1 Introduction
The Naming Game looks at how agents in a population converge on a shared system for referring to continuous stimuli (Steels, 2005; Nowak & Krakauer, 1999). These models assume that a mutual exclusivity bias is necessary for establishing a shared lexicon. However, I show that communicative success is still achieved without this bias. Monolingual assumptions may obscure differences in the evolutionary dynamics of languages in monolingual and bilingual societies.

2 The Naming Game
Agents play games with each other, one referring to an object with a word and the other trying to guess what object the first agent was referring to (see diagram). Through feedback, agents are eventually able to communicate effectively.

Agents update their lexicon according to two heuristics:
- **Heuristic A** invents new words for each sub-category when a category is split. This assumes that each name only refers to one object, hence when there are two objects with the same name, the agent should discriminate between them linguistically.
- **Heuristic B** removes all competing names associated with a category from the listener's lexicon when communication is successful. This assumes that each object only has one name.

Therefore, these heuristics implement a Mutual Exclusivity Bias.

3 Mutual Exclusivity
Monolingual children and adults exhibit a mutual exclusivity bias: a tendency to assume that each object only has one name and each name only refers to one object. However, recent research has shown that bilinguals do not exhibit mutual exclusivity. This difference is due higher variance in the input of children in bilingual contexts. Applying mutual exclusivity when presented with two languages is not suitable, since there will be at least two words for each object.

Is a shared lexicon possible without mutual exclusivity? If so, is the mutual exclusivity assumption a valid abstraction?

4 Communication without heuristics
Agents still converge on a functional language without a mutual exclusivity bias.

The effectiveness of the heuristics depends on the complexity of the social network. Performance is worse using mutual exclusivity in the 4-agent condition, but not the 2-agent condition.

5 Conclusion
Communicative success at the lexical level can be achieved without mutual exclusivity constraints. In some cases, the constraint impedes the process. The most rational default approach is not to use mutual exclusivity. This favours bilingualism rather than monolingualism.

When modelling cultural processes, abstraction is necessary. However, the cultural phenomena that appear simplest (e.g. monolingualism) may not be caused by the simplest learning mechanisms. Much of the complexity in cultural phenomena stem from complex interactions between individuals. That is, the cultural transmission process itself can shape and influence the cultural practices it transmits.

I am currently extending this research by running experiments with human participants.