Northumbria Research Link

www.northumbria.ac.uk/nrl

northumbria
UNIVERSITY NEWCASTLE
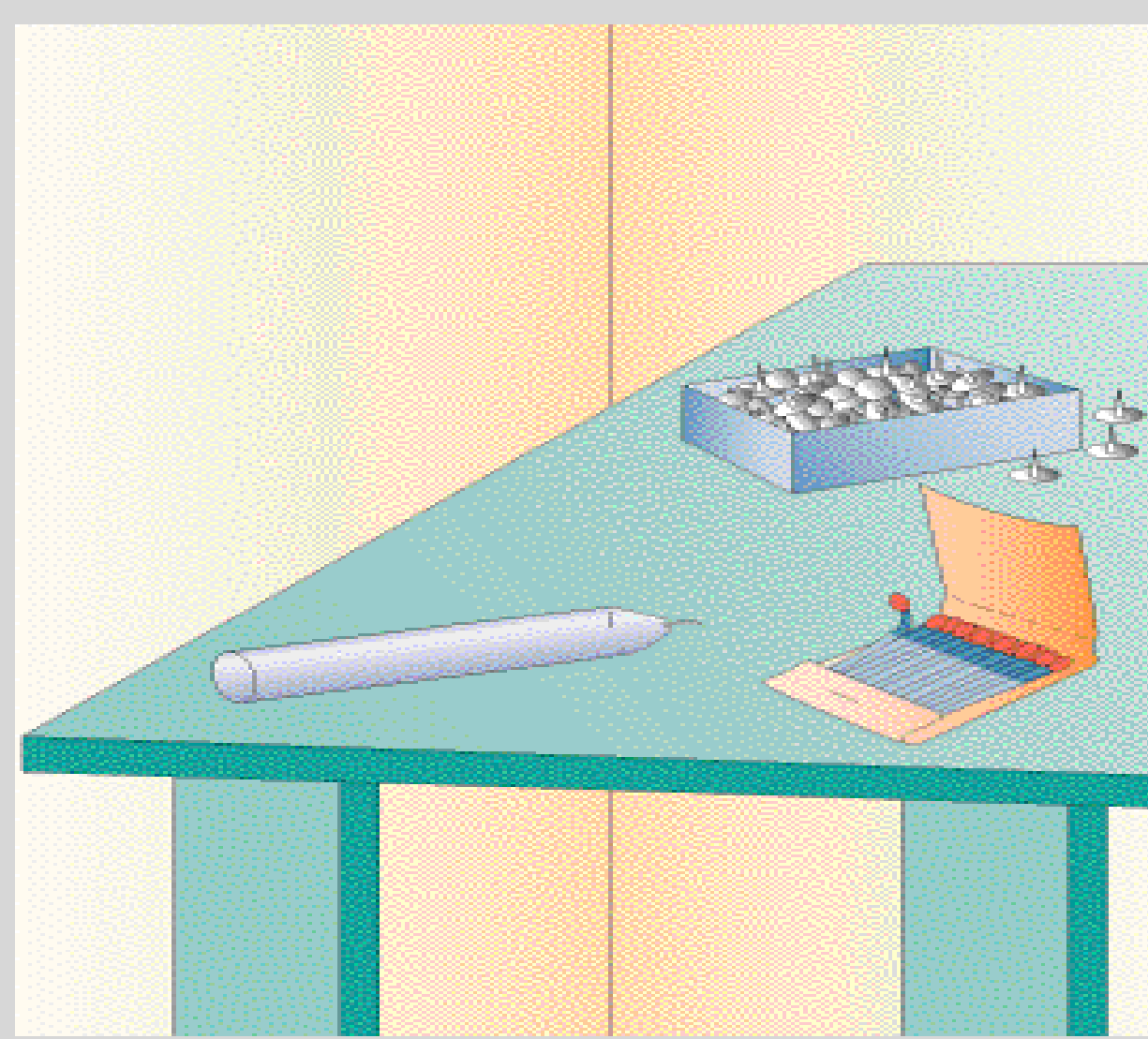
Functional Fixedness: A Novel Interpretation

Margaret Anne Defeyter & Jeanet Ingwersen
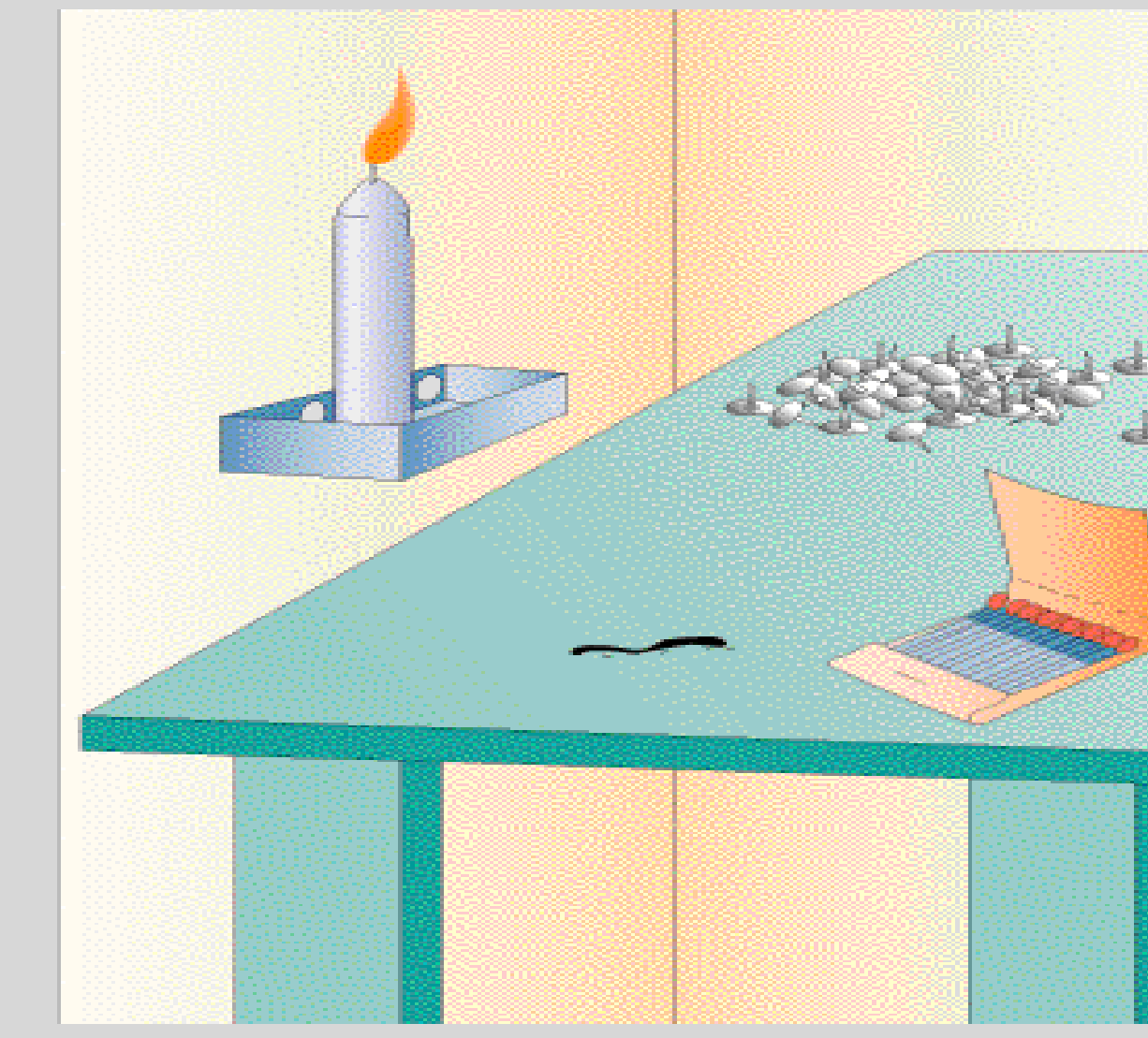
Cognition and Communication Research Centre

British Psychological Society, Lancaster. 2006

Background and Aims

The common interpretation for functional fixedness (Duncker, 1945), suggests that adults' ability to use an artifact for a novel purpose in a problem-solving task is impaired as a result of activating properties relevant to the conventional function of an artifact prior to problem-solving.

Aims of the Experiment 1:
(a) Replicate the phenomenon of functional fixedness using a new problem-solving task.
(b) Investigate whether there is evidence of functional fixedness following demonstration of a novel use for a familiar artifact.

Experiment 1: Design and Method

➤ The problem-solving task consisted of an electrical circuit board with part of the circuit missing. The end goal was to complete the circuit using only *one* of the objects supplied. Only the target object (spanner) could successfully solve the problem.

➤ 60 adults were randomly assigned to either the Conventional Function Condition, the Novel Function Condition or the Control Condition.

➤ Four dependent measures were taken: (a) Number of adults reaching a successful solution, (b) Time taken to select the target object, (c) Time taken to solve the task, and (d) The number of participants choosing the target object as their first object choice for use in the problem-solving task.
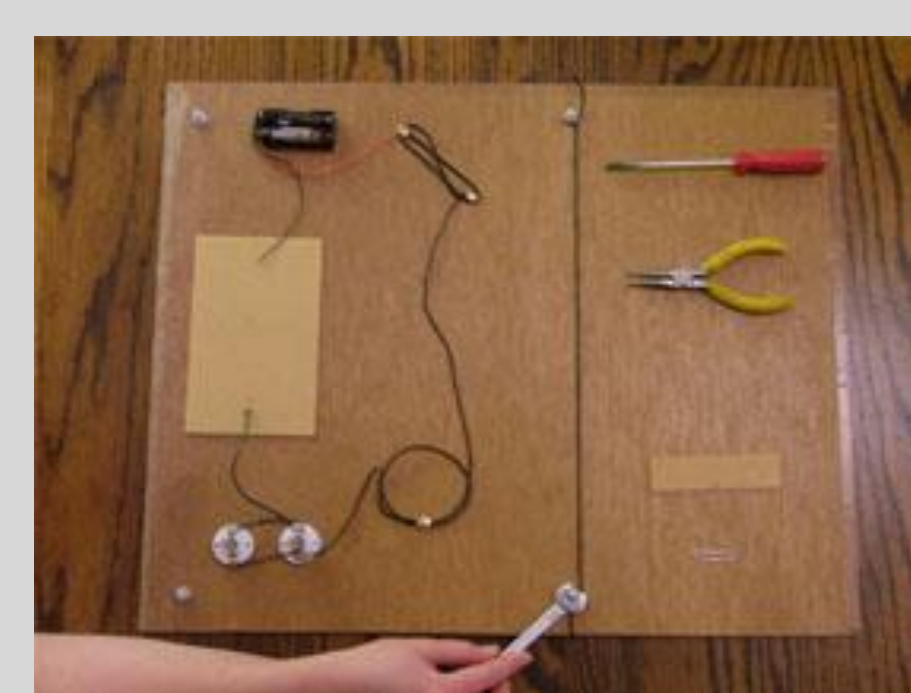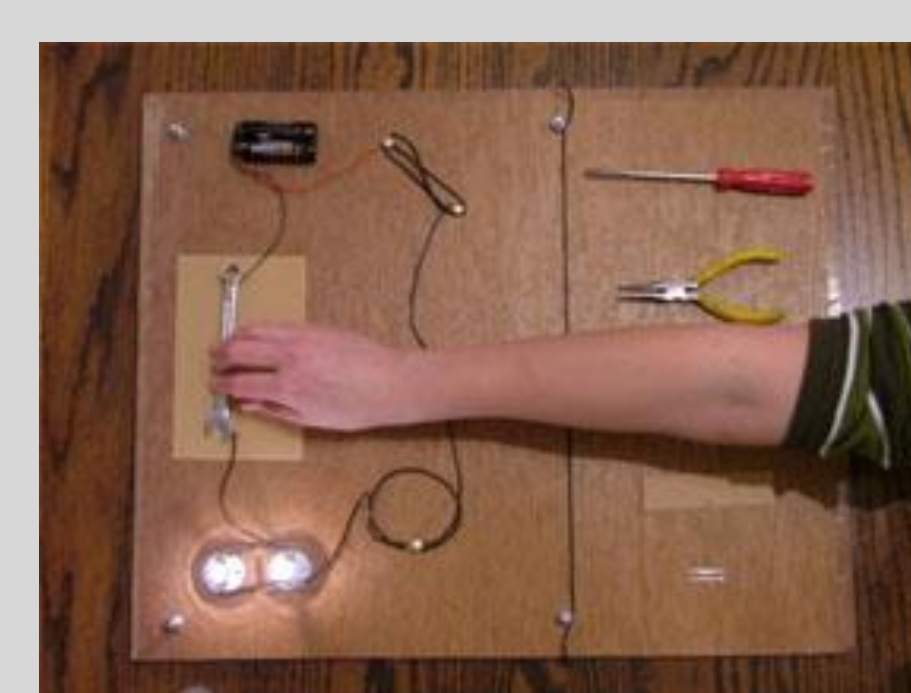
Materials
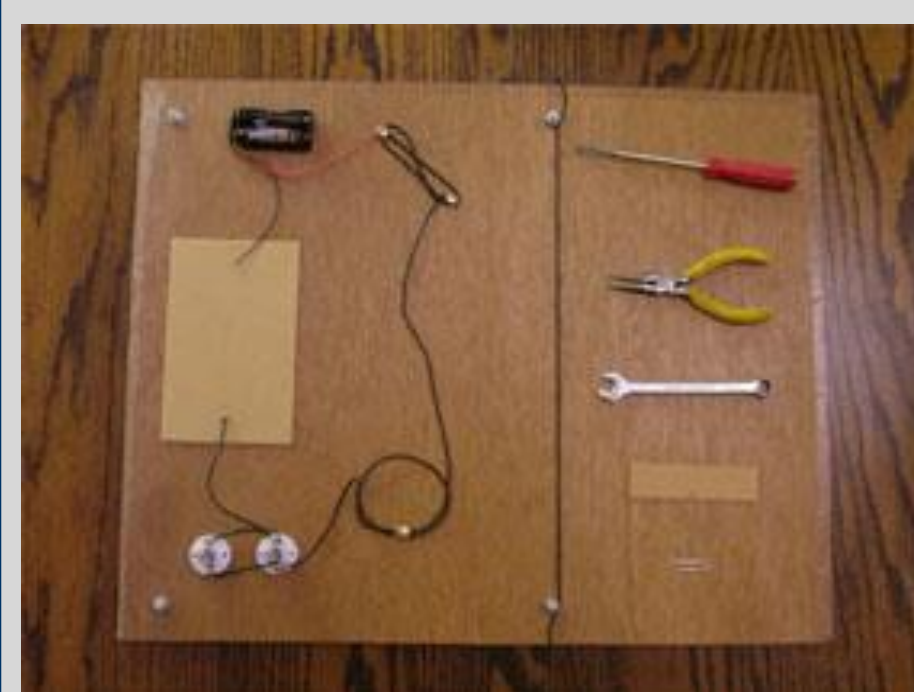
Control Condition
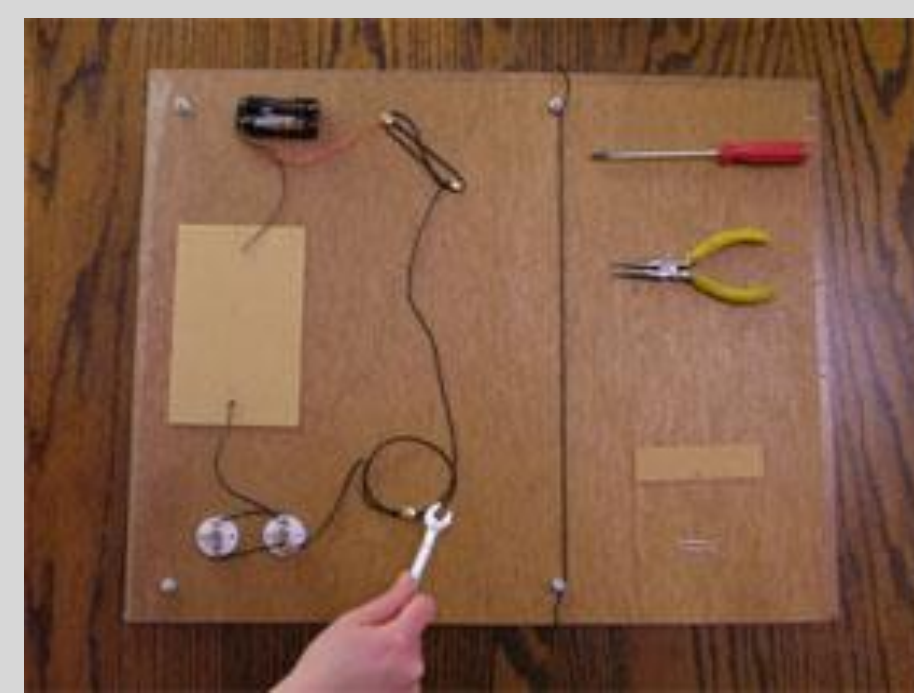
Novel Function Demonstration (Hammering)

Conventional Function Demonstration

Successful Solution

Results

Table 1. The number of participants (N = 20 in each condition) selecting the target object as their first choice, mean latency to select target object (seconds, SDs in parentheses), the number of adults reaching a successful solution and mean latency to correct solution (seconds, SDs in parentheses), in conventional function, novel function and control conditions.

Condition	1st object selected?	Dependent Variable		
		Latency to select target	Task Solved?	Latency to Solve task
Conventional Function	5	**138.2** *(117.8)*	**11**	**183.0** *(117.9)*
Novel Function	4	**126.0** *(109.7)*	**16**	**128.9** *(109.7)*
Control	12	**68.45** *(78.5)*	**19**	**77.5** *(83.4)*

➤ Significantly more adult's selected the target object as their first object choice in the control condition than in the conventional function ($x^2_{(1)}$ = 5.013, p = 0.025) and novel function conditions ($x^2_{(1)}$ = 6.67, p = 0.01).

➤ Adult's took significantly longer to select the target object under both the conventional function condition (U = 120.00, p =0.030) and the novel function condition (U = 122.00, p = 0.035) when compared to the control condition

➤ More adults reached a successful solution in the control condition than in the conventional function condition ($x^2_{(1)}$ = 8.53, p = 0.003) but no significant difference existed between the control condition and the novel function condition ($x^2_{(1)}$ =1.06, p = N.S.)

➤ Adult's were significantly slower to reach a solution in both the conventional function condition (U = 91.00, p = 0.003) and in the novel function condition (U = 124.50, p = 0.040) compared to the control condition.

Experiment 2: Aims

In Experiment 2 we investigated whether the results of Experiment 1 would generalise to another problem-solving task. In order to investigate this possibility, it was decided to use the 'box task'. This task was developed by German and Defeyter (2000) for use with children, but has subsequently been modified for use with an adult population (German and Barrett, 2005)

Experiment 2: Design and Method

➤ In this problem-solving task adults were presented with an array of objects (a cardboard box, six Styrofoam cubes, a battery, a pencil eraser and a rubber ball). The task required participants to reach a perch on which a story character's friend was trapped. The solution was to use a target object – the cardboard box – as a platform on which to build a tower from the other objects. The character to be rescued was placed on a wooden peg, affixed to the wall at a height such that a tower constructed using the Styrofoam blocks alone could not reach it. A tower constructed with the Styrofoam blocks on top of the cardboard box would exactly reach the height of the perch.

➤ 60 Participants were randomly assigned to either a Control Condition, a Conventional Function Condition or a Novel Function Condition.

➤ Dependent variables were the same as in Experiment 1.

Materials

Control Condition

Conventional Function Demonstration

Results

Table 2. The number of participants (N = 20 in each condition) selecting the target object as their first choice, mean latency to select target object (seconds, SDs in parentheses), the number of adults reaching a successful solution and mean latency to correct solution (seconds, SDs in parentheses), in conventional function, novel function and control conditions.

Condition	1st object selected?	Dependent Variable		
		Latency to select target	Task Solved?	Latency to Solve task
Conventional Function	6	**198.85** *(115.19)*	**9**	**217.00** *(95.66)*
Novel Function	5	**119.25** *(111.85)*	**7**	**147.85** *(106.56)*
Control	15	**26.80** *(8.13)*	**20**	**55.80** *(15.34)*

➤ Significantly more adult's selected the target object as their first object choice in the control condition than in both the conventional function ($x^2_{(1)}$ = 5.023, p = 0.015) and novel function conditions ($x^2_{(1)}$ = 7.12, p = 0.01)

➤ Adult's took significantly longer to select the target object under both the conventional function condition (U = 54, p=0.001) and the novel function condition (U = 54, p = 0.001) when compared to the control condition

➤ More adults reached a successful solution in both the conventional function condition ($x^2_{(1)}$ = 15.12, p = 0.001) and the novel condition ($x^2_{(1)}$ = 9.48, p = 0.004), compared to the control condition.

➤ Adult's were significantly slower to reach a solution in both the conventional function condition (U = 2.50, p = 0.001) and in the novel function condition (U = 74.0, p = 0.001) compared to the control condition.