RESPONSES OF COMMON MARMOSETS (*Callithrix jacchus*) TO VISUAL, OLFACTORY AND AUDITORY STIMULI:

Investigating the Importance of Multimodal Signals and Perception Concerning Predators and Food

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ABSTRACT

Food detection and predator recognition are crucial for survival in the wild and this thesis asks how animals respond if one or several signals are provided. Are responses to multimodal signals different than to unimodal ones and is the modality of the signal of vital importance? Marmosets (*Callithrix jacchus*) are an ideal species in which to test the relative importance of interactions of several senses and the processing of signals because we know that their hearing, vision and sense of smell are excellent. I presented predator- and food-based stimuli in these three modalities, first individually and then in various combinations (related and conflicting). Results of individual stimuli showed responses that might be expected in wild populations but not necessarily in captive-born animals: the marmosets mobbed a taxidermic specimen of a quoll, avoided the odour of cat faeces, and froze, hid and fell silent in response to leopard growls. In contrast, marshmallow and its odour elicited highly positive responses and playback of marmoset food-related calls increased activity levels. Interaction of modalities manifested not necessarily as sensory hierarchies but as sensory input of equal weight repudiating the concept of visual dominance in primates. In some cases, olfactory and auditory stimuli actually shaped the responses to the visual stimuli. By and large, my results supported the threat-sensitivity hypothesis in that more than one predator-based stimulus reduced response time**,** indicating a perception of greater risk. Presentation of conflicting stimuli showed high-risk behaviour and uncertainty. In a separate experiment, testing responses to sounds alone, of snake, red-shouldered hawk and leopard, results showed strong fear responses to each vocalisation but the marmosets looked up more often (whilst indoors) when hearing the hawk calls. The discovery of new facial expressions in response to olfactory and auditory cues is also reported. Two facial expressions, one negative, one positive, were then tested by playback on a screen; results indicating responsiveness to the positive expression by staying in the vicinity of the screen and by leaving when a negative expression was shown. Hence, this demonstrates that marmosets may be sensitive to displays of emotions by conspecifics.

CERTIFICATION

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification.

I certify that any help received in preparing thesis and all sources used have been acknowledged in this thesis.

Signature: 

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GLOSSARY OF TERMS USED

Aversive visual stimulus:	taxidermic specimen of a quoll
Pleasant visual stimulus:	marshmallow
Neutral visual stimulus:	PVC tube
Aversive olfactory stimulus:	odour of cat faeces
Pleasant olfactory stimulus:	odour of marshmallow
Neutral olfactory stimulus:	odour of tea infuser (and container)
Aversive auditory stimulus:	leopard growl
Pleasant auditory stimulus:	calls of a common marmoset produced when they see food (food-related calls)
Neutral auditory stimulus:	background noise of the marmoset housing facility
Redundant signalling:	signalling that occurs when the components tested separately elicit the same response.
Non-redundant signalling:	signalling that occurs when the components tested separately elicit different responses.
TSPA:	threat-sensitivity predator avoidance hypothesis, proposed by Helfman (1989), which suggests that the behavioural response of prey animals will intensify with multiple stimuli pertaining to a predator.