Does scene context influence object identification?

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Abstract:

In this report two experiments are described in detail. The first one is a replication of a study done by Henderson and Hollingworth (1998). The general research question is whether the meaning of a scene influences the process of object identification. The second study expands the design of Henderson and Hollingworth by presenting an auditory stimulus in form of sentences before the picture is presented, to intensify the overall context effect of the scene. This report contains four different parts. The first part gives an introduction to the general topic and an overview about the studies that have been done so far on the topic. Then the two experiments are introduced each with a methodological part and a results part. In the very last part we interpret the results in the context of the preceding studies.

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1. Introduction

Our motivation for this research project was to test what the general mechanisms are that underlie object recognition. In this paper we especially tried to cover the question whether a certain context in which an object appears has any kind of influence on the process of object identification in this paper.
We wanted to unveil a possible relation between the perception of the global scenery (e.g. the view of a café) and the perception of objects in that scene (e.g. cups). Scene perception is a fast process which has been investigated by Olivia & Schyns (1994, 1997), who found that the extraction of overall meaning of a scene takes about 45-135 ms. The perception of objects is a process which takes longer, so that it is possible that the earlier perception of a scene influences this process (Henderson, 1999). The object recognition process can be divided into three major steps. First visual primitives and low level features have to be extracted. These features are then used to create structural descriptions which are compatible with knowledge representations stored in long term memory. In the final step these descriptions must be bound to meaning by matching them against the stored information about object types (Henderson, 1999).
Does the perception of the semantics of a scene influence *in any way* the object perception process if objects are embedded in that scene?
One can imagine two relations which objects can have to the scene in which they are integrated:

- The object is semantically consistent with the scene.
- The object is semantically inconsistent with the scene.

Is there a link between the two processes - scene and object perception - that reflects these semantic relations?
In other words: Is there a difference between the perception of a cup when it is seen in a café rather than in a parking lot?
Three different general theories came up in visual perception research on this topic, which were described by Henderson in a review paper 1999:

- The meaning of a scene spans a context which influences the initial perceptual analysis of objects (Stage one and two of object identification process). This theory is called perceptual schema model.
- The given context activates the representation of a scene, which is stored in long term memory and contains a description of objects which are likely to appear in that scene. The priming hypothesis predicts that activation spreads from this representation to the representations of consistent objects, which are therefore more activated than representations of inconsistent objects (Schachter, 1987). Hence these objects descriptions are more likely to be selected in the matching phase. This theory is called the priming model.
- There is no relation between scene and object recognition. The object identification process is completely isolated from the process of scene identification. There is a possibility of an influence after object identification has been accomplished, but object and scene perception are completely different perceptual processes without any influence on each other, which is known as the functional isolation model.

First, we should shortly define the concept *scene* in order to understand what a possible stimulus material must look like. A scene is defined as a semantically coherent view of a real-world environment. It is built up of large scale background elements, such as walls and floors, and smaller scale changeable entities that include all objects like furniture or tools (Henderson, 1999).
A scene builds up a semantic context in which embedded objects either semantically fit (They are consistent with the context) or do not fit (They are inconsistent with the context). The research motivation is to find out if and in what way semantic world knowledge about these relations influences visual perception of objects.
In our two experiments we test the hypothesis, if there is *any kind of influence* of context on object recognition. We predict a better performance if the context in which an object is presented is consistent. But first we want to illustrate what has been done so far on this topic for showing on which tradition our experiment is based on.

Two totally different paradigms, which have been used for investigation of object recognition in scenes in the past, can be distinguished. The first one is the *eye movement paradigm,* where the duration of the fixation on target objects is assumed to be a measure of how fast an object is identified. Objects which are fixated on shorter are proposed to be more easily recognized. (Friedman 1979; De Graef et al, 1990)
In the *object detection paradigm* on the other hand either the reaction time to a visual search task or the response accuracy of the detection of target objects in a briefly presented scene is taken as measure for the performance of object identification (Biederman, 1973).
The first paradigm has shown to be less successful. For that reason we will here report only about recent research based on the object detection paradigm.

In 1973 Biederman investigated the identification of objects which were tested in a decision task against distractors in normal scenes versus jumbled scenes. The distractor or the target label was shown before a scene with an embedded object was presented, and the subject had to decide afterwards whether the object had appeared within the scene. Biederman found better response accuracy for consistent objects than for inconsistent ones. But the method of using jumbled scenes has been widely criticised (Henderson, 1992, 1999; Bar & Ullman, 1996).
Ten years later Biederman et al. (1982) asked their participants to judge whether a specific object had appeared within a briefly presented scene at a certain location. The trial was structured as follows: First a label naming a target object was presented. When the participant was ready, a line drawn scene was presented for 150 ms, followed by a pattern mask with an embedded location cue. Participants had to judge whether the target had appeared at the cued location in the presented scene. Biederman et. al observed that an object is perceived best, if it does not violate any of the constraints which are imposed by scene meaning (semantic consistency with the scene, position, size, support by other objects, interposition). One interesting result was that semantic violations did not yield to weaker results compared to structural violations. Biederman concluded from this result that the locus of influence must be the perceptual stage. Biederman's experiment (1982) is widely cited as a support for the influence of extracted scene meaning on object recognition, but Henderson and Hollingworth (1998, 1999) showed that there are substantial deficits in the method used by Biederman.
They argued that the consistent object advantage in Biederman's object detection experiments eventually arose from the inadequate control of search strategies,

educated guessing and response bias and not from the influence of scene context on the perceptual analysis of objects.
In a first study Henderson & Hollingworth (1998) tested whether differences in search strategy influence performance in the object detection paradigm. They supposed that one knows better where to search for a consistent object than for an inconsistent one. Presenting the target label after the scene should prevent participants from using a search strategy. As result the effect of consistent objects being detected more accurately vanished. Instead they actually found an advantage for inconsistent objects.
One could think of phenomena like a semantic pop-out effect to explain these results, but Henderson and Hollingworth found neither a significant nor stable effect.
In a follow up study Henderson and Hollingworth (1998) showed that a second critical point in Biederman's study was an inadequate control of response bias (educated guessing). They revised Biederman's method of controlling response bias and could show that this also no longer leads to any effect of a consistent object advantage.
To show that there is an alternative to Biederman's design - which controls search strategies as well as response biases - in 1998 they came up with a new procedure to test response accuracy and detection sensitivity for consistent versus inconsistent objects. They presented twenty different line drawn scenes in which objects were embedded. Subjects were given a forced choice task after scene presentation to decide between either two consistent or two inconsistent objects. One of these objects had been embedded in the scene before. The reported result showed again a non-reliable advantage for inconsistent objects. As a conclusion of these results Henderson and Hollingworth suggested that both the initial perceptual analysis of an object and the matching of an object's visual description against stored descriptions are isolated from stored knowledge about scene-object relations as it is proposed by the functional isolation model.

In contrast, there is some evidence from neurobiological research for better perception of semantically consistent objects. Visual processing is traditionally regarded as the processing of an input image in a bottom-up cascade of cortical regions. Nevertheless, various models suggest that information is processed in a bottom-up and top-down process in the cortex simultaneously (e.g: Grossberg, 1980; Kosslyn, 1994; Ullman, 1995). Bar (2003) proposes a cortical (or subcortical) pathway from early visual areas straight to the prefrontal cortex (PFC), through which a partially analyzed version of the input image, made up of the low spatial frequency (LSF) components (i.e., a blurred image), is transmitted quickly. These representations based on fast and rough analysis can be used in top-down manner to rule out the most probable interpretation of the input image in the temporal cortex and by combining these predictions with the bottom-up analysis of the occipito-temporal cortex. This combined process limits the number of object representations that need to be verified substantially (Bar, 2006). Especially the orbitofrontal cortex (OFC) seems to affect top-down visual processing (Bar, 2006, 2003). Bar et al. (2001) showed via functional magnetic resonance imaging (fMRI) a connection between activity in the OFC and successful object recognition. Physiological findings that LSF information is transmitted by the magnocellular pathway early and quickly (e.g. Shapley, 1990) support the idea that early OFC activity is driven by LSF information as well as results from anatomical studies showing bidirectional connections between early visual areas and the prefrontal cortex (Oenguer and Price, 2000).

The significant role, which top-down mechanisms seem to play in visual processing, is suggested by many recent findings (e.g. Kosslyn et al., 1993; Humphreys et al., 1997). Furthermore, efficient recognition seems to be accomplished by framing early information about an object within the constraints of our world knowledge, including contextual associations, which are analyzed during the recognition of an object or scene and then represented and activated in a corresponding *context frame* in the parahippocampal cortex (PHC). Context frames have a similar concept as schemas that include information about the objects that typically appear within the specific context (Bar and Ullman, 1996).

To sum up the overall impression of research in this field one can say that depending on the methods which are used to investigate the phenomenon of object identification in scene context the results were completely different and contradictory up to now. But the arguments which were brought up by Henderson and Hollingworth (1998, 1999) against the classical methods used by Biederman (1982) were so plausible that we decided to build up our experiments on their methods which try to eliminate the response bias for the decision task.

2. Hypothesis and experiments

After looking at these totally different results from past research projects we decided to test the following hypothesis:

There is no relation of *any type* between scene perception/general context and object recognition before object identification has accomplished.

Our intuitive prediction was that object detection performance should be better if an object had been presented in a consistent context before. For that purpose we used a new stimulus set and tried to control the typicality of certain objects for the scenes in which they are presented in order to get an independent result. Context could be either the context which is spanned by the scene itself alone (Experiment 1) or by a systematically manipulated additional context before scene presentation through auditory priming (Experiment 2). The auditory priming in experiment 2 was introduced in order to test whether the locus of influence is the matching stage. If this is the case then the activation of knowledge representations by theses sentences should have an observable influence.
With experiment 1 we replicated the design used by Henderson & Hollingworth (1998) including the change of not having any scene presented repeatedly in order to prohibit repetition effects.

2.1 Experiment 1

2.1.1 Methods

Participants: Twenty-four people took part in the experiment most of which were students and professors of the University of Osnabrück. The age of the participants varied between eighteen and thirty-six and all of them were right handed. Eight participants were male and sixteen female.
All participants had normal or corrected-to-normal vision. The participants were naive with respect to the hypotheses under investigation.

General design and stimulus set: Participants had to do two blocks of sixty-four trials of stimulus presentation and response which were in random order for each subject. For each trial subjects had to fixate a fixation cross for 500 ms. Right after the fixation followed a 150 ms presentation of a scene in which an object was embedded. The embedded object was either consistent or inconsistent with the scene. The distance of the object from the fixation cross and the size of the objects were controlled and had to fulfil certain constraints. Object size (measured by the longer axis of the objects) varied between 83 and 240 pixel (range = 157 pixel). The objects were placed with a minimal distance of 167 pixel and maximal distance of 353 pixel (range = 186 pixel) from fixation point. After the following presentation of a mask (30 ms) subjects had to do a forced choice task in which they were presented labels of two objects and had to decide which of the two objects had been embedded in the scene. The objects offered for decision were both either consistent or inconsistent with the scene and the correct answers were equally distributed to the left and to the right side of the screen.
Sixty-four hand drawn line drawings of scenes and two semantically consistent objects per scene were used. The objects which were presented together in the forced choice task were supposed to have an equal typicality for their consistent scene. The two inconsistent objects for every scene were the consistent objects of another scene. It was tried to pair always two scenes for which the objects of one scene cause a maximal inconsistency for the combination with their paired scene. Each participant saw every scene only in one combination, so that no subject was presented any scene or object repeatedly (within one block).
A list of scenes and objects can be found in the Appendix. Some scenes had as model scene stimuli of Henderson and Hollingworth which were in part taken from Van Diepen and De Graef (1994).
Instructions and the forced-choice task were formulated in German.

So finally there were two different combinations of stimulus presentation

- Scene with **C**onsistent **O**bject **(CO)**
- Scene with **I**nconsistent **O**bject **(IO)**

The following table shows an overview of our different experimental conditions:

Experimental combinations of factors

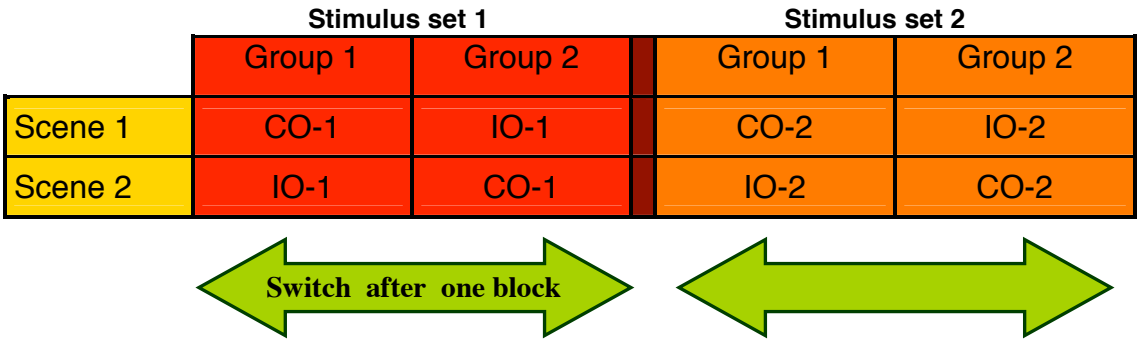
	scene-object consistency	Performance prediction
Condition 1	**CO**	**High**
Condition 2	**IO**	**Lower**

Our two conditions can now be notated in terms of expected benefit on object recognition performance:

(CO): Positive benefit of scene context because the scene is consistent with the object.

(IO): Negative benefit of scene context because the scene is inconsistent with the object.

We used a within-subjects design, so that the two different combinations of factors were balanced over two groups in the following way:



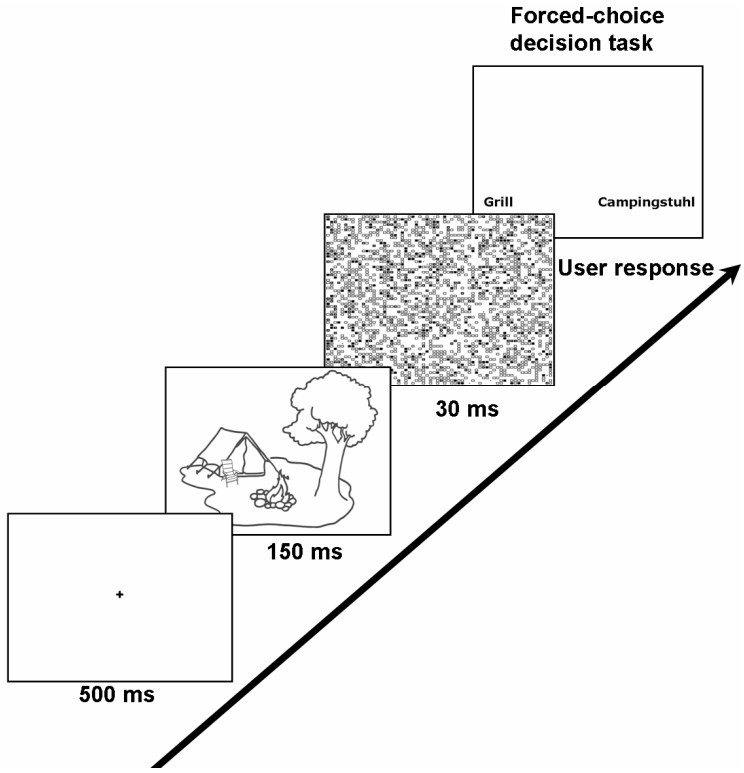
Furthermore we had two stimulus sets. In the first set the scenes were presented with one half of the objects embedded in the scene and in the other set the second half of the objects were embedded, which means that all four possible object-scene combinations were tested.
In the second block of the experiment participants of one group were presented the stimulus set of the other group. That means that if a participant had seen one scene with a consistent object in the first block he had the inconsistent object embedded in that scene in the second block and thus the participants were not able to infer the correct object. The purpose of this second block was to test if there are any repetition effects because participants had seen the scenes before. This would be a hint that the methodology of Henderson et al. (1998, 1999) is critical because of the number of repetitions.

Apparatus: The stimuli were displayed on a 17'' Iiyama Pro Lite B1702S-W2 TFT-Monitor with an 85 Hz refresh rate and a resolution of 1024 x 768. Responses were collected with a standard keyboard and the E-Prime software package.

***Procedure*:** The experimenter explained that the task on each trial was to fixate a fixation cross, then view a briefly displayed scene and to decide afterwards which of two objects that were displayed as labels had appeared in the scene. It was

mentioned that one of the objects had always appeared in the scene and the other object had not appeared in the scene. Participants were instructed that they could control the start of the next trial on their own and that they could take a break when ever they wanted to.

The participants were seated in front of the computer monitor with a distance of 70 centimetres from the screen and 125 centimetres from ground. One hand rested on the left answer key and the other on the right answer key. Viewing distance was measured before the experiment started and the participants were instructed to keep still while doing the experiment.



A fixation cross was presented for 500 ms after the participant started the trial. After a presentation of the scene for 150 ms followed a pattern mask for 30 ms. Immediately after the mask the forced-choice response screen appeared. There was no delay between each display. The forced-choice response screen remained in view until the participant gave a response to one of the options displayed. After the response participants were asked to start the next trial when they were ready to.

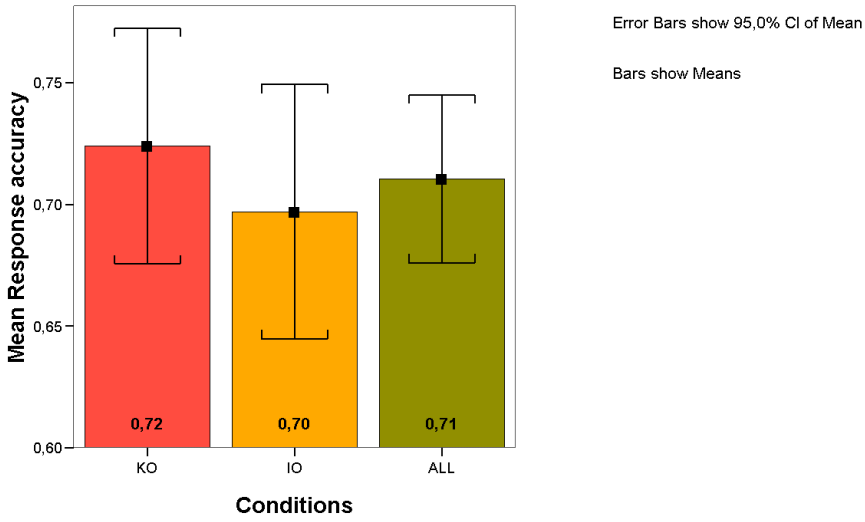
Participants took part in a practice block of 4 trials. None of the scenes used in the practice block were used in the experimental trials. Each participant saw sixty-four experimental trials in the first block and sixty-four trials in the second block. Trial order was randomized independently for each participant. The entire experiment lasted approximately 15 minutes.

2.1.2 Results

In order not to violate our premises regarding the typicality of objects for the scenes we used participants ratings from experiment 2 to see, how typical or untypical two objects are for a scene. All trials where objects were supposed to be typical or untypical but were not rated appropriate were excluded from further statistical analysis. For significance testing all percentage correct values have been Arcus-Sinus transformed in order to get a better fitting of the data to a normal distribution.

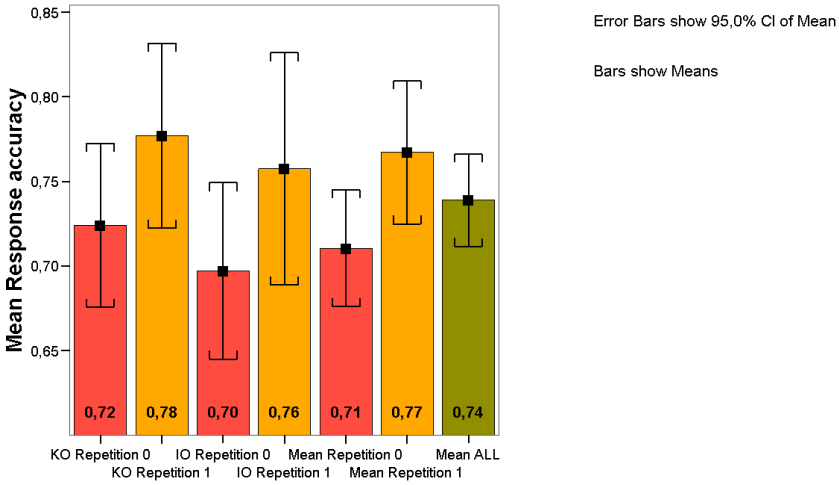
The mean value for consistent objects was 72 percent correct answers and the mean value for inconsistent ones was 70 percent.

Response accuracy (mean) over two different experimental conditions



The mean value for the two different conditions did not show any significant and stable effect. A one-way ANOVA (see: *table 1*) resulted in an F-Value of .5 and thus the effect is not significant (p = .5). But we did find a significant effect for the *first repetition* in the second block where subjects were presented a scene the second time. There is a clear tendency for a general rise in overall performance and also a rise in both of the conditions, of which the IO rise was significant and CO rise was nearly significant. For the analysis of mean values of both conditions taken together we found an F-Value of 5.5 with a resulting p-value of .02. CO Repetition 0 versus CO Repetition 1 gave an F-Value of 2.9, a p-value of .1 and IO Repetition 0 versus IO Repetition 1 gave an F-Value of 4.6 and a p-value of .04. For further details see table 2, 3, 4. The graphical representation below shows these differences.

Response accuracy (mean) over two different experimental conditions and repetition 0 and 1



Conditions over repetitions and mean values for repetition 0 and 1

There was no relation between the object size and performance and also not between object distance from fixation cross and performance.

2.1.3 Discussion

What are the conclusions of the statistical analysis? In general we replicated the results of the experiment done by Henderson et al. (1998, 1999) quite well. As Henderson we did not find any significant effect that there is an influence of scene meaning on the process of object recognition. There was only a weak tendency for consistent objects to be recognized better. That differs from Hendersons' results because they found a tendency for inconsistent objects to be recognized better. We did our experiment with a totally new stimulus set and we got the same results for a design which only differed in the preventing of repetitive exposure to the scenes. This seems to indicate clearly that there is no effect of interaction. Further interpretations of the result will be pointed out in the discussion of experiment 2 and a subsuming discussion in the end.
One thing which has to be mentioned here again is that there was a *significant effect for one repeated presentation of scenes*. We think that this can be interpreted as a clear hint that repeated presentation of scenes is critical. We did not test a setup where scenes are presented *eight times without change of the objects' place* as Henderson's group did in their experiment (1998, 1999). Although Henderson and Hollingworth checked for repetition and position effects in a previous study, we are not quite sure if this can be transferred to their follow up study. Our results at least suggest that repetition in general is critical. We think that there is a possible methodological problem, which has to be investigated in a study which accounts only exactly for repetition and the constant place of objects.

2.2 Experiment 2

2.2.1 Methods

***Participants*:** Eighty people took part in the experiment most of which were students and professors of the University of Osnabrück. The age of the participants varied between eighteen and fifty-eight.
Seventy-six participants were right handed and four left handed, forty-six were male and thirty-four female.
All participants had normal or corrected-to-normal vision and were mostly German-native speakers or at least fluent in the German language. The participants were naive with respect to the hypotheses under investigation.

General design and stimulus set: Each participant had to go through two different parts in the experiment. The first part had sixty-four trials of stimulus presentation and response. All trials were in random order for each subject. For each trial a set of two sentences was presented via headphones while a fixation cross was present on the screen. The second sentence could be either consistent or inconsistent with the scene. The first sentence did not stand in any relation to the scene, only in one condition the sentence had a consistent relation to the inconsistent object in the scene. This combination was intended to dissolve the inconsistency between scene and object.
Right after the sentences followed a 150 ms presentation of a scene in which an object was embedded. The embedded object was either consistent or inconsistent with the scene. The distance of the object from the fixation cross and the size of the

objects were controlled in the same way as in experiment 1. There was also a presentation of a mask (30 ms) and subjects then had to do a forced choice task in which they were presented labels of two objects and had to decide which of the two objects had been embedded in the scene. The objects offered for decision were both either consistent or inconsistent with the scene and the correct answers were equally distributed to the left and to the right.
We used the same set of sixty-four hand drawn line drawings of scenes and objects as for experiment 1 with the same combinations of scenes and objects. Also the pairing of scenes was done in the same way. In this experimental setup it was also controlled that each participant saw every scene only in one combination of object and sentences, so that no subject was presented any scene, object or sentence repeatedly. Instructions, sentences and the forced-choice task were in German.
The sentences presented were all of the form "X has done something. Now he/she is doing something somewhere in relation with something". None of the sentences had direct naming of one of the objects presented in the following forced choice task in order to avoid search strategies. All sentences were phrased and recorded on our own.
The auditory sentence presentation is referred to as auditory priming because it leads to priming in a certain semantic direction, which means that relevant concepts should be more activated than irrelevant, as proposed by the implicit memory model (Schachter, 1987). For consistent priming it is a kind of preparation for the upcoming scene and for inconsistent priming concepts are activated which do not have any relation to the upcoming scene. We decided that the notation of inconsistent priming fits better to our research question than normally used notations like base-line or distractor. Consistency or inconsistency of priming or objects is always in reference to the scene, except from the first sentence of the condition where the inconsistency of object and scene should be dissolved.
With consistent and inconsistent priming sentences before the scene and an object in the scene that is consistent or inconsistent with it, we gain the following conditions:

- **C**onsistent **P**riming → **C**onsistent **O**bject
  (CP → CO)
- **C**onsistent **P**riming → **I**nconsistent **O**bject
  (CP → IO)
- **I**nconsistent **P**riming → **C**onsistent **O**bject
  (IP → CO)
- **I**nconsistent **P**riming → **I**nconsistent **O**bject
  (IP → IO)

The last condition (IP → IO) was left out because we found it insensible to test a condition where neither priming nor object was consistent with the scene and would therefore not yield information for our purpose.
We furthermore added another factor level that was supposed to show the influence of context knowledge on object recognition. In this condition the object was inconsistent with the scene but the priming beforehand was meant to dissolve the inconsistency of the object by making a connection between scene and object. This was done by the combination of the first sentence being consistent with the object and the second being consistent with the scene.

This leads to two additional conditions:

- **I**nconsistency **D**issolving **P**riming → **I**nconsistent **O**bject (**IDP → IO**)
- **I**nconsistency **D**issolving **P**riming → **C**onsistent **O**bject (**IDP → CO**)

The second combination was also left out of our experimental design due to the fact , there is no inconsistency to dissolve if the object is consistent

The following table shows an overview of our different experimental conditions:

	Auditory priming	scene-object consistency	performance prediction
Condition 1	**CP**	**CO**	**Highest**
Condition 2	**CP**	**IO**	**Lowest**
Condition 3	**IDP**	**CO**	
Condition 4	**IDP**	**IO**	**At least better than condition 2**
Condition 5	**IP**	**CO**	**Higher than conditon 2 but lower then condition 1**
Condition 6	**IP**	**IO**	

Conditions labelled red were excluded from the experiment

Our four conditions can now be notated in terms of expected benefit on object recognition performance:

(CP → CO): Positive benefit of auditory priming because the second sentence is consistent with the object and the scene and also positive benefit of scene context because the scene is consistentwith the object.

(**IDP → IO**): Positive benefit of auditory priming because the first sentence is consistent with the object and the second with the scene (dissolving of inconsistency), but negative benefit of scene context because the scene is inconsistent with the object.

(IP → CO): Negative benefit of auditory priming because the sentences are both inconsistent with the object and the scene, but positive benefit of scene context because the scene is consistent with the object.

(CP → IO): Negative benefit of auditory priming because the second sentence is inconsistent with the object but consistent to the scene, which is itself inconsistent with the object (negative benefit on object).

Therefore we had a **2 x 2 design**:

1. Positive auditory benefit on object recognition vs. negative auditory benefit on object recognition

2. Positive scene context benefit on object recognition vs. negative scene context benefit on object recognition

As in experiment 1 we used a within-subjects design, so that the four different combinations of factors were balanced over four groups in the following way:

Stimulus set 1	Group 1	Group 2	Group 3	Group 4
Scene 1	CP & CO-1	CP & IO-1	IDP & IO-1	IP & CO-1
Scene 2	CP & IO-1	IDP & IO-1	IP & CO-1	CP & CO-1
Scene 3	IDP & IO-1	IP & CO-1	CP & CO-1	CP & IO-1
Scene 4	IP & CO-1	CP & CO-1	CP & IO-1	IDP & IO-1
Stimulus set 2	Group 1	Group 2	Group 3	Group 4
Scene 1	CP & CO-2	CP & IO-2	IDP & IO-2	IP & CO-2
Scene 2	CP & IO-2	IDP & IO-2	IP & CO-2	CP & CO-2
Scene 3	IDP & IO-2	IP & CO-2	CP & CO-2	CP & IO-2
Scene 4	IP & CO-2	CP & CO-2	CP & IO-2	IDP & IO-2

Furthermore we had two stimulus groups as described for experiment 1.

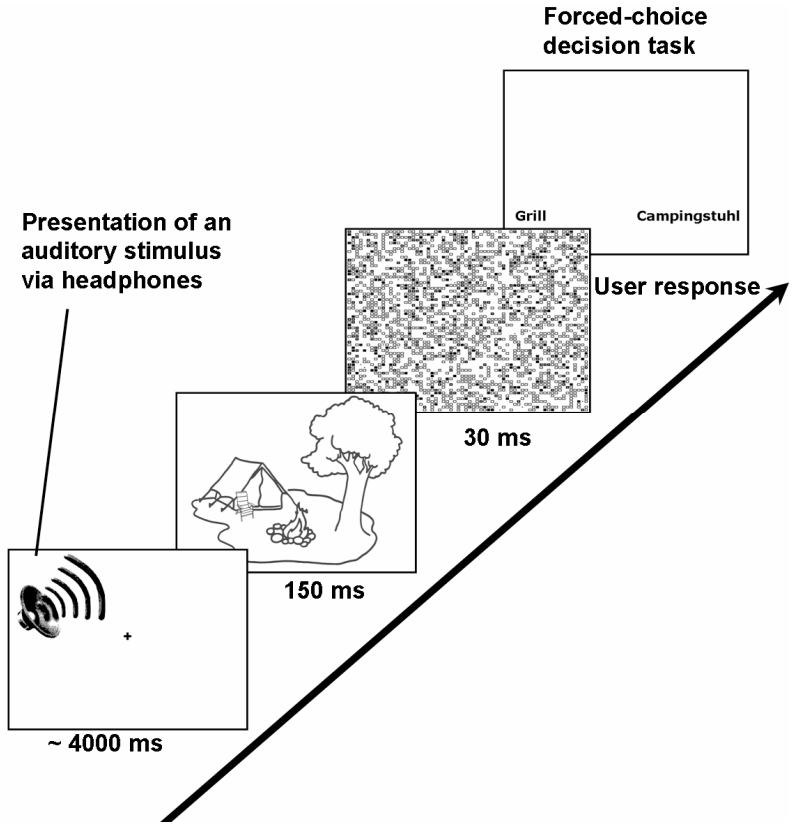
In the second part of the experiment the participants were asked to judge to which degree the used image of the two objects are typical for a specific scene. We wanted to test if the objects which were present in the scenes were really consistent or inconsistent with that scene. Every pair of objects was tested against the consistent scene and its inconsistent paired scene. The images of the objects which had been embedded in the scene were used for that task. A pair was always tested on one screen in order to have direct comparison of the typicality of the two objects.
All objects had to be rated on a scale of four levels (Very typical, typical, not typical, very untypical). The results of this rating were only used in the analysis to identify invalid trials.

***Apparatus*:** The stimuli were displayed on an Elsa Ecomo 750 22" monitor with a 85 Hz refresh rate and a resolution of 1024 x 768. Responses were collected with a response box and the E-Prime software package.

***Procedure*:** The experimenter explained that the task on each trial was to listen to the two sentences and imagine the situation described while fixating on a fixation cross. Participants were informed that there would be a briefly displayed scene immediately after the second sentence and that they had to decide afterwards which of two objects that were displayed as labels had appeared in the scene. It was mentioned that one of the objects always had appeared in the scene and the other

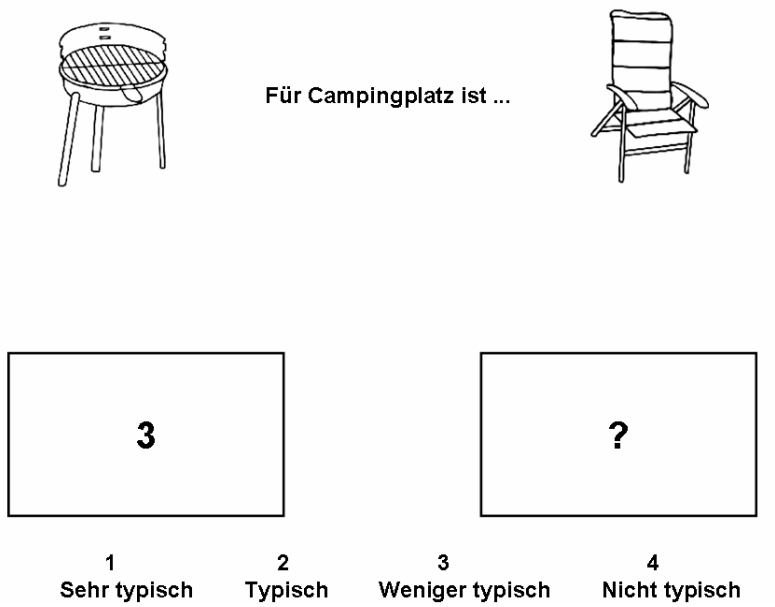
object had not appeared in the scene and that they should respond intuitively without reflection. Participants were instructed that they could control the start of the next trial on their own and that they could take a break when ever they wanted to.

Participants were then seated in front of the computer monitor with a distance of 86 centimetres from the screen and 125 centimetres from ground. One hand rested on the left answer button and the other on the right answer button. Viewing distance was measured before the experiment started and the participants were instructed to keep still while doing the experiment.



A fixation cross was presented while the participants heard the sentences after the trial was started. Directly after the second sentence a scene was visible for 150 ms, followed by the pattern mask for 30 ms. Immediately after the mask the forced-choice task was displayed. There was no delay between each display. The forced-choice task stayed on screen until the participant gave a response to one of the options displayed. After the response the participant was asked to start the next trial when they were ready to.

Participants took part in a practice block of 4 trials. None of the scenes used in the practice block were used in the experimental trials. Each participant had to do sixty-four experimental trials. Trial order was randomized independently for each participant.



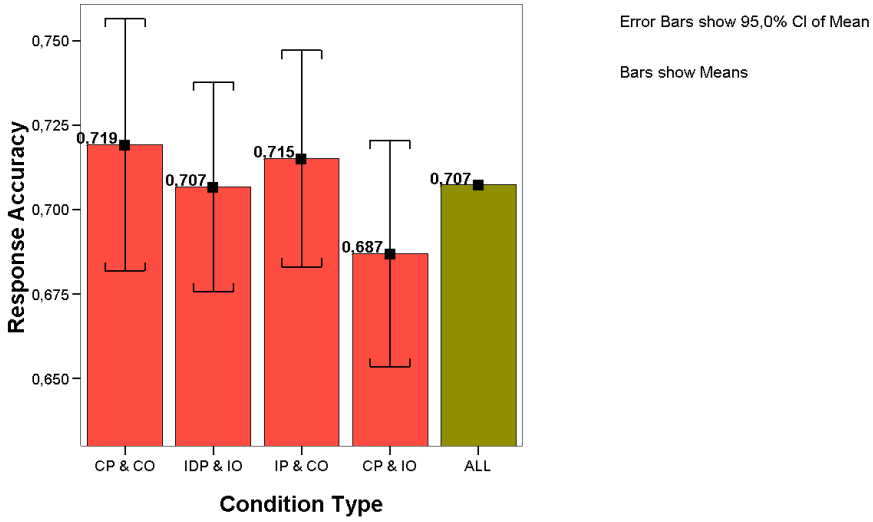
In the second part of the experiment participants were instructed that they had to judge to which degree the used images of two objects were typical for a specific scene. Participants were told to answer quickly and intuitively.

The entire experiment lasted approximately 35 minutes.

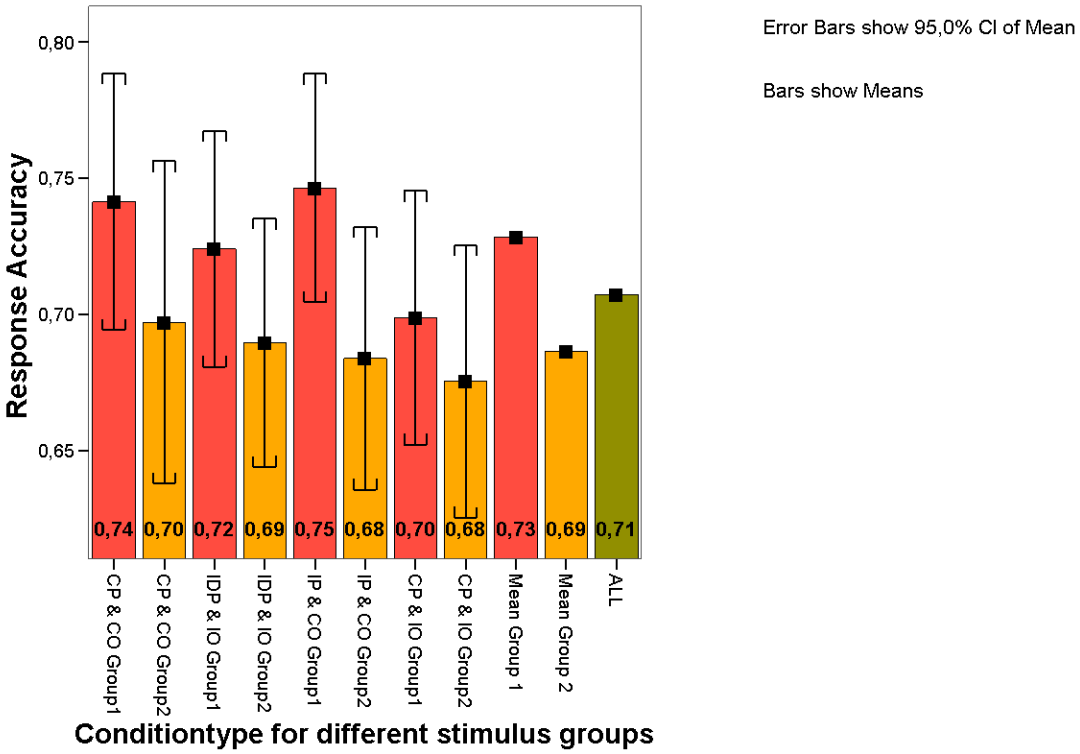
2.2.2 Results

In order not to violate our premises we first did an analysis of the participants' ratings how typical or untypical the two objects are for a scene. All trials where objects were supposed to be typical or untypical but were not rated appropriate were excluded from further statistical analysis. There had also been some filtering of trials in which the participant showed untypical response times.
For significance testing all percentage correct values were Arcus-Sinus transformed in order to get better fitting of the data to a normal distribution.
As one can see from the charts below, there was no strong effect for the different experimental conditions. The first chart shows the mean response accuracy over the different conditions and the overall response accuracy for both stimulus sets taken together and the second for both sets separately. There is some tendency that if an object is consistent to the scene in which it is presented the response accuracy is better than for inconsistent objects.

Response accuracy (mean) over four different experimental conditions



Response accuracy (mean) over four different experimental conditions differentiated for both stimulus groups



To test for significance we used two different general linear models. The first one discriminated only as **within-subject factor** the **four different conditions** (see: *table 5,6*) as defined above which were treated in the GLM as one factor and in the second we used as **within-subject factors auditory benefit on object recognition** and **scene context benefit on object recognition** (see: *table 7, 8*).
For the first analysis we found a p-value of .290 for the within-subject factor condition type. This means that there is no significant difference between the different condition groups. In the second analysis there was also neither a significant effect for **auditory benefit on object recognition** (p-value = .35) nor for **scene context benefit on object recognition** (p-value = .13). There is evidence that the factor scene context has greater influence on object recognition than the auditory priming, although we did not find a significant result. For a graphical representation of these effects see *chart 1, 2, 3 and 4* in the Appendix.
The data indicates that the two conditions where the scene context is consistent to the object showed higher performance (.72) than the two other conditions where the context was inconsistent (.70). But also the two conditions where the auditory priming was consistent to the object were better (.71) than the conditions where the priming had been inconsistent (.70). In the general linear model the two **stimulus groups** were included as a **between subjects factor** (see: *table 6, 8*) and surprisingly this factor became nearly significant for both analysis types (p-value = .1). We think that this difference could be due to the fact that both groups differ fundamentally in the structure of the distribution of the age of participants. Overall the mean age of group two was 2.5 years older than in group one. Given the fact that the age of the participants seems to have an influence on the response accuracy we assume that this was the driving factor for the weaker result for group two. The correlation between age and overall response accuracy gave a significant result (p-value < .05) with a correlation of -.320 (see: *table 9, 10*) meaning that there is a tendency that

older participants do worse than younger ones. The second fact which can explain this difference is that the ratio of male and female was different for both groups. There were more male participants in the second group (twenty-six) compared to the first one (twenty). If we now take into consideration that female participants performed significantly better (Mean accuracy: .69 (male) and .73 (female), p-value < .05, (see: *table 11*)) this can further explain why the second group performed worse. At the moment we do not know why male and female perform differently. However the two facts (age and gender difference) cannot clarify why the results over conditions are different for both groups (see chart on the previous page).
For the object size and object distance from fix cross which have been controlled and measured no significant effect was found.

2.2.3 Discussion

What are the conclusions of the statistical analysis? We could not show with our experiments and our methods that the hypothesis in question must be rejected. This could be interpreted as support for the functional isolation model. There was no significant difference for the different conditions or factors, so it seems that there is no measureable interaction between scene perception and object recognition. There also seems just very little influence of the context which has been induced by auditory priming before scene presentation. The results for the CP & CO condition of experiment 2 is only little better than the CO condition of experiment 1 where we did not use the auditory priming method. There is some tendency that the auditory priming has positive influence as well as the scene context if it is consistent with the object which is presented. That means that consistent context seems to work better for both auditory and visual context. So that we can say that the tendency of an advantage for inconsistent objects as proposed by Henderson (1998) cannot be affirmed. But we still see possible problems with the method of the two experiments which could have caused that a measurable effect vanished.
The first one is that the presentation of the scene took place directly after the auditory priming, which possibly overcharged participants, especially if we take into account that participants were instructed to *imagine* the actions and the places of the actions they were presented, which possibly leads to interference with the visual task. The sentence presentation is also hard to control with respect to content, what it implies and what priming effects it has. We cannot really ensure that there is no tendency that sentences facilitate one object more than the other and that the sentences prime the scenes equally well or distract from them equally well. There should possibly be a much more simplistic account to that like presenting only the label of the scene or the distractor before.
Another special problem with these experiments was that also the visual stimulus set was introduced the first time. Objects and scenes have not been tested before neither for representativeness nor for differences in complexity. That leads to the conjecture, that there are substantial differences in the performance for the different scenes.
But there is also a much more general problem. As extraction of scene context is in theory connected to the extraction of low spatial frequency features of an image (Bar, 2006) and line drawings contain almost no low spatial frequency information, there is big chance that already the correct extraction of the overall meaning can not be guarantied. Also Schyns & Oliva (1994, 1997) used photographs for their investigation of how long it takes to extract meaning from a scene. That could be a

possible reason that prevented a strong influence of scene meaning on object recognition. But it does not clarify why the auditory priming did not have stronger influence. This should be the case according to the priming model. There should be at least some activation spreading to relevant pieces of information (Schachter, 1987) and hence a higher probability for consistent objects to be identified. This could be interpreted in the way that the priming model which proposes that the influence takes place at the matching stage goes in the wrong direction.
To sum all this up we cannot rule out that our methodology is a driving factor to prevent an effect to arise.

3. General discussion

What can be read out of the results of these two experiments and the results that Henderson et al. (1999) and Bar (2006) found?
As mentioned above the priming model becomes less plausible because sentence presentation which should induce a higher activation for certain consistent or inconsistent concepts did not work very well. So it seems to be obvious to conclude that there is no higher likelihood for structural descriptions of consistent objects to be selected. But the big question is whether a model which proposes an influence of the scene interpretation to take place on the stage one or two of the process of object recognition can really be investigated with line drawings. If meaning cannot be extracted in a similar way as in full-colour pictures then it is not surprising that the outcomes of Bar and Henderson are that substantially different. Bar proposes an influence of areas which are responsible for scene perception based on low spatial frequency information of a scene on the early stage of object recognition. Line drawings are much more abstract and would therefore eventually just work to find out something about the priming model because they activate associated concepts in memory taking that meaning can be roughly inferred from stimuli. That extraction of meaning is possible does not mean that this process is done by the same brain area as Bar found for full-colour pictures and therefore the same projection to lower areas cannot be assumed without further research. But if there is only an early influence of the areas Bar found for extraction of scene meaning (which are potentially different for line drawing scenes) on early object recognition processing, line drawing could possibly be material which is inappropriate for investigation. So if it could be proven by further experiments that the interpretation of line drawing pictures do activate memory concepts but are not capable influencing the object recognition processes in early phases in contrast to stimuli containing much low frequency information this could be another argument against the priming model.

4. Conclusion

We were not able to show any significant positive effect of consistent scene context on object recognition and also no significant influence of consistent auditory priming beforehand. But this could be only due to the fact that line drawings or priming method were not appropriate to investigate such a phenomenon. As Henderson (1999) pointed out correctly and illustrative one further major question stays: If there would be a method to show that there is any influence of global meaning on local

analysis of objects, experiments are up to now not able to give answers on which stage of object recognition process this takes place. Perhaps our method – presenting sentences before scene presentation - is a possibility to unveil further results. But as described before the method as it was used in experiment 2 was not easy enough to control. Follow up studies should certainly use a much more easy method when trying to use this type of priming beforehand in order to investigate the question. There should also be some further research done on the question if line drawings are suitable for these kinds of questions.

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Appendix

1. Stimulus Material

1. 1 Sentences

Freibad

1. Pairing:: Restaurant, Flughafen
2. Objects
    1. Konsistent: Schnorchel, Taucherbrille
    2. Inkonsistent: Messer, Gabel
3. Primining sentences
    1. Sentence one: Tina hat ein Lesezeichen gebastelt.
    2. Consistent sentence: Jetzt steht sie im Freibad neben dem Schwimmbecken.
    3. Inconsistent sentence: Jetzt eilt sie im Flughafen zu ihrem Flugzeug.
    4. Dissolving inconsistency: Tina hat ein Schnitzel gegessen.

Restaurant

1. Pairing:: Freibad, Parkplatz
2. Objects
    1. Konsistent: Messer, Gabel
    2. Inkonsistent: Schnorchel, Taucherbrille
3. Primining sentences
    1. Sentence one: Volker hat den Boden gesaugt.
    2. Consistent sentence: Jetzt speist er im Restaurant am Tisch.
    3. Inconsistent sentence: Jetzt steht er auf dem Parkplatz mit seinen Einkäufen.
    4. Dissolving inconsistency: Volker hat den Tauchkurs besucht.

Garten

1. Pairing:: Büro, Grillen
2. Objects
    1. Konsistent: Harke, Schaufel
    2. Inkonsistent: Schreibtischlampe, Bildschirm
3. Primining sentences
    1. Sentence one: Timo hat die Kinder gezählt.
    2. Consistent sentence: Jetzt ruht er im Garten auf der Liege.
    3. Inconsistent sentence: Jetzt isst er beim Barbecue sein Steak.
    4. Dissolving inconsistency: Timo hat seinen Arbeitsplatz aufgeräumt.

Am Schreibtisch / Büro

1. Pairing:: Garten, Krankenhaus
2. Objects
    1. Konsistent: Schreibtischlampe, Bildschirm
    2. Inkonsistent: Harke, Schaufel
3. Primining sentences
    1. Sentence one: Toni ist Marathon gelaufen.
    2. Consistent sentence: Jetzt sitzt er im Büro an den Akten.
    3. Inconsistent sentence: Jetzt spricht er im Krankenhaus mit dem Chirurg.
    4. Dissolving inconsistency: Toni hat Unkraut gejätet.

Werkzeugkeller

1. Pairing:: Jahrmarkt, Skateplatz
2. Objects
    1. Konsistent: Bohrmaschine, Kreissäge
    2. Inkonsistent: Luftballon, Lutscher/Lolli
3. Primining sentences
    1. Sentence one: Peter eine Musik CD gebrannt.
    2. Consistent sentence: Jetzt schleift er im Werkzeugkeller den Tisch.
    3. Inconsistent sentence: Jetzt probiert er auf dem Skateplatz die Halfpipe.
    4. Dissolving inconsistency: Peter hat auf der Kirmes gefeiert.

Jahrmarkt

1. Pairing:: Werkzeugkeller, Bach → hat eine Frau, hier muss also wieder so wie vorher
2. Objects
    1. Konsistent: Luftballon, Lolli/Lutscher
    2. Inkonsistent: Bohrmaschine, Kreissäge
3. Primining sentences
    1. Sentence one: Katrin hat Mathe geübt
    2. Consistent sentence: Jetzt zieht sie auf dem Jahrmarkt Lose
    3. Inconsistent sentence: Jetzt watet sie im Bach durchs Wasser.
    4. Dissolving inconsistency: Katrin hat im Baumarkt eingekauft.

Kirche

1. Pairing:: Park, Labor
2. Objects
    1. Konsistent: Kerze, Bibel
    2. Inkonsistent: Laterne, Papierkorb
3. Primining sentences
    1. Sentence one: Rita hat das Geschirr abgespült.
    2. Consistent sentence: Jetzt spielt sie in der Kirche Orgel.
    3. Inconsistent sentence: Jetzt sucht sie im Labor ihren Kittel.
    4. Dissolving inconsistency: Rita ist durch den Park geschlendert.

Park

1. Pairing:: Kirche, Brücke
2. Objects
    1. Konsistent: Laterne, Papierkorb
    2. Inkonsistent: Kerze, Bibel
3. Primining sentences
    1. Sentence one: Susi hat die Haare gefärbt.
    2. Consistent sentence: Jetzt entspannt sie im Park auf der Wiese.
    3. Inconsistent sentence: Jetzt läuft sie über die Brücke nach Hause.
    4. Dissolving inconsistency: Susi hat beim Pfarrer gebeichtet.

Stall

1. Pairing:: Bahnhof, Indianercamp
2. Objects
    1. Konsistent: Gummistiefel, Wassereimer
    2. Inkonsistent: Reisetasche, Kofferwagen
3. Primining sentences
    1. Sentence one: Lukas hat das Licht angeschaltet.
    2. Consistent sentence: Jetzt füttert im Stall die Kühe.
    3. Inconsistent sentence: Jetzt raucht er im Indianercamp eine Pfeife.
    4. Dissolving inconsistency: Lukas hat den Zug verpasst.

Bahnhofshalle

1. Pairing:: Stall, Tankstelle
2. Objects
    1. Konsistent: Reisetasche, Kofferwagen
    2. Inkonsistent: Gummistiefel, Wassereimer
3. Primining sentences
    1. Sentence one:Helmut hat das Kreuzworträtsel gelöst.
    2. Consistent sentence: Helmut wartet er in der Bahnhofshalle auf seinen Zug.
    3. Inconsistent sentence: Jetzt kontrolliert er an der Tankstelle den Reifendruck.
    4. Dissolving inconsistency: Helmut hat die Pferdebox gereinigt.

Gerichtssaal

1. Pairing:: Hafen, Landstraße
2. Objects
    1. Konsistent: Gesetzbuch, Hammer
    2. Inkonsistent: Boje, Möwe
3. Primining sentences
    1. Sentence one: Carsten hat gefrühstückt.
    2. Consistent sentence: Jetzt sitzt er im Gerichtssaal neben dem Anwalt.
    3. Inconsistent sentence: Jetzt fährt er über die Landstrasse mit dem Bus.
    4. Dissolving inconsistency: Carsten hat eine Bootsfahrt gemacht.

Hafen

1. Pairing:: Gerichtssaal, Zirkus
2. Objects
    1. Konsistent: Boje, Möwe
    2. Inkonsistent: Gerichtsbuch, Hammer
3. Primining sentences
    1. Sentence one: Lisa hat einen Strumpf gestrickt.
    2. Consistent sentence: Jetzt beobachtet sie am Hafen die Schiffe.
    3. Inconsistent sentence: Jetzt beobachtet sie vor dem Zirkus den Clown.
    4. Dissolving inconsistency: Lisa hat das Urteil verkündet.

Landstraße

1. Pairing:: Zirkus, Gerichtssaal
2. Objects
    1. Konsistent: Ortsschild, Geschwindigkeitsbegrenzung
    2. Inkonsistent: Pferd, Löwe
3. Primining sentences
    1. Sentence one: Gerhard hat Karten gespielt.
    2. Consistent sentence: Jetzt fährt er über die Landstrasse mit dem Bus.
    3. Inconsistent sentence: Jetzt sitzt er im Gerichtssaal neben dem Anwalt.
    4. Dissolving inconsistency: Gerhard hat die Tiershow gesehen.

Zirkus

1. Pairing:: Landstraße, Hafen
2. Objects
    1. Konsistent: Pferd, Löwe
    2. Inkonsistent: Ortsschild, Geschwindigkeitsbegrenzung
3. Primining sentences
    1. Sentence one: Heike hat am Fließband gearbeitet.
    2. Consistent sentence: Jetzt beobachtet sie vor dem Zirkus den Clown.
    3. Inconsistent sentence: Jetzt beobachtet sie am Hafen die Schiffe.
    4. Dissolving inconsistency: Heike hat die Vorfahrt missachtet.

Wohnzimmer

1. Pairing:: Waschsalon, Treppenhaus
2. Objects
    1. Konsistent: Sessel, Stehlampe
    2. Inkonsistent: Waschpulver, Wäschekorb
3. Primining sentences
    1. Sentence one: Rosa hat ihre Haare gefönt.
    2. Consistent sentence: Jetzt liest sie im Wohnzimmer die Zeitung.
    3. Inconsistent sentence: Jetzt geht sie die Treppe zum Erdgeschoss herunter.
    4. Dissolving inconsistency: Rosa hat Wäsche gewaschen.

Waschsalon

Pairing:: Wohnzimmer, Geldautomat

1. Objects
    1. Konsistent: Waschpulver, Wäschekorb
    2. Inkonsistent: Sessel, Stehlampe
2. Primining sentences
    1. Sentence one: Eva hat ihren Hund trainiert.
    2. Consistent sentence: Jetzt startet sie im Waschsalon den Trockner.
    3. Inconsistent sentence: Jetzt hebt sie am Geldautomaten Geld ab.
    4. Dissolving inconsistency: Eva hat das Wohnzimmer eingerichtet.

Zeltplatz

1. Pairing:: Straßenbahnhaltestelle, Kaufhaus
2. Objects
    1. Konsistent: Campingstuhl, Grill
    2. Inkonsistent: Fahrkartenautomat, Haltestellenschild
3. Primining sentences
    1. Sentence one: Janis hat Biologie gelernt.
    2. Consistent sentence: Jetzt sitzt er auf dem Campingplatz mit Freunden.
    3. Inconsistent sentence: Jetzt steht er im Kaufhaus an der Kasse.
    4. Dissolving inconsistency: Jannis hat auf die S-Bahn gewartet.

Straßenbahnhaltestelle

1. Pairing:: Zeltplatz, Straße
2. Objects
    1. Konsistent: Fahrkartenautomat, Haltestellenschild
    2. Inkonsistent: Kopfkissen, Kommode
3. Primining sentences
    1. Sentence one: Anne hat mit dem Ball gespielt.
    2. Consistent sentence: Jetzt spricht sie neben der Straßenbahn mit dem Kontrolleur.
    3. Inconsistent sentence: Jetzt geht sie an der Strasse zu ihrem Rad.
    4. Dissolving inconsistency: Anne hat mit Freunden gezeltet.

Picknick

1. Pairing:: Friseur, Fabrikgelände
2. Objects
    1. Konsistent: Weinflasche, Baguette
    2. Inkonsistent: Schere, Fön
3. Primining sentences
    1. Sentence one: Sandra hat einen Ausflug gemacht.
    2. Consistent sentence: Jetzt macht sie ein Picknick auf der Wiese.
    3. Inconsistent sentence: Jetzt betritt sie das Fabrikgelände durch das Tor.
    4. Dissolving inconsistency: Sandra hat den Friseursalon verklagt.

Friseur

1. Pairing:: Picknick, Golfplatz
2. Objects
    1. Konsistent: Schere, Fön
    2. Inkonsistent: Weinflasche, Baguette
3. Primining sentences
    1. Sentence one: Aileen hat Freunde besucht.
    2. Consistent sentence: Jetzt sitzt sie beim Friseur vor dem Spiegel.
    3. Inconsistent sentence: Jetzt sucht sie auf dem Golfplatz nach ihrem Ball.
    4. Dissolving inconsistency: Aileen hat französisch gegessen.

Bushaltestelle

1. Pairing:: Disko, Konzertsaal
2. Objects
    1. Konsistent: Schultasche, Mülleimer
    2. Inkonsistent: Bierflasche, Cocktailglas
3. Primining sentences
    1. Sentence one: Conny hat ihre Schuhe gebunden.
    2. Consistent sentence: Jetzt wartet sie an der Bushaltestelle auf ihren Bus.
    3. Inconsistent sentence: Jetzt spielt sie im Konzertsaal ein Lied.
    4. Dissolving inconsistency: Conni hat sich in der Disko amüsiert.

Disko/ Ball

1. Pairing:: Bushaltestelle, Tiefgarage
2. Objects
    1. Konsistent: Bierflasche, Cocktailglas
    2. Inkonsistent: Schultasche, Mülleimer
3. Primining sentences
    1. Sentence one: Anna hat ein Plakat gesehen.
    2. Consistent sentence: Jetzt bestellt sie sich im Disko ein Getränk.
    3. Inconsistent sentence: Jetzt parkt sie in der Tiefgarage ihr Auto.
    4. Dissolving inconsistency: Anna hat auf dem Pausenhof gewartet.

Strand

1. Pairing:: Schlafzimmer, Küche
2. Objects
    1. Konsistent: Wasserball, Sandspielzeug
    2. Inkonsistent: Kommode, Nachttischlampe
3. Primining sentences
    1. Sentence one: Holger hat das Baby fotografiert.
    2. Consistent sentence: Jetzt liegt er am Strand in der Sonne.
    3. Inconsistent sentence: Jetzt kocht er in der Küche das Abendessen.
    4. Dissolving inconsistency: Holger hat sein Bett gemacht.

Schlafzimmer

1. Pairing:: Strand, Umkleide
2. Objects
    1. Konsistent: Kommode, Schreibtischlampe
    2. Inkonsistent: Wasserball, Sandspielzeug
3. Primining sentences
    1. Sentence one: Hannes hat eine Pizza bestellt.
    2. Consistent sentence: Jetzt bezieht er im Schlafzimmer das Kissen.
    3. Inconsistent sentence: Jetzt schnürt er in der Umkleide seine Schuhe.
    4. Dissolving inconsistency: Hannes hat am Strand gespielt.

Basketballplatz

1. Pairing:: Wald, Wüste
2. Objects
    1. Konsistent: Trinkflasche, Turnschuh
    2. Inkonsistent: Tannenzapfen, Pilz
3. Primining sentences
    1. Sentence one: Arne hat das Zimmer aufgeräumt.
    2. Consistent sentence: Jetzt spielt er auf dem Sportplatz Basketball.
    3. Inconsistent sentence: Jetzt sieht er in der Wüste eine Fata Morgana.
    4. Dissolving inconsistency: Arne hat Moos gesammelt.

Wald

1. Pairing:: Basketballplatz, Bar
2. Objects
    1. Konsistent: Pilz, Tannenzapfen
    2. Inkonsistent: Trinkflasche, Basketball
3. Primining sentences
    1. Sentence one: Thomas hat Geige gespielt.
    2. Consistent sentence: Jetzt macht er im Wald einen Spaziergang.
    3. Inconsistent sentence: Jetzt sitzt er in der Bar an der Theke.
    4. Dissolving inconsistency: Thomas hat Sport gemacht.

Tiefgarage

1. Pairing:: Konzertsaal, Disko
2. Objects
    1. Konsistent: Bezahlautomat, Anhänger
    2. Inkonsistent: Cello, Harfe
3. Primining sentences
    1. Sentence one: Katja hat Saft gekauft.
    2. Consistent sentence: Jetzt parkt sie in der Tiefgarage ihr Auto.
    3. Inconsistent sentence: Jetzt bestellt sie sich in der Disco ein Getränk.
    4. Dissolving inconsistency: Katja hat ihr Instrument gespielt.

Konzertsaal

1. Pairing:: Tiefgarage, Bushaltestelle
2. Objects
    1. Konsistent: Cello, Harfe
    2. Inkonsistent: Bezahlautomat, Anhänger
3. Primining sentences
    1. Sentence one: Ina ist aufs Land gezogen.
    2. Consistent sentence: Jetzt spielt sie im Konzertsaal ein Lied.
    3. Inconsistent sentence: Jetzt wartet sie an der Bushaltestelle auf ihren Bus.
    4. Dissolving inconsistency: Ina hat die Tiefgarage verlassen.

Parkplatz

1. Pairing:: Flughafen, Restaurant
2. Objects
    1. Konsistent: Einkaufswagen, Auto
    2. Inkonsistent: Ausstiegtreppe, Gepäckwagen
3. Primining sentences
    1. Sentence one: Jochen hat seine Unterlagen sortiert.
    2. Consistent sentence: Jetzt steht er auf dem Parkplatz mit seinen Einkäufen.
    3. Inconsistent sentence: Jetzt speist er im Restaurant am Tisch.
    4. Dissolving inconsistency: Jochen hat das Flugzeug verlassen.

Flughafen

1. Pairing:: Parkplatz, Freibad
2. Objects
    1. Konsistent: Ausstiegstreppe, Gepäckwagen
    2. Inkonsistent: Einkaufswagen, Auto
3. Primining sentences
    1. Sentence one: Lina hat ein Menü gekocht.
    2. Consistent sentence: Jetzt eilt sie im Flughafen zu ihrem Flugzeug.
    3. Inconsistent sentence: Jetzt steht sie im Freibad neben dem Schwimmbecken.
    4. Dissolving inconsistency: Lina hat ihre Einkäufe verstaut.

Kaufhaus

1. Pairing:: Straße, Campingplatz
2. Objects
    1. Konsistent: Mütze, Schal
    2. Inkonsistent: Hydrant, Parkuhr
3. Primining sentences
    1. Sentence one: Martin hat sich im Schatten ausgeruht.
    2. Consistent sentence: Jetzt steht er im Kaufhaus an der Kasse.
    3. Inconsistent sentence: Jetzt sitzt er auf dem Campingplatz mit Freunden.
    4. Dissolving inconsistency: Martin ist die Straße entlang gegangen.

Neue Straße

1. Pairing:: Kaufhaus, Straßenbahn
2. Objects
    1. Konsistent: Hydrant, Parkuhr
    2. Inkonsistent: Mütze, Schal
3. Primining sentences
    1. Sentence one: Karla war mit ihrem Bruder feiern.
    2. Consistent sentence: Jetzt geht sie an der Straße zu ihrem Rad.
    3. Inconsistent sentence: Jetzt spricht sie neben der Straßenbahn mit dem Kontrolleur.
    4. Dissolving inconsistency: Karla hat sich warm angezogen.

Krankenhaus

1. Pairing:: Grillen, Büro
2. Objects
    1. Konsistent: Tropf, Krücken
    2. Inkonsistent: Grillzange, Kohlebeutel
3. Primining sentences
    1. Sentence one: Anton hat seine Sachen gepackt.
    2. Consistent sentence: Jetzt spricht er im Krankenhaus mit dem Chirurg.
    3. Inconsistent sentence: Jetzt sitzt er im Büro an den Akten.
    4. Dissolving inconsistency: Anton hat ein Barbecue veranstaltet.

Grillen (Barbecue)

1. Pairing:: Krankenhaus, Garten
2. Objects
    1. Konsistent: Grillzange, Kohlebeutel
    2. Inkonsistent: Tropf, Krücken
3. Primining sentences
    1. Sentence one: Patrick hat Hunde ausgeführt.
    2. Consistent sentence: Jetzt isst er beim Barbecue sein Steak.
    3. Inconsistent sentence: Jetzt ruht er im Garten auf der Liege.
    4. Dissolving inconsistency: Patrick hat die Klinik verlassen.

Behandlungszimmer (Zahnarzt)

1. Pairing:: Kreuzung, Friedhof
2. Objects
    1. Konsistent: Spritze, Sauger
    2. Inkonsistent: Blitzgerät, Straßenschild
3. Primining sentences
    1. Sentence one: Christian hat einen Roman gelesen.
    2. Consistent sentence: Jetzt sitzt er im Behandlungszimmer beim Arzt.
    3. Inconsistent sentence: Jetzt besucht er auf dem Friedhof das Grab.
    4. Dissolving inconsistency: Christian hat die Verkehrsregeln gebrochen.

Kreuzung / Ampel

1. Pairing:: Behandlungszimmer (Zahnarzt), Konferenzraum
2. Objects
    1. Konsistent: Blitzgerät, Straßenschild
    2. Inkonsistent: Spritze, Sauger
3. Primining sentences
    1. Sentence one: Felix hat seine Oma besucht.
    2. Consistent sentence: Jetzt wartet er an der Ampel hinter einem LKW.
    3. Inconsistent sentence: Jetzt wartet er im Konferenzsaal auf die Kollegen.
    4. Dissolving inconsistency: Felix hat einen Zahnarzttermin verpasst.

Bauernhof

1. Pairing:: Universitätshörsaal, Teich
2. Objects
    1. Konsistent: Ferkel, Huhn
    2. Inkonsistent: Schwamm, Buch
3. Primining sentences
    1. Sentence one: Jutta hat im Chor gesungen.
    2. Consistent sentence: Jetzt füttert sie auf dem Bauernhof das Vieh.
    3. Inconsistent sentence: Jetzt entspannt sie am Teich mit einem Buch.
    4. Dissolving inconsistency: Jutta hat eine Vorlesung besucht.

Universität/ Hörsaal

1. Pairing:: Bauernhof, Kinderzimmer
2. Objects
    1. Konsistent: Schwamm, Buch
    2. Inkonsistent: Ferkel, Huhn
3. Primining sentences
    1. Sentence one: Jana hat die Glühbirne gewechselt.
    2. Consistent sentence: Jetzt lauscht sie im Hörsaal dem Professor.
    3. Inconsistent sentence: Jetzt spielt sie im Kinderzimmer auf dem Teppich.
    4. Dissolving inconsistency: Jana hat die Tiere versorgt.

Friedhof

1. Pairing:: Konferenzsaal, Behandlungszimmer
2. Objects
    1. Konsistent: Grablicht, Kranz
    2. Inkonsistent: Laptop, Ordner
3. Primining sentences
    1. Sentence one: Herbert hat Physikformeln gelernt.
    2. Consistent sentence: Jetzt besucht er auf dem Friedhof das Grab.
    3. Inconsistent sentence: Jetzt sitzt er im Behandlungszimmer beim Arzt.
    4. Dissolving inconsistency: Herbert hat an der Konferenz teilgenommen.

Konferenzsaal

1. Pairing:: Friedhof, Kreuzung
2. Objects
    1. Konsistent: Laptop, Ordner
    2. Inkonsistent: Grablicht, Kranz
3. Primining sentences
    1. Sentence one: Johann hat die Tafel gewischt.
    2. Consistent sentence: Jetzt besucht er im Konferenzraum das Meeting.
    3. Inconsistent sentence: Jetzt wartet er an der Ampel hinter einem LKW.
    4. Dissolving inconsistency: Johann hat eine Beerdigung besucht.

Kino

1. Pairing:: Gasse, Esszimmer
2. Objects
    1. Konsistent: Popcorntüte, Trinkbecher
    2. Inkonsistent: Pflanzenkübel, Katze
3. Primining sentences
    1. Sentence one: Friedrich hat Walzer getanzt.
    2. Consistent sentence: Jetzt sieht er im Kino einen Film.
    3. Inconsistent sentence: Jetzt setzt er sich im Esszimmer an den Tisch.
    4. Dissolving inconsistency: Friedrich hat die Gasse gefegt.

Gasse

1. Pairing:: Kino, Steg
2. Objects
    1. Konsistent: Pflanzenkübel, Katze
    2. Inkonsistent: Popcorntüte, Trinkbecher
3. Primining sentences
    1. Sentence one: Markus hat mit dem Handy telefoniert.
    2. Consistent sentence: Jetzt geht er durch die Gasse zur Schule.
    3. Inconsistent sentence: Jetzt entspannt er auf dem Steg am See.
    4. Dissolving inconsistency: Markus hat eine Filmpremiere gesehen.

Bekleidungsgeschäft

1. Pairing:: Hinterhof, Klassenzimmer
2. Objects
    1. Konsistent: Hut, Schuh
    2. Inkonsistent: Mülltonne, Motorrad
3. Primining sentences
    1. Sentence one: Lara hat die Wand gestrichen.
    2. Consistent sentence: Jetzt ist sie im Bekleidungsgeschäft in der Kabine.
    3. Inconsistent sentence: Jetzt wischt sie im Klassenzimmer die Tafel.
    4. Dissolving inconsistency: Lara hat im Hinterhof geparkt.

Hinterhof/ Garage

1. Pairing:: Bekleidungsgeschäft, Badezimmer
2. Objects
    1. Konsistent: Mülltonne, Motorrad
    2. Inkonsistent: Hut, Schuh
3. Primining sentences
    1. Sentence one: Maren hat Vögel beobachtet.
    2. Consistent sentence: Jetzt verscheucht sie im Hinterhof eine Ratte.
    3. Inconsistent sentence: Jetzt betrachtet sie im Bad die Fliesen.
    4. Dissolving inconsistency: Maren hat ein Kleidungsstück gekauft.

Badezimmer

1. Pairing:: Klassenzimmer, Hinterhof
2. Objects
    1. Konsistent: Zahnbürste, Zahnpasta
    2. Inkonsistent: Taschenrechner, Zirkel
3. Primining sentences
    1. Sentence one: Hilke hat mit Freunden gechattet.
    2. Consistent sentence: Jetzt betrachtet sie im Bad die Fliesen.
    3. Inconsistent sentence: Jetzt verscheucht sie im Hinterhof eine Ratte.
    4. Dissolving inconsistency: Hilke hat Mathe Aufgaben gelöst.

Klassenzimmer

1. Pairing:: Badezimmer, Bekleidungsgeschäft
2. Objects
    1. Konsistent: Taschenrechner, Zirkel
    2. Inkonsistent: Zahnbürste, Zahnpasta
3. Primining sentences
    1. Sentence one: Ines hat ferngesehen.
    2. Consistent sentence: Jetzt wischt sie im Klassenzimmer die Tafel.
    3. Inconsistent sentence: Jetzt ist sie im Bekleidungsgeschäft in der Kabine.
    4. Dissolving inconsistency: Ines hat ihre Zähne geputzt.

Bar

1. Pairing:: Wüste, Wald
2. Objects
    1. Konsistent: Glas, Flasche
    2. Inkonsistent: Busch, Schädel
3. Primining sentences
    1. Sentence one: Christoph hat ein Bild gezeichnet.
    2. Consistent sentence: Jetzt sitzt er in der Bar an der Theke.
    3. Inconsistent sentence: Jetzt macht er im Wald einen Spaziergang.
    4. Dissolving inconsistency: Christoph hat die Wüste durchquert.

Wüste

1. Pairing:: Bar, Basketballplatz
2. Objects
    1. Konsistent: Busch, Schädel
    2. Inkonsistent: Glas, Flasche
3. Primining sentences
    1. Sentence one: Gregor hat die Rechnung bezahlt.
    2. Consistent sentence: Jetzt sieht er in der Wüste eine Fata Morgana.
    3. Inconsistent sentence: Jetzt spielt er auf dem Sportplatz Basketball.
    4. Dissolving inconsistency: Gregor hat eine Weinprobe mitgemacht.

Kinderzimmer

1. Pairing:: Teich, Hörsaal
2. Objects
    1. Konsistent: Puppe, Malbuch
    2. Inkonsistent: Ente, Seerose
3. Primining sentences
    1. Semantisch Konsistent: Laura hat ein Video gedreht.
    2. Consistent sentence: Jetzt spielt sie im Kinderzimmer auf dem Teppich.
    3. Inconsistent sentence: Jetzt lauscht sie im Hörsaal dem Professor.
    4. Dissolving inconsistency: Laura ist in den Gartenteich gefallen.

Teich

1. Pairing:: Kinderzimmer, Bauernhof
2. Objects
    1. Konsistent: Ente, Seerose
    2. Inkonsistent: Puppe, Malbuch
3. Primining sentences
    1. Sentence one: Sissy hat den Rasen gemäht.
    2. Consistent sentence: Jetzt entspannt sie am Teich mit einem Buch.
    3. Inconsistent sentence: Jetzt füttert sie auf dem Bauernhof das Vieh.
    4. Dissolving inconsistency: Sissy hat Spielzeug getauscht.

Brücke

1. Pairing:: Labor, Park
2. Objects
    1. Konsistent: Fahrrad, Hund
    2. Inkonsistent: Mikroskop, Reagenzglas
3. Primining sentences
    1. Sentence one: Ellen hat das Musikstück geprobt.
    2. Consistent sentence: Jetzt läuft sie über die Brücke nach Hause.
    3. Inconsistent sentence: Jetzt entspannt sie im Park auf der Wiese.
    4. Dissolving inconsistency: Ellen hat eine Chemiestunde gehabt.

Labor

1. Pairing:: Brücke, Kirche
2. Objects
    1. Konsistent: Mikroskop, Erlenmeyer Kolben
    2. Inkonsistent: Fahrrad, Hund
3. Primining sentences
    1. Sentence one: Lissy hat den Müll rausgebracht.
    2. Consistent sentence: Jetzt sucht sie im Labor ihren Kittel.
    3. Inconsistent sentence: Jetzt spielt sie in der Kirche Orgel.
    4. Dissolving inconsistency: Lissy hat den Fluss überquert.

Treppenhaus

1. Pairing:: Vorraum Bank, Wohnzimmer
2. Objects
    1. Konsistent: Fußmatte, Kehrbesen
    2. Inkonsistent: Geldbörse, EC Karte
3. Primining sentences
    1. Sentence one: Steffi hat Blumen gegossen.
    2. Consistent sentence: Jetzt geht sie die Treppe zum Erdgeschoss herunter.
    3. Inconsistent sentence: Jetzt liest sie im Wohnzimmer die Zeitung.
    4. Dissolving inconsistency: Steffi hat ihr Konto aufgelöst.

Vorraum Bank

1. Pairing:: Treppenhaus, Waschsalon
2. Objects
    1. Konsistent: Geldbörse , EC Karte
    2. Inkonsistent: Fußmatte, Kehrbesen
3. Primining sentences
    1. Sentence one: Tara hat Vögel beobachtet.
    2. Consistent sentence: Jetzt hebt sie am Geldautomaten Geld ab.
    3. Inconsistent sentence: Jetzt startet sie im Waschsalon den Trockner.
    4. Dissolving inconsistency: Tara hat das Treppenhaus gestrichen.

Bach

1. Pairing:: Skateplatz, Jahrmarkt
2. Objects
    1. Konsistent: Vogel, Hase
    2. Inkonsistent: Skateboard, Rollerskates
3. Primining sentences
    1. Sentence one: Paula hat der Band applaudiert.
    2. Consistent sentence: Jetzt watet sie im Bach durch das Wasser.
    3. Inconsistent sentence: Jetzt zieht sie auf dem Jahrmarkt Lose.
    4. Dissolving inconsistency: Paula hat im Skateshop gearbeitet.

Skateplatz

1. Pairing:: Bach, Werkzeugkeller
2. Objects
    1. Konsistent: Skateboard, Rollerskates
    2. Inkonsistent: Vogel, Hase
3. Primining sentences
    1. Sentence one: Carlos hat Nüsse geknackt.
    2. Consistent sentence: Jetzt probiert er auf dem Skateplatz die Halfpipe.
    3. Inconsistent sentence: Jetzt schleift er im Werkzeugkeller den Tisch.
    4. Dissolving inconsistency: Carlos hat am Waldrand gewartet.

Steg

1. Pairing:: Esszimmer, Gasse
2. Objects
    1. Konsistent: Kescher, Angel
    2. Inkonsistent: Blumenvase, Kerzenständer
3. Primining sentences
    1. Sentence one: Steffen hat sein Zimmer gelüftet.
    2. Consistent sentence: Jetzt entspannt er auf dem Steg am See.
    3. Inconsistent sentence: Jetzt geht er durch die Gasse zur Schule.
    4. Dissolving inconsistency: Steffen hat den Tisch geschmückt.

Esszimmer

1. Pairing:: Steg, Kino
2. Objects
    1. Konsistent: Blumenvase, Kerzenständer
    2. Inkonsistent: Kescher, Angel
3. Primining sentences
    1. Sentence one: Clemens hat ein Bild aufgehängt.
    2. Consistent sentence: Jetzt setzt er sich im Esszimmer an den Tisch.
    3. Inconsistent sentence: Jetzt sieht er im Kino einen Film.
    4. Dissolving inconsistency: Clemens hat einen Fisch gefangen.

Indianercamp

1. Pairing:: Tankstelle, Stall
2. Objects
    1. Konsistent: Lagerfeuer, Marterpfahl
    2. Inkonsistent: LKW, PKW
3. Primining sentences
    1. Sentence one: Herman hat ein Tier gekauft.
    2. Consistent sentence: Jetzt raucht er im Indianercamp eine Pfeife.
    3. Inconsistent sentence: Jetzt füttert er im Stall die Kühe.
    4. Dissolving inconsistency: Herman ist auf der Autobahn gefahren.

Tankstelle

1. Pairing:: Indianercamp, Bahnhof
2. Objects
    1. Konsistent: LKW, PKW
    2. Inkonsistent: Marterpfahl, Lagerfeuer
3. Primining sentences
    1. Sentence one: Harry hat den Stuhl repariert.
    2. Consistent sentence: Jetzt kontrolliert er an der Tankstelle den Reifendruck.
    3. Inconsistent sentence: Jetzt wartet er in der Bahnhofshalle auf ihren Zug.
    4. Dissolving inconsistency: Harry hat im Freien Indianer gespielt.

Küche

1. Pairing:: Umkleidekabine, Strand
2. Objects
    1. Konsistent: Obstkorb, Küchenmaschine
    2. Inkonsistent: Fußball, Fußballschuh
3. Primining sentences
    1. Sentence one: Bernhard hat Besuch gehabt.
    2. Consistent sentence: Jetzt kocht er in der Küche das Abendessen.
    3. Inconsistent sentence: Jetzt liegt er am Strand in der Sonne.
    4. Dissolving inconsistency: Bernhard hat Fußball gespielt.

Umkleide(Kabine)

1. Pairing:: Küche, Schlafzimmer
2. Objects
    1. Konsistent: Hose, Jacke
    2. Inkonsistent: Obstkorb, Küchenmaschine
3. Primining sentences
    1. Sentence one: Arthur hat ein Geschenk eingepackt.
    2. Consistent sentence: Jetzt schnürt er in der Umkleide seine Schuhe.
    3. Inconsistent sentence: Jetzt bezieht er im Schlafzimmer die Kissen.
    4. Dissolving inconsistency: Arthur hat einen Fruchtcocktail zubereitet.

Golfplatz

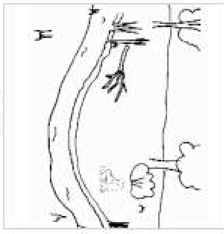
1. Pairing:: Fabrik, Friseur
2. Objects
    1. Konsistent: Golftasche, Golfauto
    2. Inkonsistent: Container, Schild
3. Primining sentences
    1. Sentence one: Sarah hat Wäsche aufgehängt.
    2. Consistent sentence: Jetzt sucht sie auf dem Golfplatz nach ihrem Ball.
    3. Inconsistent sentence: Jetzt sitzt sie beim Friseur vor dem Spiegel.
    4. Dissolving inconsistency: Sarah hat den Farbrikhof verlassen.

Fabrikgelände

1. Pairing:: Golfplatz, Picknick
2. Objects
    1. Konsistent: Container, Schild
    2. Inkonsistent: Golftasche, Golfauto
3. Primining sentences
    1. Sentence one: Molly hat Blumen gegossen.
    2. Consistent sentence: Jetzt betritt sie das Fabrikgelände durch das Tor.
    3. Inconsistent sentence: Jetzt macht sie ein Picknick auf der Wiese.
    4. Dissolving inconsistency: Molly hat einen Golfkurs belegt.

1. 2 Images

1. 2. 1 Scenes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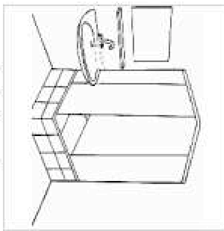
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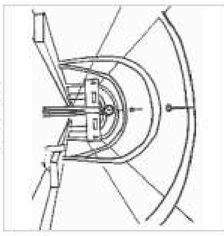
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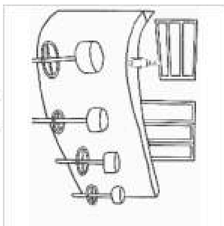
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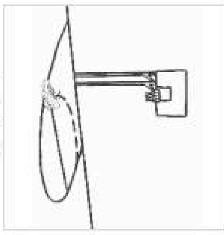
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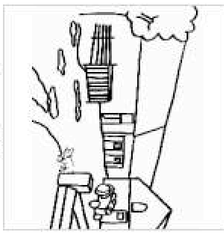
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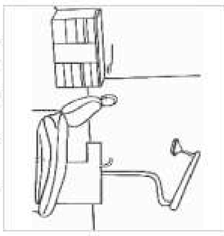
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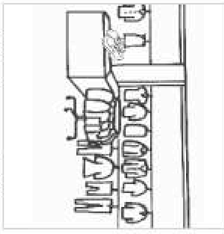
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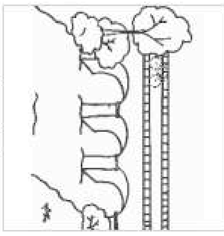
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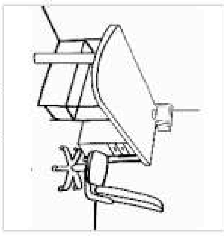
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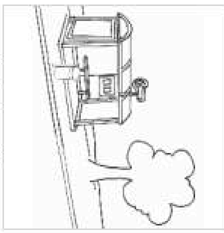
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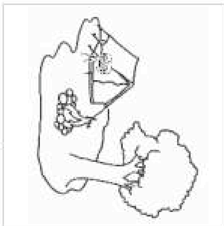
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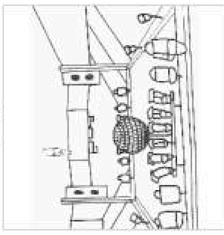
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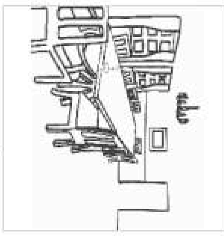
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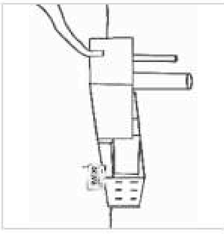
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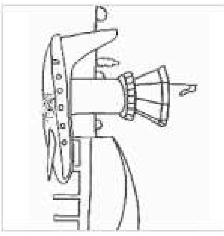
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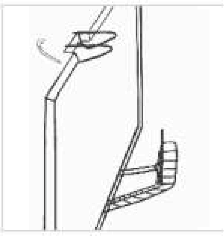
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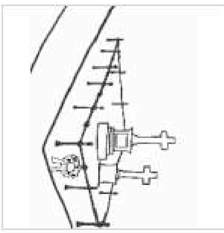
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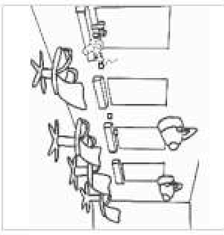
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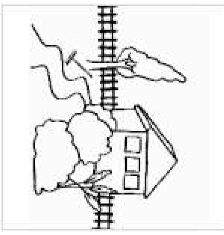
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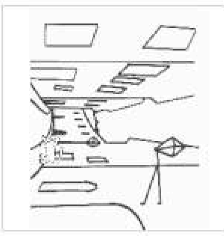
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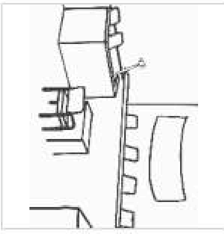
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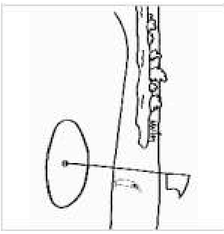
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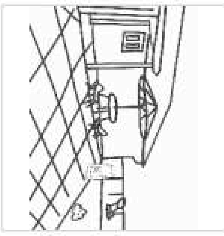
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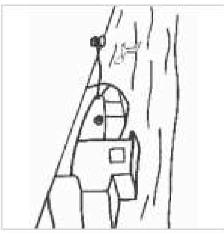
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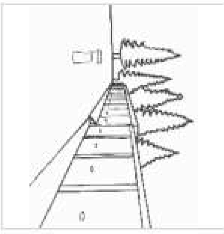
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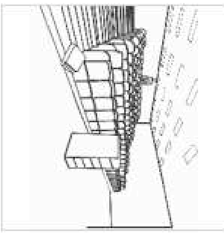
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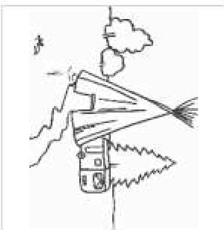
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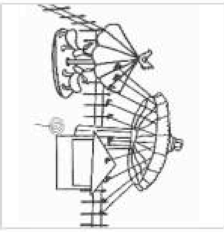
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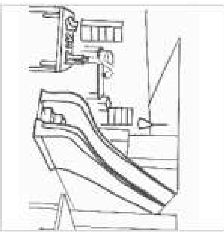
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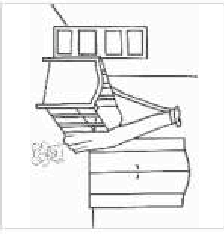
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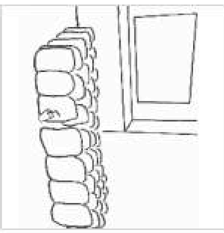
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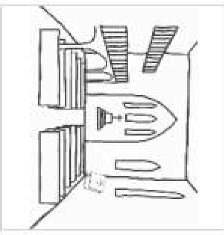
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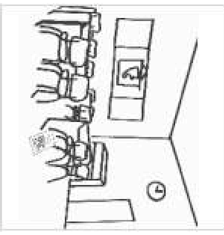
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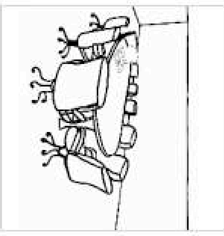
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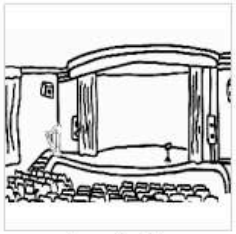

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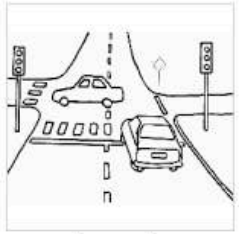
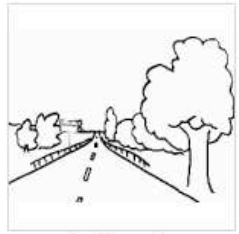
krankenhaus-k



kreuzung-k

kueche-k

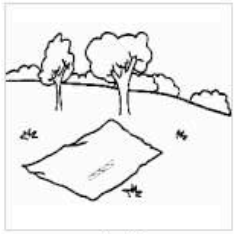
labor-k



landstrasse-k

park-k

parkplatz-k



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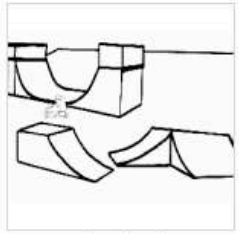
restaurant-k

schlafzimmer-k



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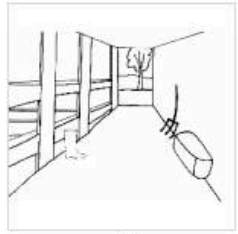
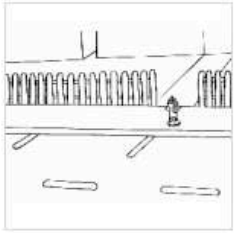


stall-k

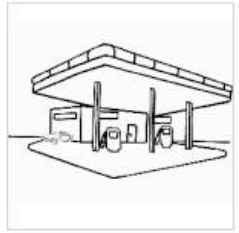
steg-k

strand-k



strasse-k

strassenbahn-k



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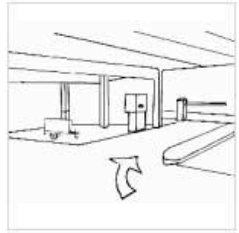
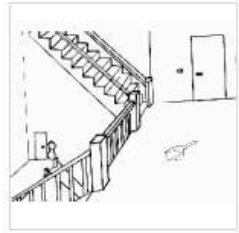
teich-k



tiefgarage-k



treppenhaus-k

umkleide-k

vorraum-bank-k

wald-k

waschsalon-k

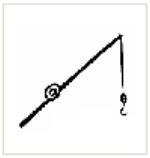
werkzeugkeller-k

wohnzimmer-k

wueste-k

zirkus-k

1. 2. 2 Objects


angel


anhaenger


ausstiegstreppe


auto


baguette


bezahlautomat


bibel


bierflasche


bildschirm


blatt


blumenvase


bohrmaschine


boje


buch


busch


campingstuhl


cello


clown


cocktailglas


container


ec_karte


eimer


einkaufswagen


ente


fahrkartenautomat


fahrrad


ferkel


fisch


flasche


foen


gabel


geldboerse


gepaeckwagen


geschwindigkeitsschild


gesetzbuch


glas


golfauto


golftasche


grablicht


grill

grillzange

gummistiefel

haltestellenschild

hammer

harfe

harke

hase

hose

huhn

hund

hydrant

inlineskates

jacke

kaffemaschine

katze

kehrbesen

kehrblech

kerze

kerzenstaender

kescher

kolben

kommode

kompressor

kranz

kreissaege

kruecke

lagerfeuer

laptop

laterne

lkw


loewe


luftballon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moewe


motorrad

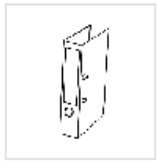

muelleimer


muelltonne


muetze


nachttischlampe


obstschale


ordner

ortsschild


papierkorb


parkuhr


pferd


pflanzenkuebel


pilz


pkw


popcorntuete

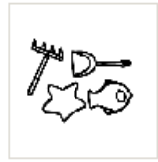

puppe


regenschirm


reisetasche


sandeimer


sandkuchenform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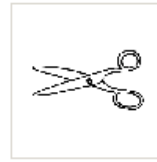
schaedel


schal


schaufel


schere

schild


schlange


schnorchel


schreibtischlampe


schuh


schultasche


schwamm


seerose

sessel

skateboard

spritze

stehlampe

strassenschild

tannenzapfen

taschenrechner

taucherbrille

teddybaer

trinkbecher

trinkflasche

tropf

turnschuh

vogel

waeschekorb

waschpulver

wasserball

wassereimer

weinflasche

zahnbuerste

zahnpasta

zahnpasta2

zahnspiegel

zebra

zirkel

2. Analysis

2. 1 Statistical charts

Chart 1

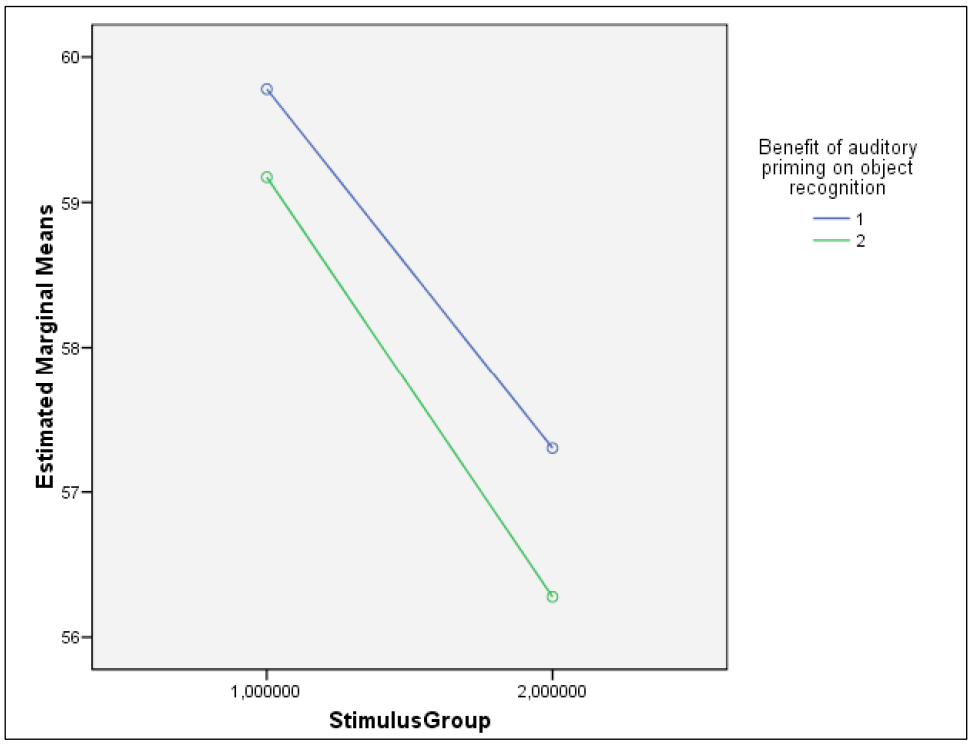


Chart 2

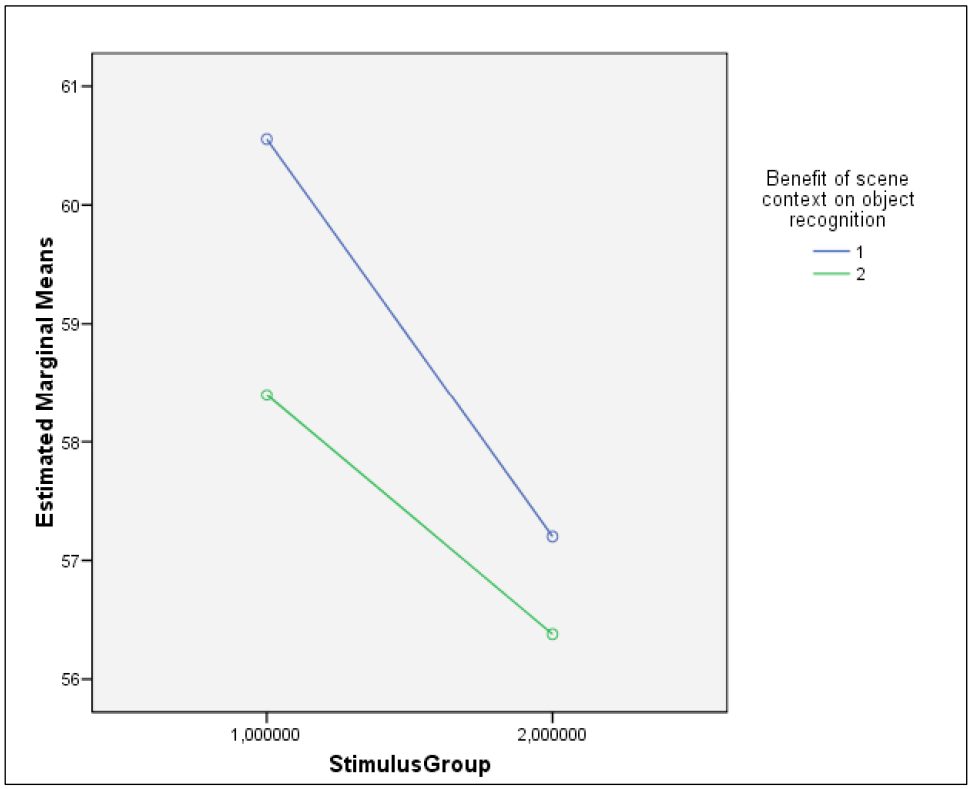


Chart 3

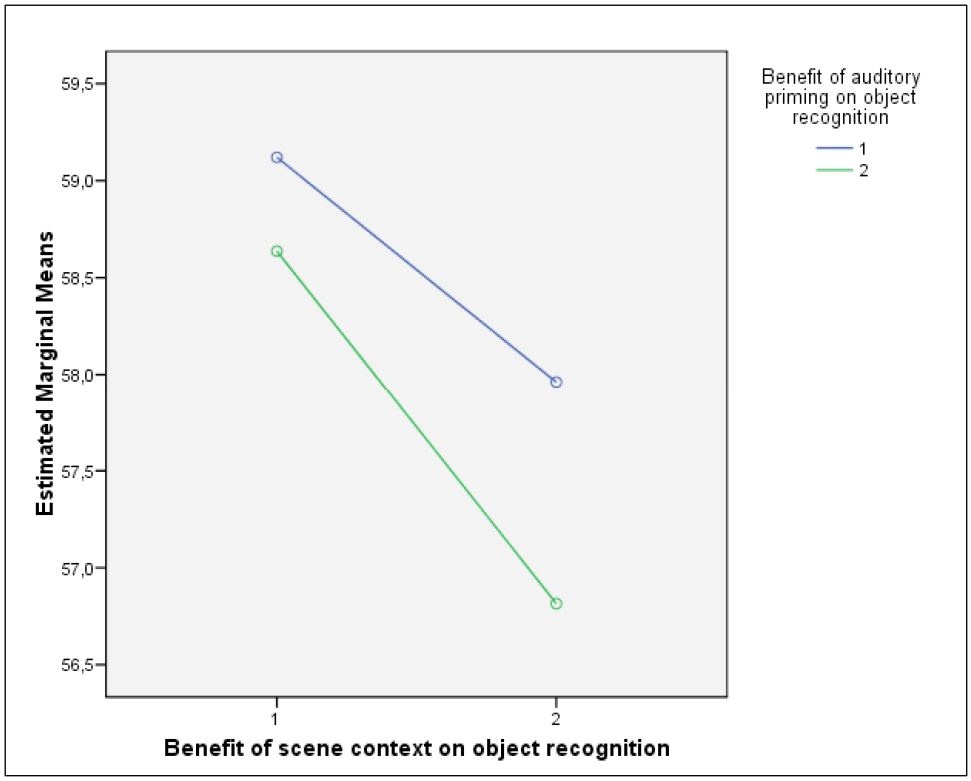
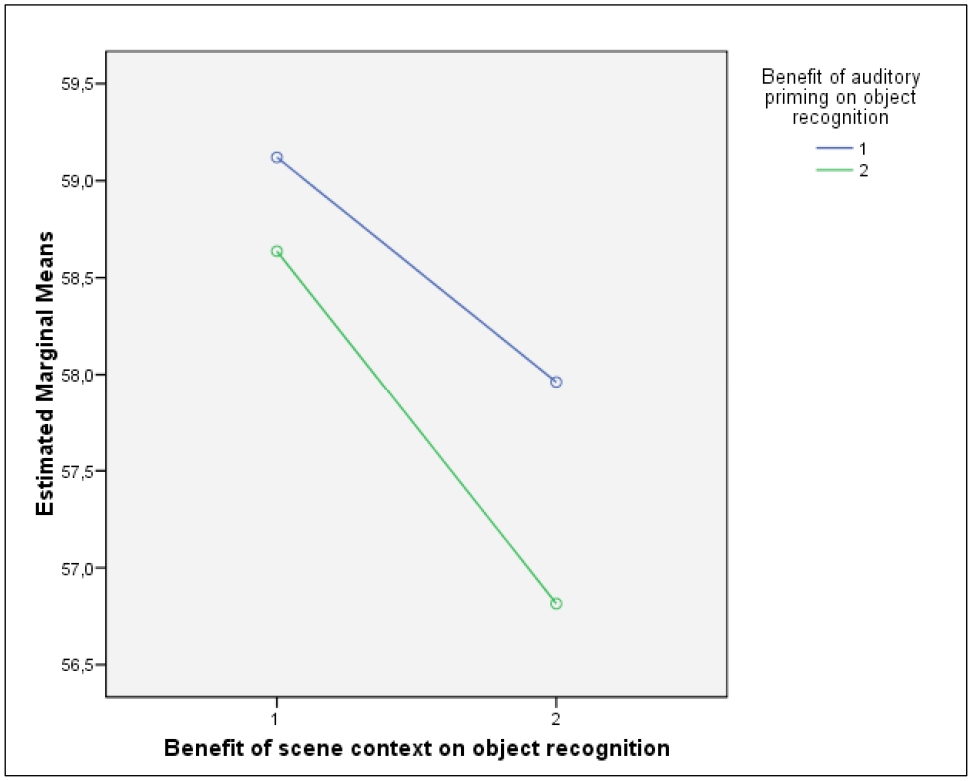


Chart 4



2. 2 Statistical tables

Table 1: ANOVA for experiment 1

Mean responses for all subjects over different groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	29,739	1	29,739	,508	,480
Within Groups	2695,272	46	58,593		
Total	2725,011	47			

Table 2: ANOVA for mean values of repetition 0 and 1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	423,907	1	423,907	5,523	,021
Within Groups	7214,909	94	76,754		
Total	7638,816	95			

Table 3: ANOVA for mean values of condition CO - repetition 0 and 1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	190,253	1	190,253	2,892	,096
Within Groups	3026,237	46	65,788		
Total	3216,490	47			

Table 4: ANOVAA for mean values of condition CO - repetition 0 and 1

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1912,692	1	1912,692	4,596	,037
Within Groups	19141,519	46	416,120		
Total	21054,210	47			

Table 5: General Linear Model 1: Tests of Within-Subjects Effects

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.
Conditions	Sphericity Assumed	239,569	3	79,856	1,134	,336
	Greenhouse-Geisser	239,569	2,774	86,347	1,134	,334
	Huynh-Feldt	239,569	2,924	81,932	1,134	,335
	Lower-bound	239,569	1,000	239,569	1,134	,290
Conditions * StimulusGroup	Sphericity Assumed	64,894	3	21,631	,307	,820
	Greenhouse-Geisser	64,894	2,774	23,390	,307	,805
	Huynh-Feldt	64,894	2,924	22,194	,307	,815
	Lower-bound	64,894	1,000	64,894	,307	,581
Error(Conditions)	Sphericity Assumed	16476,629	234	70,413		
	Greenhouse-Geisser	16476,629	216,410	76,136		
	Huynh-Feldt	16476,629	228,071	72,243		
	Lower-bound	16476,629	78,000	211,239		

Table 6: General Linear Model 1: Tests of Between-Subjects Effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1081432,094	1	1081432,094	5116,967	,000
StimulusGroup	577,228	1	577,228	2,731	,102
Error	16484,709	78	211,342		

Table 7: General Linear Model 2: Tests of Within-Subjects Effects

Source		Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power(a)
Benefit of auditory priming on object recognition	Sphericity Assumed	53,143	1	53,143	,874	,353	,011	,874	,152
	Greenhouse-Geisser	53,143	1,000	53,143	,874	,353	,011	,874	,152
	Huynh-Feldt	53,143	1,000	53,143	,874	,353	,011	,874	,152
	Lower-bound	53,143	1,000	53,143	,874	,353	,011	,874	,152
Error(Benefit of auditory priming on object recognition)	Sphericity Assumed	4741,872	78	60,793					
	Greenhouse-Geisser	4741,872	78,000	60,793					
	Huynh-Feldt	4741,872	78,000	60,793					
	Lower-bound	4741,872	78,000	60,793					
Benefit of scene context on object recognition	Sphericity Assumed	177,649	1	177,649	2,348	,129	,029	2,348	,328
	Greenhouse-Geisser	177,649	1,000	177,649	2,348	,129	,029	2,348	,328
	Huynh-Feldt	177,649	1,000	177,649	2,348	,129	,029	2,348	,328
	Lower-bound	177,649	1,000	177,649	2,348	,129	,029	2,348	,328
Error(Benefit of scene context on object recognition)	Sphericity Assumed	5900,866	78	75,652					

Table 8: General Linear Model 2: Tests of Between-Subjects Effects

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power(a)
Intercept	1081432,094	1	1081432,094	5116,967	,000	,985	5116,967	1,000
Stimulus Group	577,228	1	577,228	2,731	,102	,034	2,731	,372
Error	16484,709	78	211,342					

a Computed using alpha = ,05

Table 9: Test for normal distribution of all response accuracies over all conditions

Tests of Normality

	Kolmogorov-Smirnov(a)			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
TotalCorrResponseALLTrans	,054	80	,200(*)	,992	80	,911

* This is a lower bound of the true significance.
A Lilliefors Significance Correction

Table 10: Correlation between age and overall performance

		TotalCorrResponseALLTrans	Age
Correct response	Pearson Correlation	1	-,320(**)
	Sig. (2-tailed)		,004
	N	80	80
Age	Pearson Correlation	-,320(**)	1
	Sig. (2-tailed)	,004	
	N	80	80

** Correlation is significant at the 0.01 level (2-tailed).

Table 11: T-Test for differences in overall performance of male and female

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Overall response accuracy	Equal variances assumed	1,367	,246	-2,015	78	,047	-3,18173091	1,57938318	-6,32604128	-,03742055
	Equal variances not assumed			-1,949	61,643	,056	-3,18173091	1,63228526	-6,44499905	,08153722