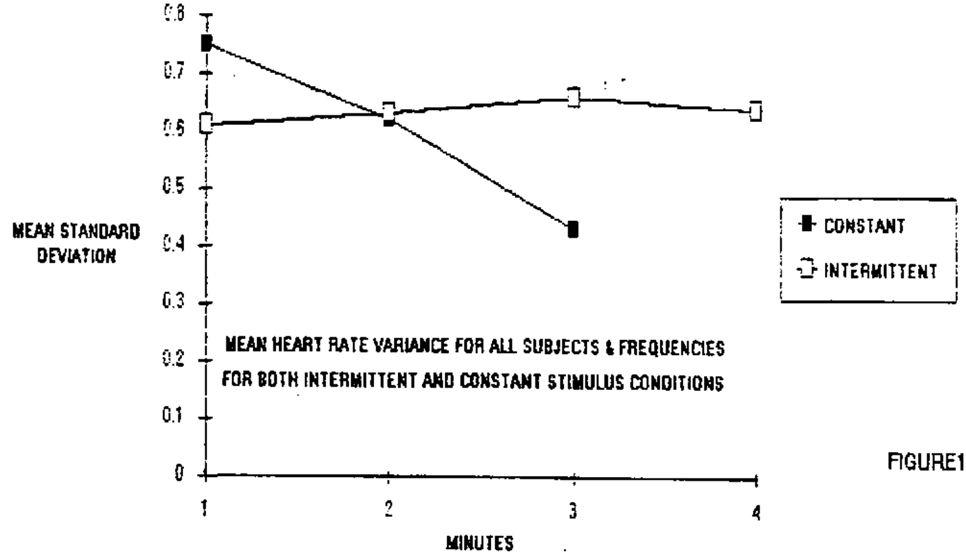

FIGURE1

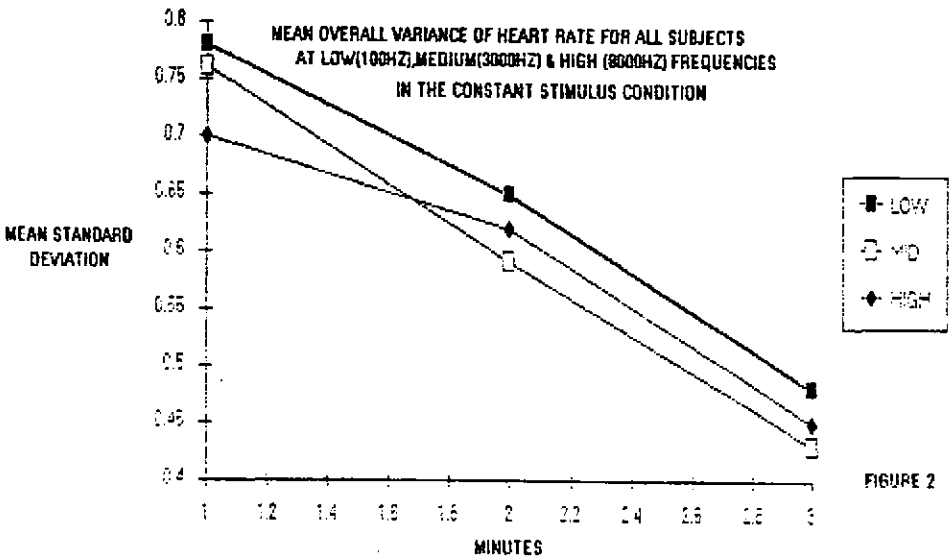

FIGURE 2

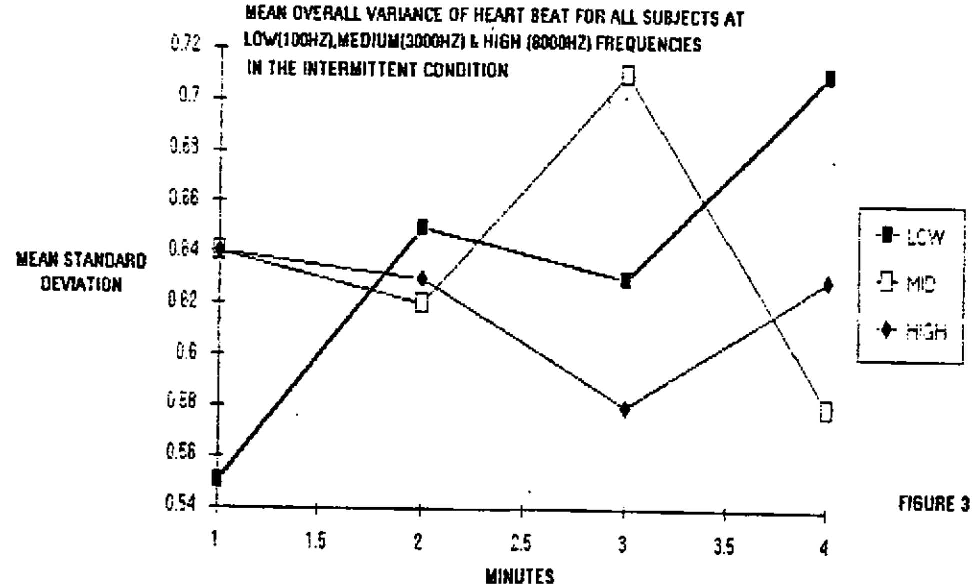

FIGURE 3

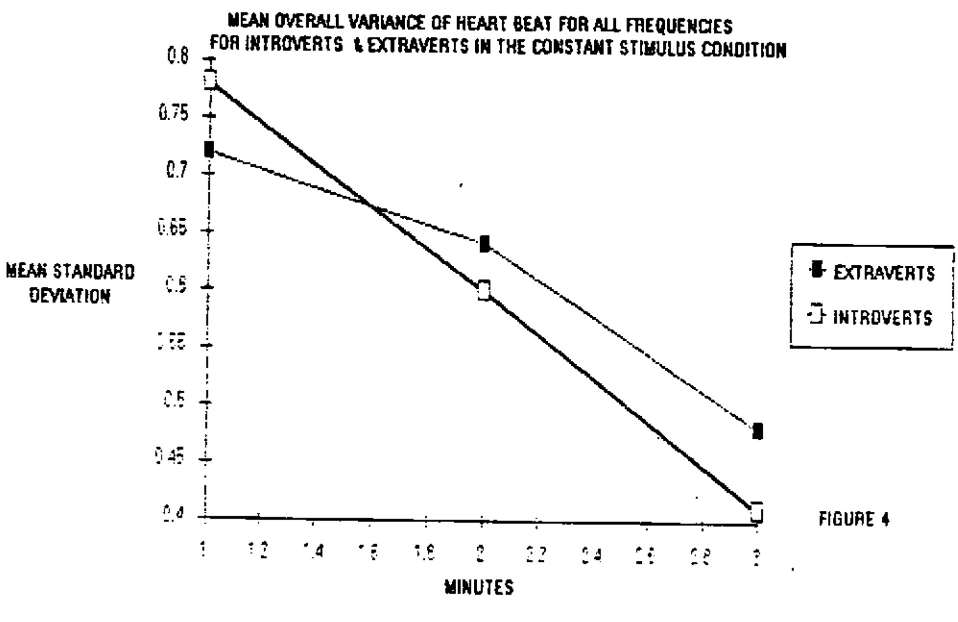

FIGURE 4