



ADULTS RELY ON STATISTICS

- To learn word meanings, they keep track of co-occurrences of words & referents (cross-situational word learning, CSWL, Yu & Smith, 2007).

ADULTS RELY ON THEIR KNOWLEDGE ABOUT LANGUAGE STRUCTURES & THE WORLD

- They use this knowledge to make predictions and inferences when processing spoken sentences (Altmann & Kamide, 1999)

How do statistics and knowledge interact in foreign language word learning?

→ Experiment 1

Which cue dominates when they are in conflict?

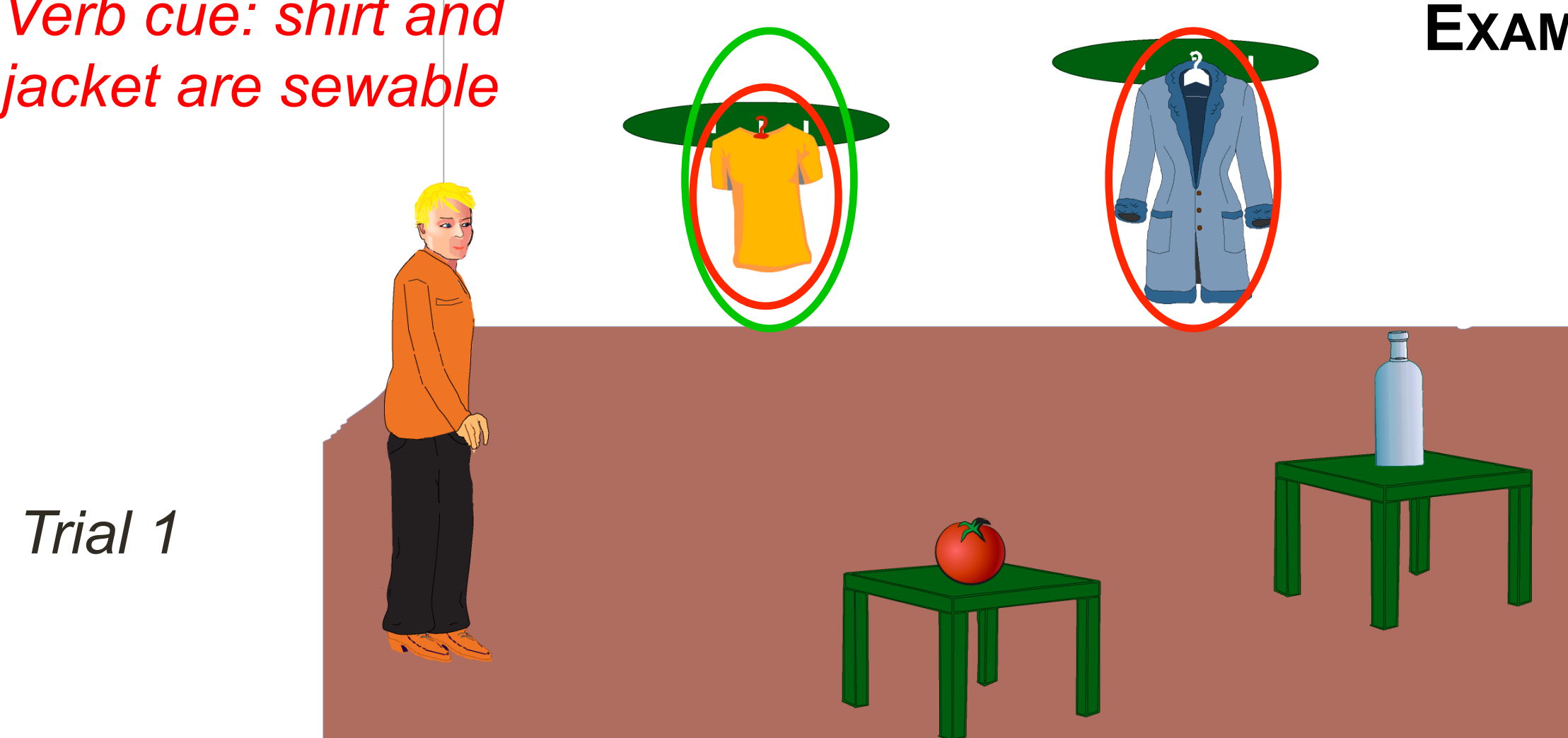
→ Experiment 2

EXPERIMENTAL PARADIGM & BASIC PROCEDURE

- German adults learn a mini semi-natural language (based on Indonesian) in three basic phases:

- Verb learning:** Participants are familiarized with restrictive verbs (e.g. eat, sew) and non-restrictive verbs (e.g. take).
- Noun learning:** Visual static scenes & auditory SVO-sentences are presented. Participants are asked to understand the sentences and learn the nouns.
- Vocabulary test** ('Click on the object matching the spoken noun.') & confidence rating ('How sure are you about your choice?', 1(not sure)-9(sure))

Verb cue: shirt and jacket are sewable



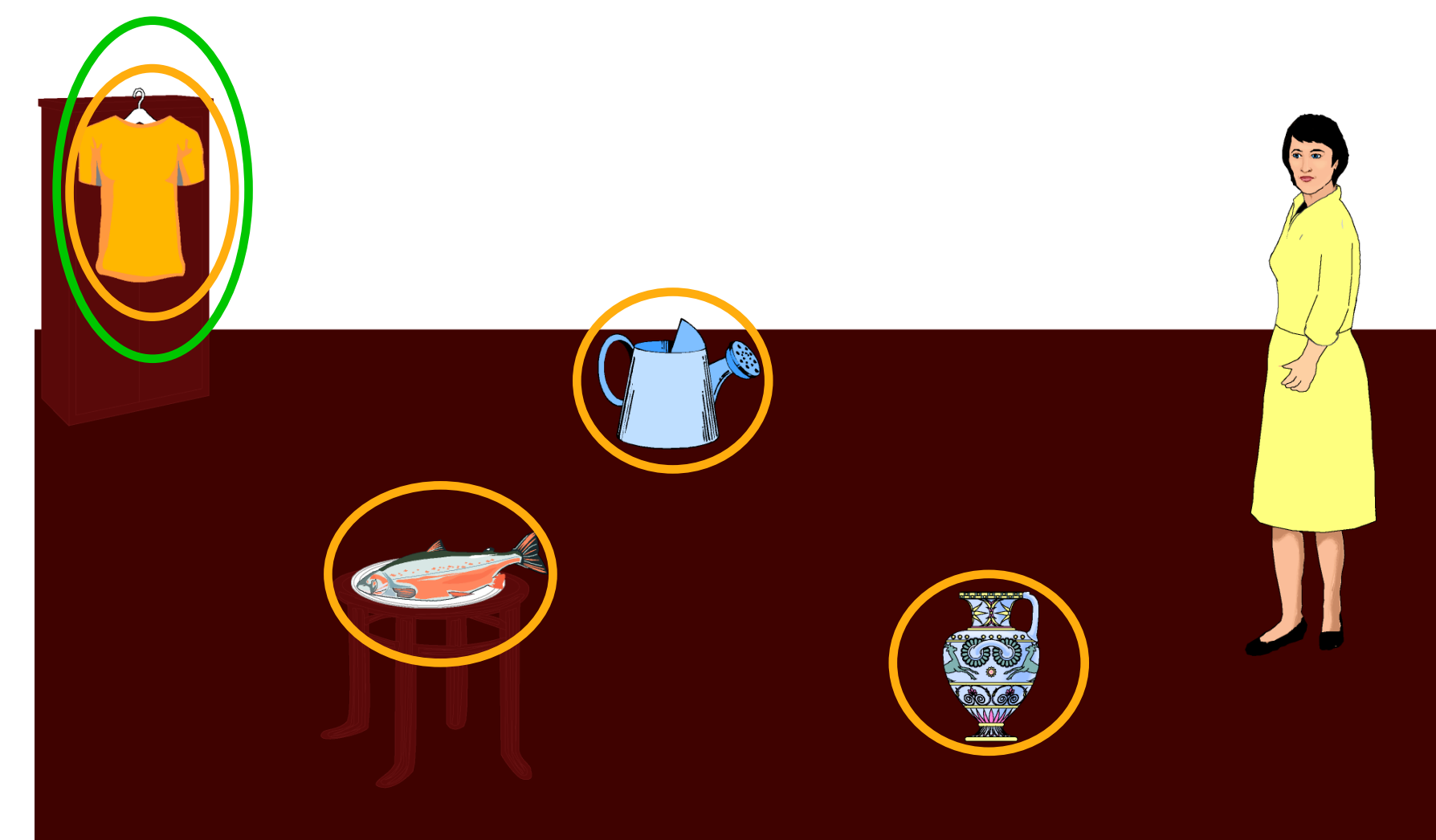
Trial 1

[Si laki]_{NP1} [mankemema]_{verb} [si badut]_{NP2}
DET man sew-MEMA DET shirt
'The man will sew the shirt.'

Remember: All verbs are known already in this phase!

EXAMPLE NOUN LEARNING PHASE

CSWL: shirt repeated, 'badut' repeated



Trial 2

[Si gadis]_{NP1} [tambamema]_{verb} [si badut]_{NP2}
DET woman take-MEMA DET shirt
'The woman will take the shirt.'

EXPERIMENT 1

Manipulation of the degree of verb restriction to study the interaction of CSWL and verb-derived inference learning

CONDITIONS

The nouns (Phase 2) were in one of three conditions:

- Noun occurs with **restrictive verb** and there is only **1 object** in scene matching the verb category (+3 distractor objects):
Si laki bermamema si sonis ('The man **eats** the tomato')
tomato, shirt, bottle, jacket, man
- Noun occurs with **restrictive verb** but there are **2 objects** in scene matching the verb category (+2 distractor objects):
Si laki mankemema si badut ('The man **sews** the shirt')
shirt, jacket, tomato, bottle, man
- Noun occurs with **non-restr. verb** > **4 potential referent objects**:
Si gadis tambamema si badut ('The woman **takes** the shirt')
shirt, fish, vase, can, woman

RESULTS

- ✓ Noun learning was significantly above chance for all conditions.
- ✓ Nouns were learned best (77%) and decisions were rated highest (7.0) in Condition 1. > Direct verb cue (with the visual context and word knowledge) helped learners to learn noun meanings.
- ✓ Learning & rating were higher for Condition 2 (74%; 6.4) than 3 (66%; 5.4). > Verb cues worked together with CSWL.

OVERALL CONCLUSIONS

- CSWL and verb information (with visual context & world knowledge) can work together in foreign language word learning.
- When in conflict, both cues are considered.
- Statistical information cannot be fully ignored but overridden.
- Prior knowledge can be ignored in principle, however, probably there is an even stronger influence in real life.

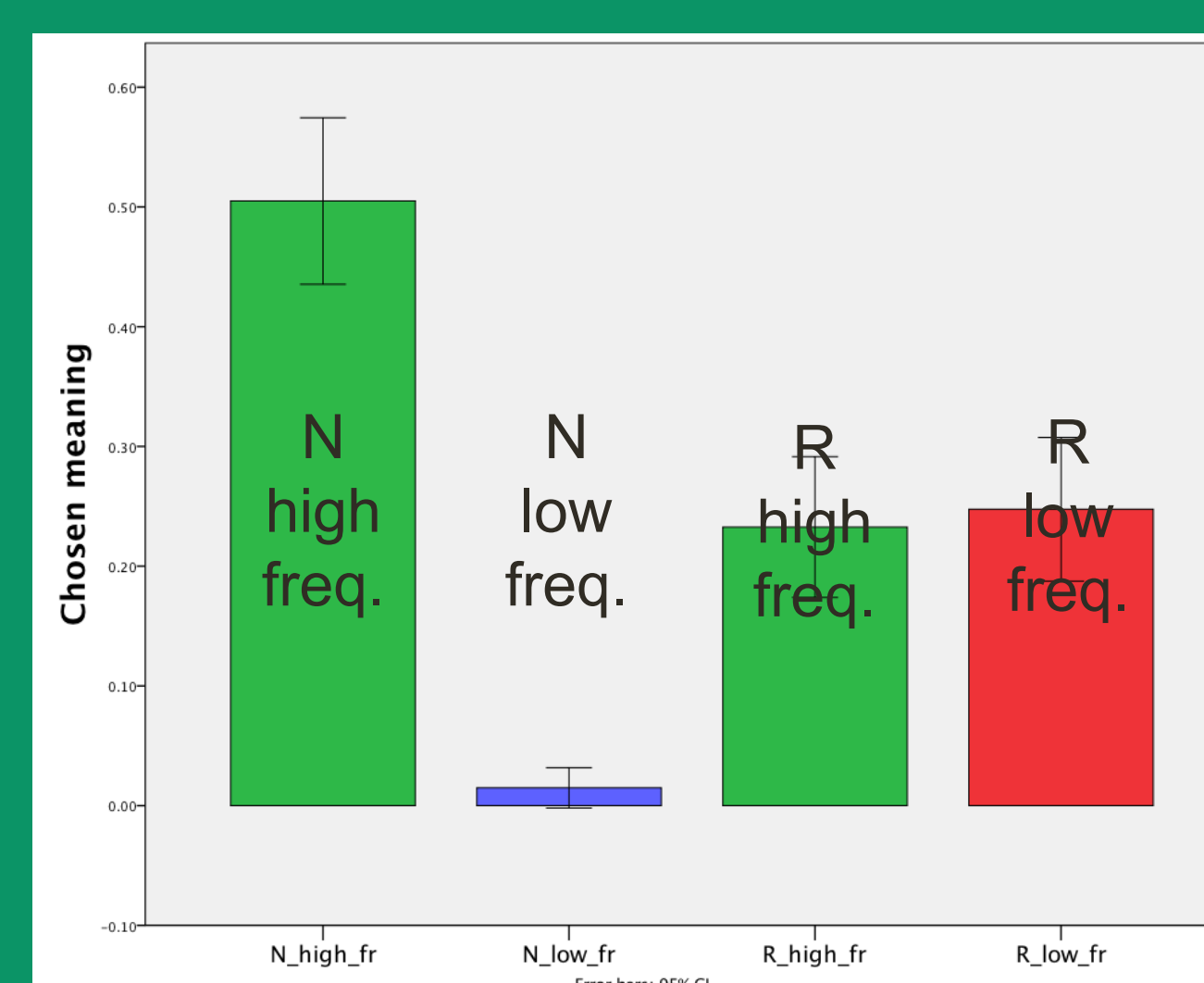
EXPERIMENT 2

Each noun has two potential meanings (= 2 potential referents) - one favored by frequencies, the other favored by verb information

CRUCIAL DESIGN CHARACTERISTICS

- Each noun has two potential conflicting meanings
 - Low frequency meaning (co-occurrence noun & object: 50%)
 - High frequency meaning (co-occurrence noun & object: 83%)
- AND each noun is in one of 2 Conditions
 - R**(estrictive): Noun occurs with restrictive verb which favors the low-frequency meaning!
 - N**(on-restrictive): Noun occurs with non-restrictive verbs, i.e. there is no cue except statistics applicable.

>>> Nouns in **Condition N** just have a **frequency-favored** and a **frequency-disfavored meaning**. Nouns in **Condition R** have a **frequency-favored** and a **verb-favored meaning** (= conflict)!



RESULTS

- ✓ Noun learning sig. above chance for both conditions, no sig. difference (N: 87.5%, R: 80.8%)
- ✓ **N**: High-freq. meaning chosen 97%
- ✓ **R**: High-freq. meaning: 48.5%
- >>> Interaction chosen meaning & condition
- ✓ No difference in confidence ratings for N vs. R BUT sig. higher confidence rating for high-frequency choices than low-frequency choices in R (7.5 vs. 6.5)

>>> In R, learners' choices are clearly biased by verbs! However, when learners chose the verb-favored meaning, their confidence was lower > frequencies still influenced them!