EFFECTS OF (GRASPED) HANDLES ALIGNMENT ON KEYPRESS RESPONSES WITH TWO-HANDLED OBJECTS

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INTRODUCTION

- Research has shown that photos of graspable objects produce faster and more accurate responses when the position of the graspable part (i.e. the handle) and the actual responding hand of the participant are spatially aligned [1].
- Such correspondence or alignment effect has been interpreted as evidence in favour of automatic motor activation and has so far been studied with one-handled objects, that is, objects graspable on one side only [1-3].
- The aim of the present study is to explore whether a) graspable objects that are usually grasped by two hands (i.e. two-handled objects; e.g. shears) show similar effects when they are shown as grasped on one side; b) there is an effect of the viewpoint or perspective in which the grasping hands are shown (i.e. one's own vs. other people's viewpoint).

Table 1: Mean RTs and percentages of error (with standard deviations in parentheses) as a function of *Condition* from both Experiments.

	Experiment 1		Experiment 2	
Condition	RTs (ms)	ERs (%)	RTs (ms)	ERs (%)
Object Alone	549 (63.0)	4.2 (5.0)	534 (50.2)	3.1 (2.9)
Compatible Grasping	543 (71.1)	3.5 (5.5)	531 (50.6)	3.0 (2.2)
Incompatible Grasping	571 (71.7)	6.8 (6.7)	546 (51.9)	4.3 (3.7)
Two-Handed Grasping	558 (70.9)	3.9 (5.5)	543 (52.5)	3.2 (2.6)

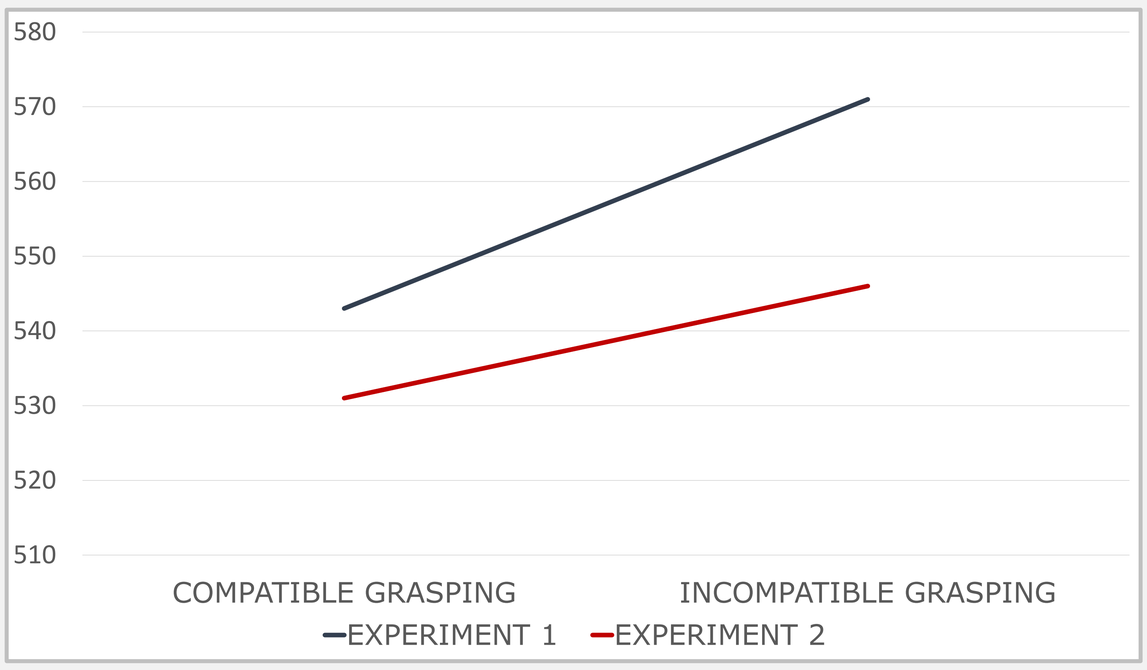

Fig. 3: The correspondence effect in both experiments.

METHODS

Thirty-eight (Exp. 1) and thirty-six (Exp. 2) participants were asked to categorize 8 two-handled objects (Fig. 1) as being mainly used during spare time or while cooking. Each object could appear on the display either alone or as grasped by one hand/two hands in either the egocentric (Exp. 1) or the allocentric (Exp. 2) perspective. When the object was grasped by one hand, the hand could be spatially compatible (same side) or incompatible (opposite side) with the response key (see Fig. 2 below for details). The experiments have a within-participants factor with four levels (*Condition*: Object Alone, Compatible Grasping, Incompatible Grasping, Two-Handed Grasping). Response Times (RTs) and Percentages of Errors (ERs) are the key dependent variables.

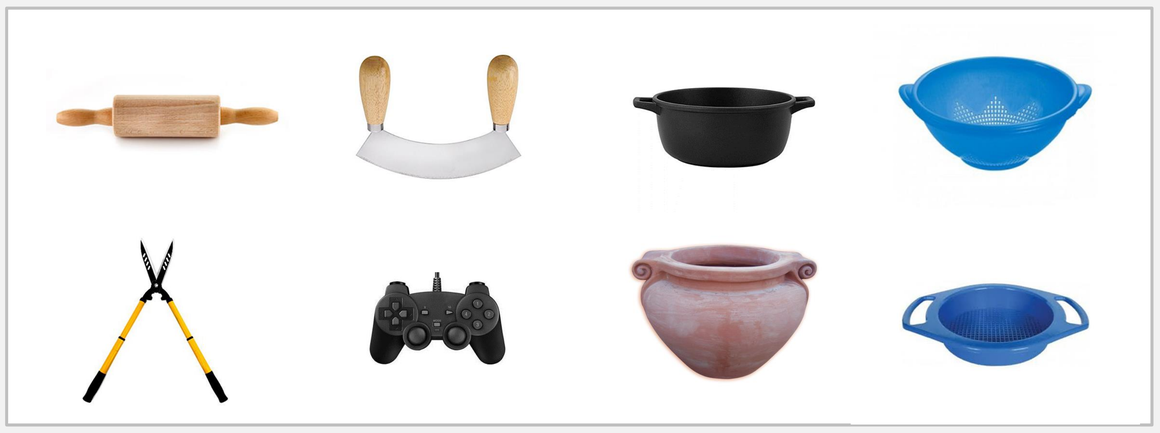

Fig. 1: Two-handled objects used in experiments 1 and 2.

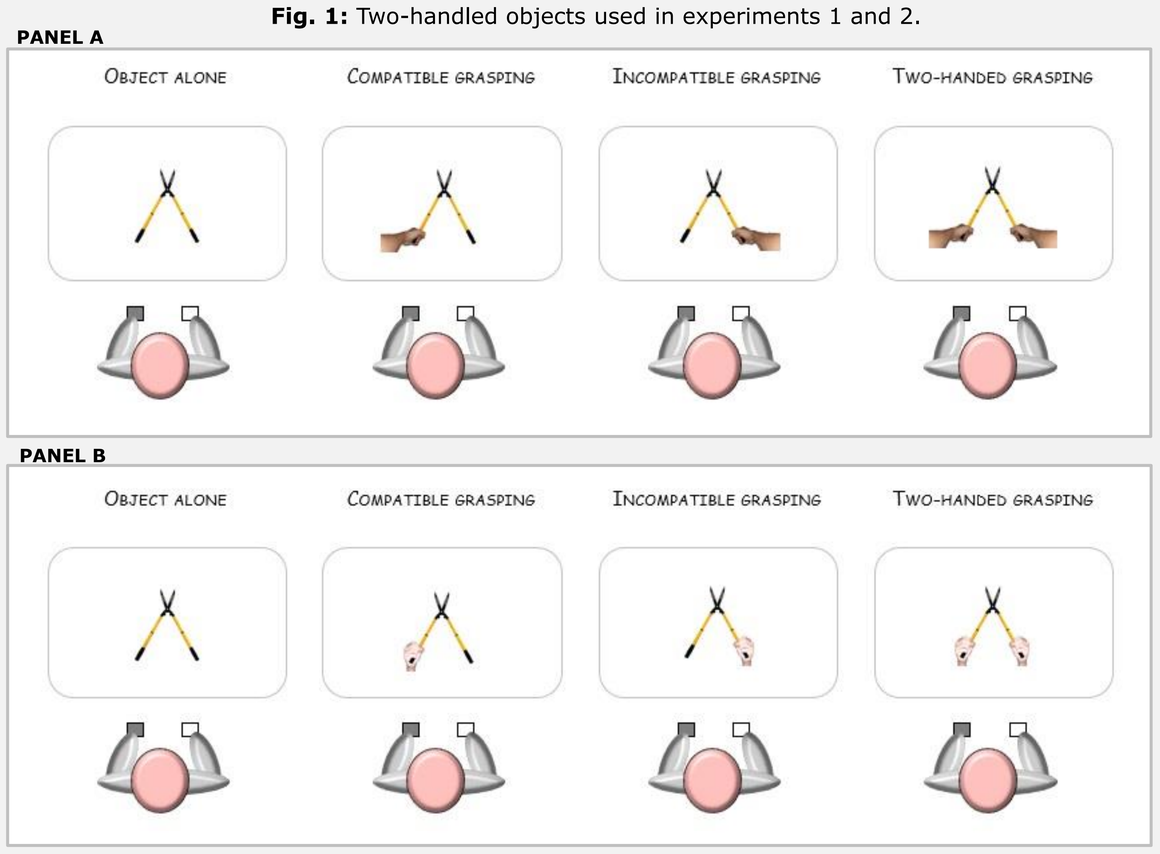

Fig. 2: Illustration of the 4 experimental conditions in experiments 1 (panel A) and 2 (panel B).

RESULTS & DISCUSSION

- For both experiments, a Repeated Analysis of Variance (ANOVA) with *Condition* as the within-subject factor was performed on RTs and ERs. The main effect of *Condition* was significant for both dependent variables in Experiment 1 [$F(3,111) = 21.91$, $p < .001$, $\eta_p^2 = .372$ and $F(3,111) = 11.49$, $p < .001$, $\eta_p^2 = .237$, for RTs and ERs, respectively], whereas it was significant for RTs only in Experiment 2 [$F(3,105) = 16.99$, $p < .001$, $\eta_p^2 = .327$]. Descriptive statistics are shown in Table 1.
- For both experiments, Bonferroni-corrected planned comparisons revealed better performances in the Compatible Grasping compared to the Incompatible Grasping condition, indicating a facilitation for the processing of two-handled objects when they appeared as grasped on the same side as the response (i.e., correspondence or alignment effect).
- A further ANOVA with *Correspondence* (compatible grasping vs. incompatible grasping) as the within-participant factor and *Experiment* (1, 2) as the between-participants factor was performed on RTs. Results showed a main effect of *Correspondence*, $F(1,72) = 67.32$, $MSe = 246.27$, $p < .001$, $\eta_p^2 = .483$, and a significant interaction between *Correspondence* and *Experiment*, $F(1,72) = 6.13$, $MSe = 1510.75$, $p = .016$, $\eta_p^2 = .079$. That is, the correspondence effect was smaller in Experiment 2 (15 ms) than in Experiment 1 (28 ms; see Fig. 3).
- These results suggest that the activation of the motor system when viewing graspable objects may be moderated by the viewpoint in which the grasping hands are shown (our own vs. other people's). An object that is shown as already grasped by other people's hands might indeed be perceived as an object not available for one's own action. As such, it either might refrain any activation of the motor system or might induce activation in the motor system to a lesser extent [4, 5].

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