

based technologies for presenting stimulus patterns for studies of animal behaviour (Swartz and Rosenbaum, 1980; Cook and Mineka, 1990; Clark and Uetz, 1990; Evans and Marler, 1991; Evans *et al.*, 1993; McQuoid and Galef, 1994). In a recent experiment Shimizu (1997) found that male pigeons (*Columba livia*) exhibited courtship displays to video images of female pigeons that were similar to their responses to live females, while exhibiting no courtship behaviour to video images of a non-conspecific (parrot). In the experiments reported here we carried out initial studies to ascertain whether both male and female pigeons would produce courtship behaviour to video images of the opposite gender birds. In a second set of experiments we investigated how similar male courtship behaviour was when live models were compared with videotaped sequences. Since these experiments form a part of a larger program we also investigated how automated computer scoring compares with hand scoring of video records.

2 METHODS

Experiments 1 and 2: Subjects were 8 experimentally naive, sexually mature, male Homing Pigeons (*Columba livia*). They were first adapted to the arena, and tested to see if they were attracted to the live female model used to produce the videotaped stimuli. In experiment 2, 4 female birds were tested using equivalent conditions to the males.

m long x 1.25 m high, with a 1 V set which displayed stimulus conditions, positioned so that it was flush with one wall. A Sony 8mm VHS Handycam recorded both audio and video behaviour of the subjects.

Stimuli in Experiment 1 consisted of video-recordings of, (1) a sexually receptive female pigeon, (2) a non-sexually receptive female pigeon, (3) a sexually receptive male pigeon, and (4) a non-conspecific (a domestic mallard duck). For experiment 2, similar sets of stimuli were made but males were the models, and females the subjects.

Procedure: The stimulus conditions were counterbalanced across subjects using 4 x 4 Latin Squares. Each test trial was scored on a number of courtship dimensions, including frequency of 'Courtship Cooing', 'Tail Dragging', 'Driving' and 'Displacement Preening'. In addition, the duration of 'Parading', 'Inflation/Erection of feathers', and 'Total Courtship Duration' were scored. The video tapes of a random sample of test trials were scored twice, once by one of the experimenters and also "blindly" by another person, yielding an $r = 0.996$.

Experiments 3 and 4: Experiment 3 was essentially similar to experiment 1 except that 5 male subjects were used, and three experimental conditions. These consisted of (1) a live female bird model, (2) a videotaped version of the same female model, and (3) a video of an empty room. In Experiment 4 a narrow walkway was substituted for the open arena, so that videotaped records of the male birds behaviour could be "standardized" for easy automatic computer analysis of records. The same three stimulus conditions used in Experiment 3 were

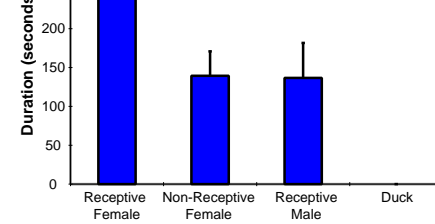


Figure 1: Male Recognition Experiment 1 - Total Courtship Duration.

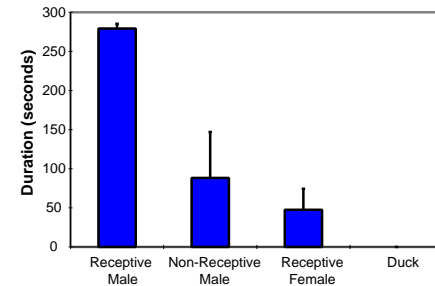


Figure 2: Female Recognition Experiment 2 - Total Courtship Duration.

4 CONCLUSION

- Both male and female pigeons exhibit robust courtship behaviour to video images of conspecifics of the opposite gender, that is essentially similar to that exhibited to live models.
- The courtship behaviour contains all of the elements seen in natural courtship, "bowing", "cooing", "waltzing", "tail-dragging" and "charging".
- The same courtship behaviour is exhibited in an arena and runway.
- Automated computer scoring of courtship responses is feasible and reliable.
- These data, together with our detailed ethograms (see poster ...) will be critical for the construction of our virtual pigeon for future "neuroethological studies".

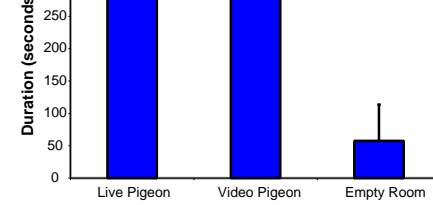


Figure 3: Arena Experiment - Total Courtship Duration.

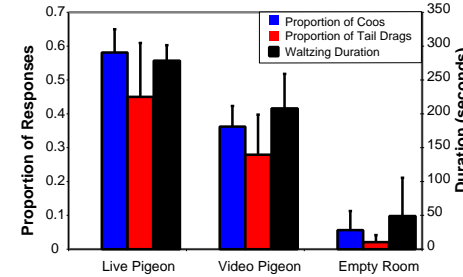


Figure 4: Arena Experiment - Proportion of Cooing and Tail Drags, and Duration of Waltzing.

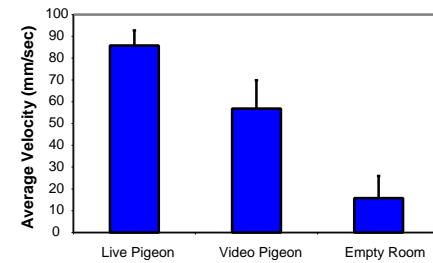


Figure 7: Automated Scoring in the Arena Experiment - Average Velocity of Movement of the Pigeon's Path.

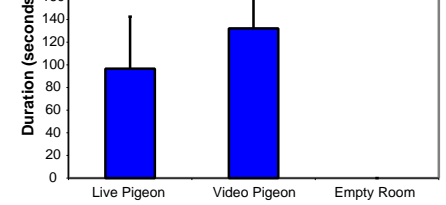


Figure 5: Runway Experiment - Total Courtship Duration.

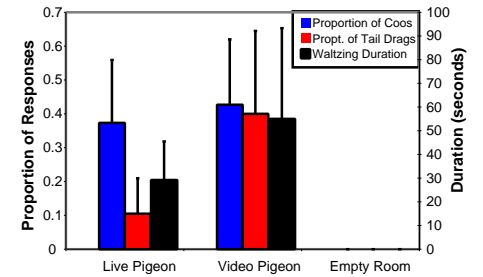


Figure 6: Runway Experiment - Proportion of Cooing and Tail Drags, and Duration of Waltzing.

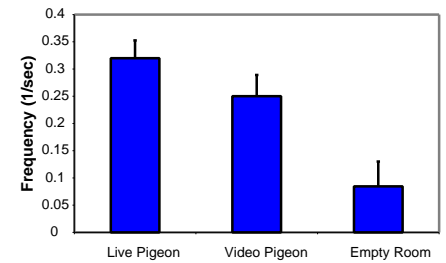


Figure 8: Automated Scoring in the Arena Experiment - Frequency of Half Circles (Waltzing).