Instructions

Experiment 1

Relational-inference task

Imagine being in December, in a dark cold night. The next day you should go to class, but the Weathercast predicts a heavy snowfall. That night you decide that in the case it snows, you will not go to class. Moreover, you know that if you miss class, you will have to study the topic taught in class from the student book. However, you still do not possess the student book, and so you know that if you want to study from the book, you will have to go to bookshop and buy it.

This situation can be represented by the following three conditional rules:

-if it snows → I will not go to class

-if I do not go to class → I will have to study from the student book

-if I want to study from the student book → I will have to buy it

The next day you wake up, you look outside your window and you realize that it is actually snowing. What are the consequences of this piece of information? They are three:

-I will not go to class

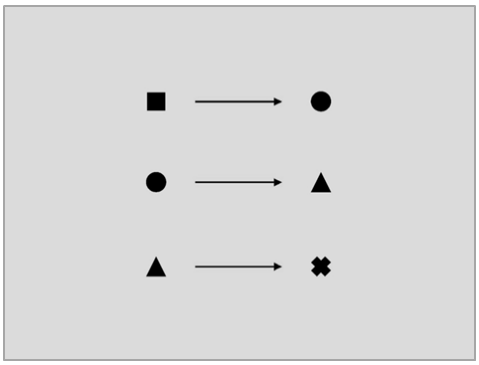
-I will have to study from the student book

-I will have to buy the student book

This example represents real-life situations that resemble the task you have to perform today. In each trial, you will see three conditional rules of the form "if A then B". These rules connect some conditions (states) that might occur. The rules can be concatenated between each other, as in the example. After you have seen the rules, we will tell you that one of the condition has actually occurred (Do you remember the example? This is like looking outside your window and verify that it is actually

snowing) and you will have to assert all the consequences of this piece of information (that is, all the states that will consequently occur).

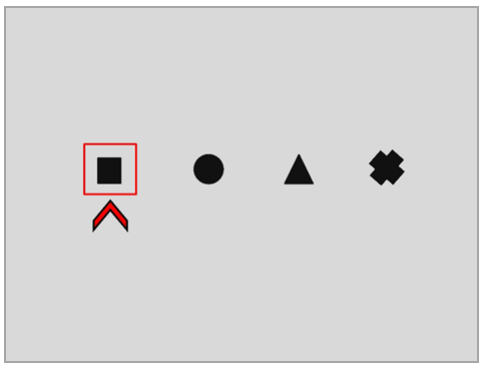
The first feature of the task is that you will not face linguistics items, but rather every condition will be represented by a symbol. For example, you could face a situation of the form:



You will not know if a specific state (symbol) will occur or not, but you will know the conditional relations that regulate their occurrence. In this example, you know that if “square” occurs, then “circle” will necessarily occur; if “circle” occurs, “triangle” will necessarily occur; if “triangle” occurs, “cross” will necessarily occur.

You will see the three relations at the same time, but they will remain on the screen just for 9 seconds, before disappearing. Keep in mind that you still do not know if a specific state will occur, but you know the conditional relations linking these symbols.

After the disappearance of the symbols, you will see a screen similar to the following:



As you can see, on the screen you will see all the four symbols you have previously seen. One (and only one) of the four symbols will be always highlighted by a red square and a red arrow. The highlighted symbol is the state that has occurred, the “source state”. The source state, in each trial,

could be one of the three symbols that constituted a premise in the relations you have previously observed: in the previous example, one between “square”, “circle” and “triangle”.

Given that “square” (in this example) has occurred, your task is to choose all and only the symbols that will necessarily occur given the occurrence of the source state, based on the conditional relations connecting the states. Therefore:

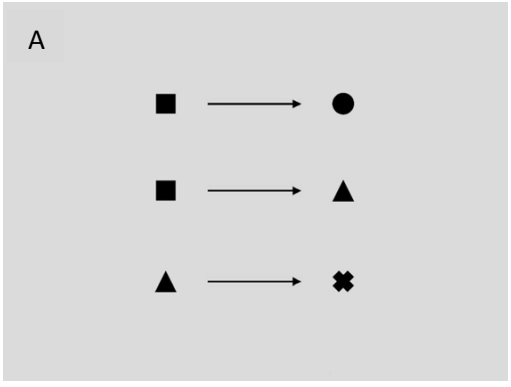
-given that “square” has occurred, also “circle” will occur.

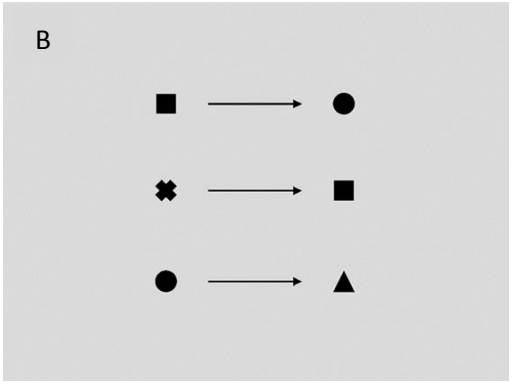
-now you know that “circle” has occurred, so also “triangle” will occur.

-since “triangle” has occurred, also cross will occur.

In this example, you should select all the three remaining symbols given “square” as source state. Remember that also “circle” or “triangle” could have been selected as source state, instead of “square”. Based on the current source state your response will change: if “circle” is the source state, you will choose “triangle” and “cross”; if “triangle” is the source state, you will only select “cross”.

Please consider that the previous configuration of symbols is just one of the possible combinations of relations between states. Although you will encounter the same four symbols (square, circle, triangle, cross) composing three conditional relations, symbols and relations can be combined in different ways. For example, the same symbol can have more than one consequence, or the order of presentation of rules may not reflect the sequential order of concatenated states. Here you can see a couple of examples of the alternative types of configurations you can encounter:





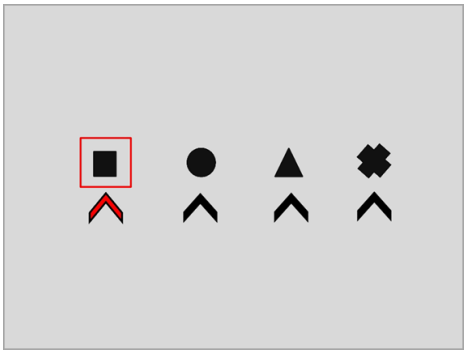
For example, in figure A, if “square” is the source state, “circle” and “triangle” will necessarily occur; since “triangle” will occur, also “cross” will occur. On the other hand, if “triangle” is the source state, only “cross” will occur.

In figure B, if “cross” is the source state, “square” will occur; but if “square” will occur, also “circle” will occur; if “circle” will occur, “triangle” will occur as well. If “square” is the source state, only circle and triangle will occur.

Symbols will be paired with a key on the keyboard:

- Q=square
- W=circle
- O=triangle
- P=cross

Symbol-key associations will remain constant along the all experiment. The position on the screen of the symbols in the response phase will be constant. Your task is to press the keys correspondent to the symbols you want to select. After the selection of a symbol, a black arrow will appear under the selected symbol to highlight the selection, as you can see in the following figure:



You will have also the possibility to cancel your previous choice by pressing the same key you have used to select the current symbol. Similarly, you will have the possibility to change again your mind and re-select the same symbol, re-cancel it and so on, until you are sure about your choice. Cancelations and re-selections will not affect the evaluation of your final performance, which will

take into account only your final selection, that you will confirm pressing the space bar. A trial will be considered as correct if you will select all and only the symbols that will necessarily occur given the occurrence of the source state, while will be classified as incorrect in all the other cases (if you select more or less symbols than you should). The order of selection of symbols is not important, as well as it is not important to press the key relative to the source state. You will have all the time you want to confirm your choice and this will not affect evaluation of performance.

You will not receive feedback about your performance until the end of the experimental sessions. At the end of the experimental session, you will receive a reimbursement proportional to the percentage of correct responses (ranging from 0 to 14 euros).

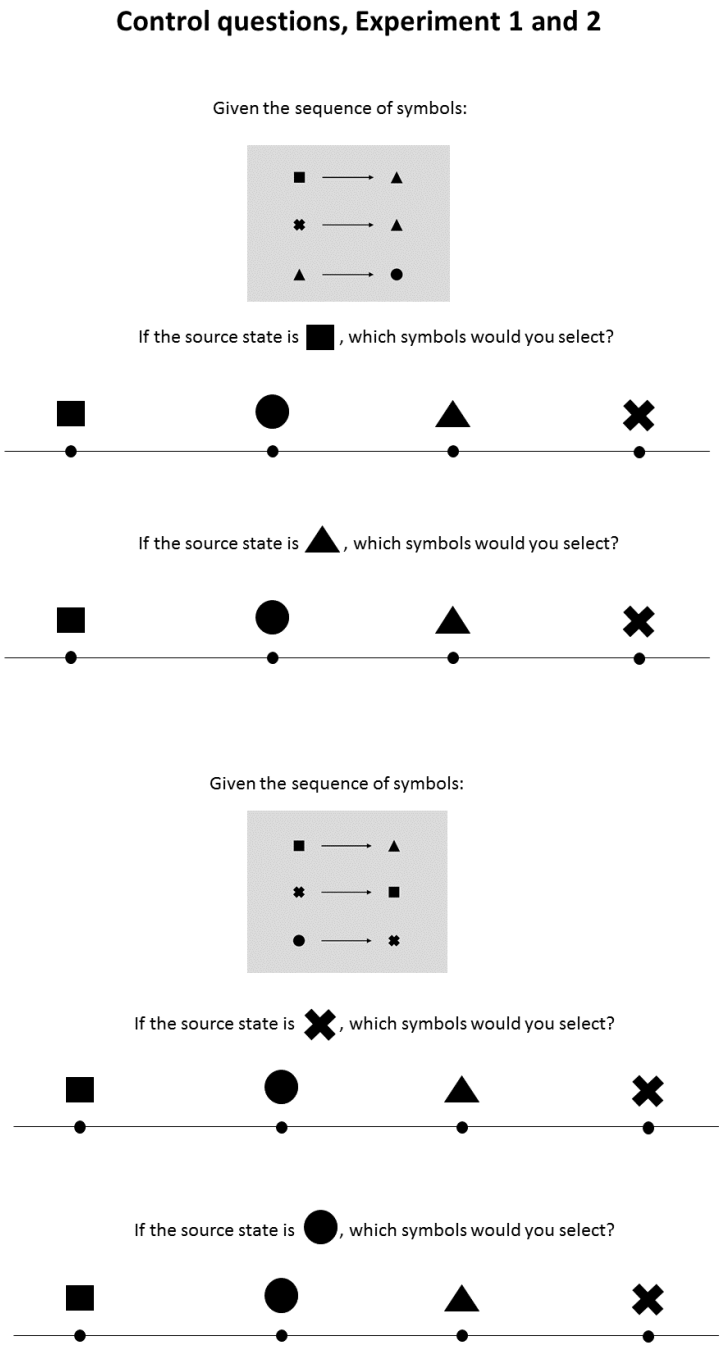
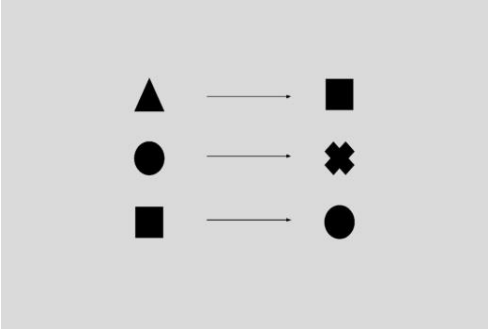


Figure 1.A1. Control questions of the Relational-inference task.

Experiment 2

Additional instructions between Session 1 and Session 2

This experiment has been already administered to a pool of participants in a previous experimental session. We analyzed aye-movements and performance in the task, and we discovered that there are two common ways of performing the task. These two strategies emerge in the first phase of the trial, when you can see, for 9 seconds, conditional relations between symbols:



Now we will describe to you the two strategies and we will tell you which of the two has been the more effective in the task. Listen to the description of the strategies carefully, <u>independently of the strategy you used in the previous session.</u>

<u>Strategy 1</u>

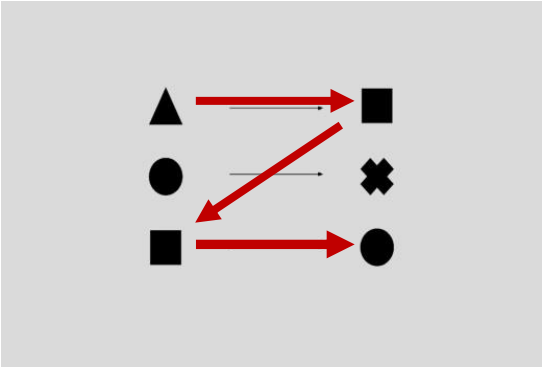
Strategy n.1 consists in the simple memorization of the three conditional rules in the order they are presented, from top to bottom. The pairs of symbols are memorized and kept in mind until the source state (e.g. square) appears. After the disclosure of the source state, the strategy is to make an inference after the other starting from the source state (e.g. from square to circle, from circle to cross, in the example above).

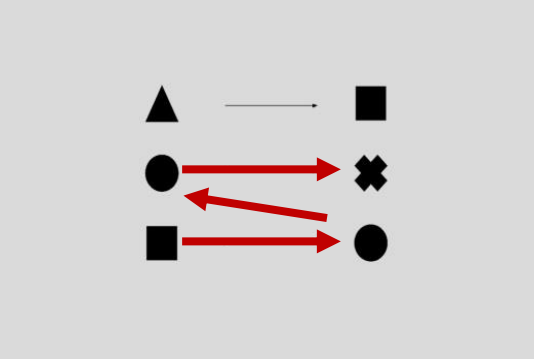
This strategy has been shown to be rather ineffective: participants that used this strategy gained on average 5.58 euros (62% of correct responses).

<u>Strategy 2</u>

Participants using Strategy n.2, in the phase of encoding of symbols, first try to look for the transitive relations between conditional pairs of symbols, to detect triplets of sequential events.

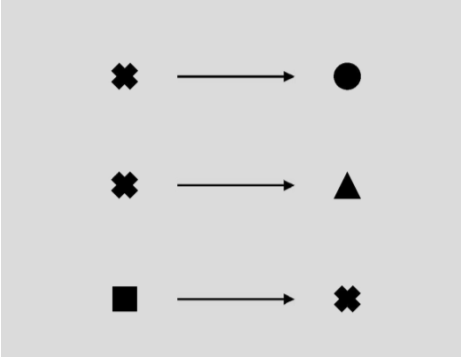
In the above example, they used some seconds to detect two triplets based on transitive relations: triangle-square-circle and square-circle-cross:



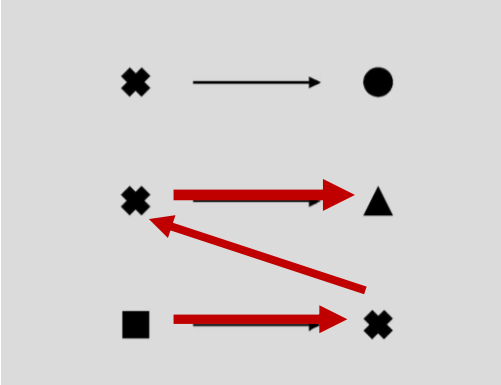


Once these relations were detected, they combined them in a single sequential chain (triangle-square-circle-cross) and they memorized it. After the disclosure of the source state (e.g. square) they selected all the symbols that followed in the sequential chain they built in their mind (e.g. circle, cross)

In other types of trial, like:

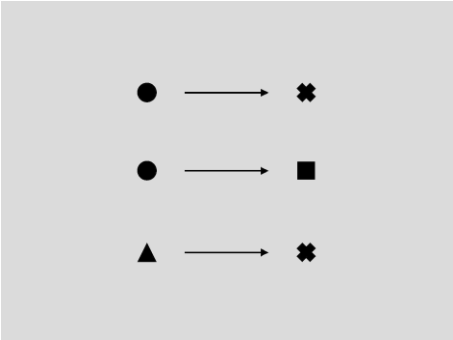


They first looked for potential transitive relations between conditionals



After they have detected the sequential triplet square-cross-triangle, they noticed that “cross” had another consequence (circle). Eventually, they combined these relations in a unique sequence of the type square-cross-(triangle & circle).

Finally, in trials like:



After having noticed that there are no transitive relations between symbols, they tried to memorize symbols in a unique integrated model, taking advantage of the repetition of symbols. For example, they memorized a sequence of the form: circle-(cross & square)-triangle-cross.

This strategy has been more effective that strategy n.1: participants who used it gained on average 7.56 euros (84% of correct responses).

These two strategies were described to you just for your information. Now we ask you to perform again the task in the way you prefer, even using a strategy different from the ones we have reported.