Does incidental training increase the prevalence of overall similarity classification?

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Opposite theories

Differentiation Theory: Classification starts with an undifferentiated whole, which can be broken down into its constituent attributes if time and cognitive resources allow.

e.g. Lockhead, 1972; Brooks, 1978; Ward, 1983; Kemler Nelson, 1984; J. Smith & Kemler Nelson, 1984; Ashby et al., 1998; E. Smith et al., 1998; Goldstone & Barsalou, 1998; Tracy et al., 2003; Couchman et al., 2010.

Combination Theory: Classification starts with the attributes. Information from these attributes can be combined if time and cognitive resources allow.

e.g. Oden & Massaro (1978); Treisman & Gelade (1980); Lamberts (1995); Milton & Wills (2004).

Chemical analogies

Analytic, nonanalytic/holistic — presupposes Differentiation Theory.

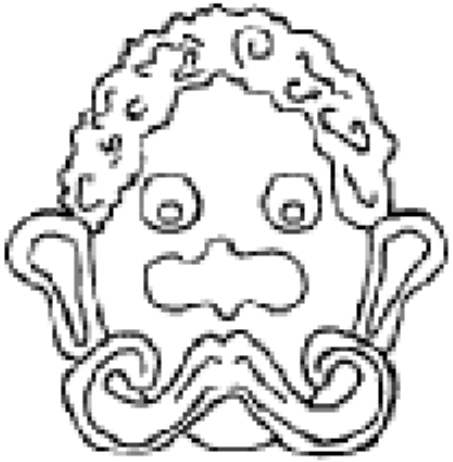
Synthetic, nonsynthetic — more appropriate if Combination Theory is correct.

Prediction

Differentiation Theory: Overall similarity classification is *less* effortful than classifying on the basis of a single dimension.

Policeman

Doctor



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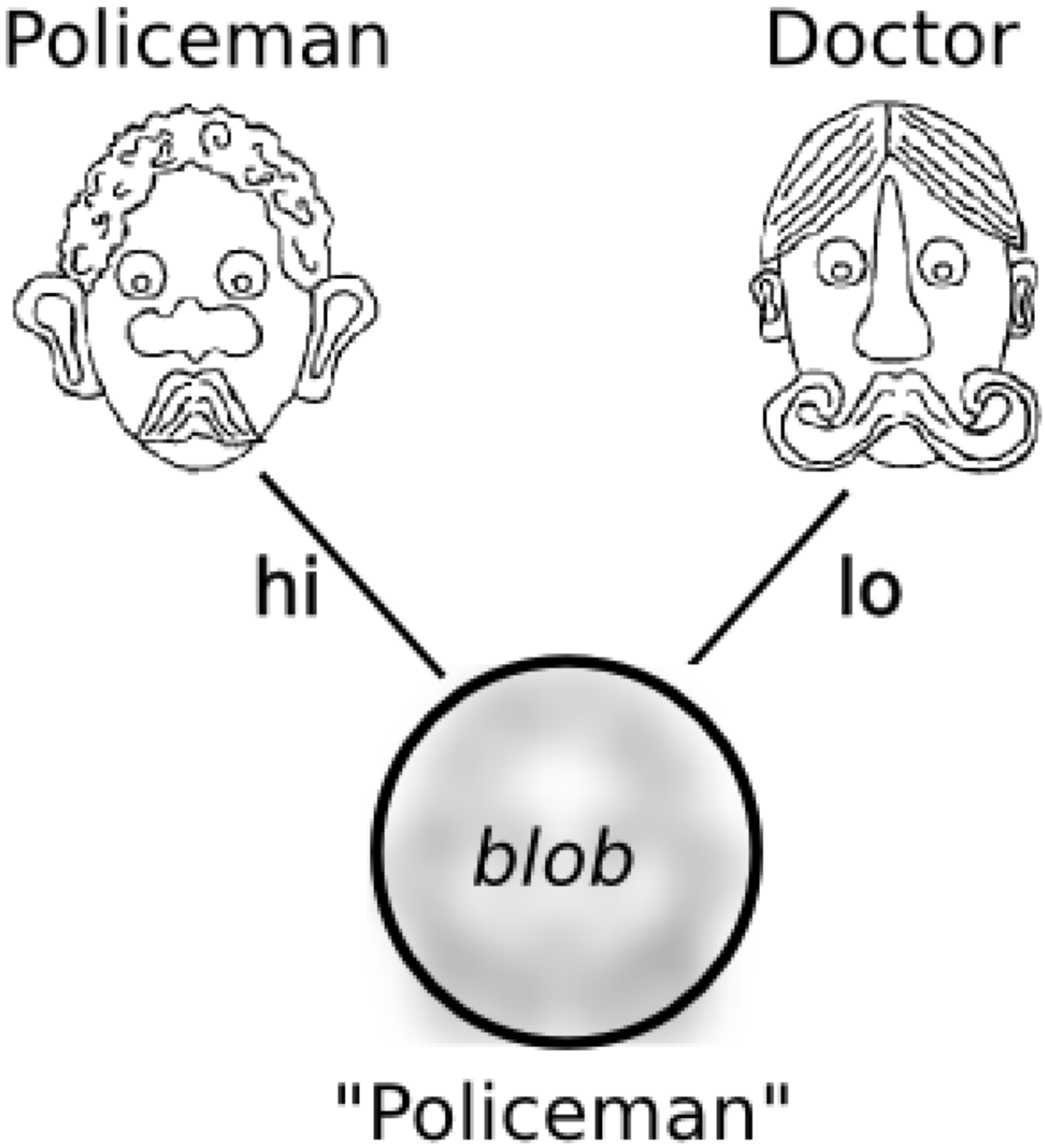
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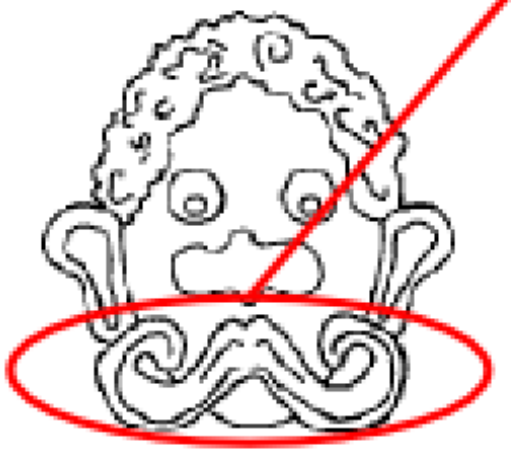


"Doctor"

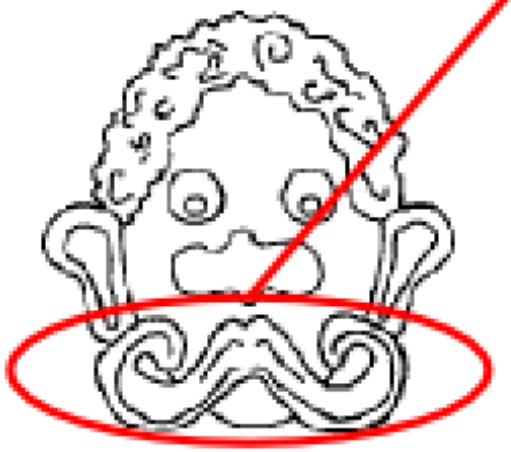
Opposite predictions

Differentiation Theory: Overall similarity classification is *less* effortful than classifying on the basis of a single dimension.

Combination Theory: Overall similarity classification is *more* effortful than classifying on the basis of a single dimension.

Policeman

Doctor



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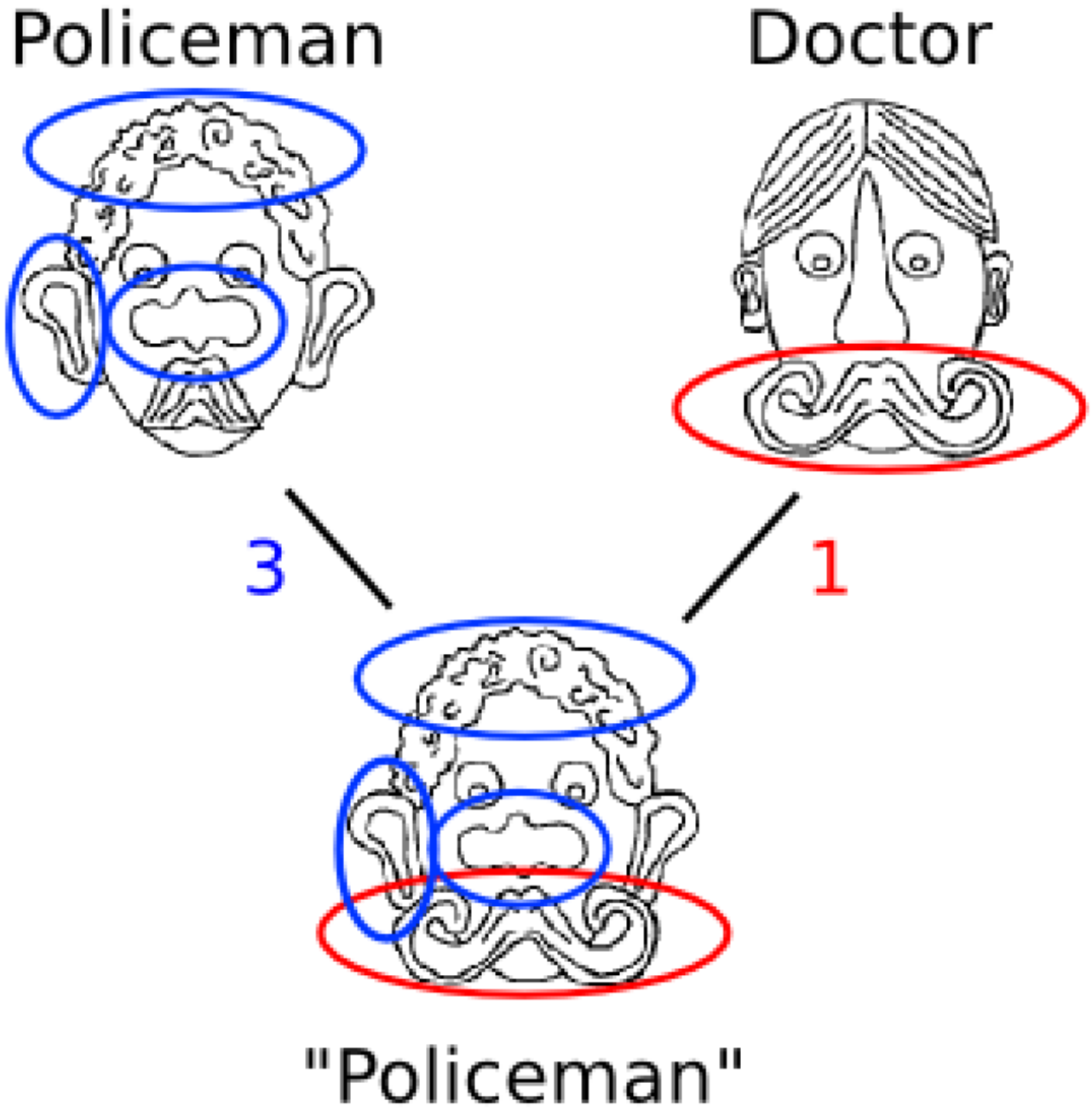
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"Policeman"

Disconfirmation of Differentiation Theory

Match to standards task

Milton, Longmore & Wills (2008): (a) stimulus presentation time.

Milton, Wills & Hodgson (2009): (b) frontal lobe activity.

Milton & Wills (2009): (c) reaction time, (d) eye gaze.

Wills, Milton, Longmore, Hester & Robinson (2013): (e) concurrent load, (f) working memory capacity, (g) instructions.

Wills, Longmore & Milton (2013): (h) impulsivity.

Empirical basis for Differentiation Theory

- "Triad" (minimal classification) procedure — Effects of time pressure, concurrent load, instructions (Ward, 1983; Smith & Kemler Nelson, 1984).
- Criterial-attribute procedure — Effects of incidental training, concurrent load (Kemler Nelson, 1984; Smith & Shapiro, 1989).
- Different procedures/stimuli give different results?
- Or a flaw in one or more of the procedures?

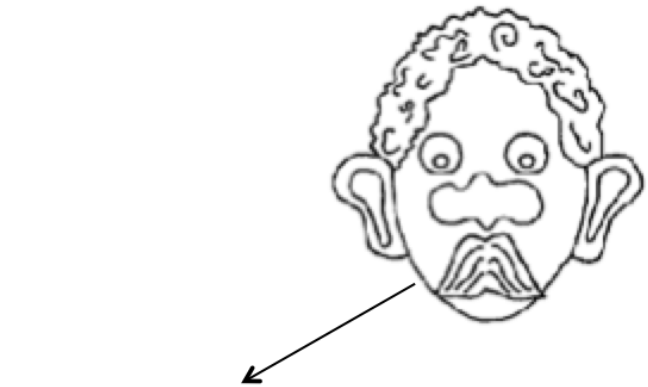
Criterial-attribute procedure

	D1	*D2*	*D3*	*D4*
Train A	1	1	1	1
	1	1	1	0
	1	1	0	1
	1	0	1	1
Train B	0	0	0	0
	0	0	0	1
	0	0	1	0
	0	1	0	0

Criterial-attribute procedure

	D1	*D2*	*D3*	*D4*
Train A	1	1	1	1
	1	1	1	0
	1	1	0	1
	1	0	1	1
Train B	0	0	0	0
	0	0	0	1
	0	0	1	0
	0	1	0	0
"Critical" Test	0	1	1	1
	1	0	0	0

Intentional training



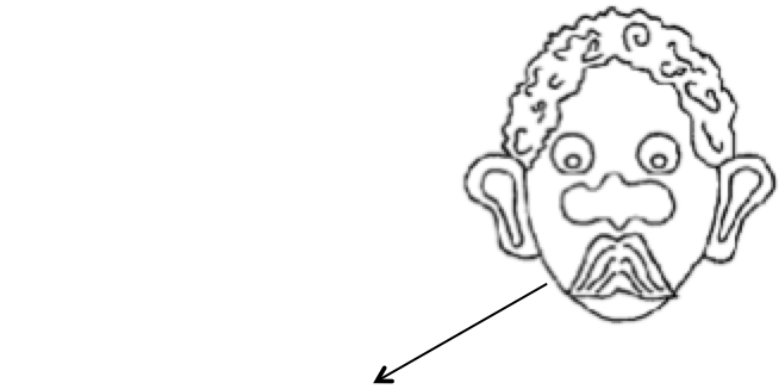
Group 1 – Doctor

Group 2 – Policeman

Incidental training

Seen Before?

Test phase



Group 1 – Doctor

Group 2 – Policeman

Key Result 1

Kemler Nelson (1984): Overall similarity classification is more prevalent after incidental training than intentional training.

Appears to support Differentiation Theory.

Non-criterial attribute

	D1	*D2*	*D3*	*D4*
Train A	1	1	1	1
	1	1	1	0
	1	1	0	1
	1	0	1	1
Train B	0	0	0	0
	0	0	0	1
	0	0	1	0
	0	1	0	0
"Critical" Test	0	1	1	1
	1	0	0	0

Response-set analysis

Kemler Nelson (1984) large-scale replication, with extended test phase.

	Stimulus				Response model				
	D1	*D2*	*D3*	*D4*	*CA*	*N2*	*N3*	*N4*	*OS*
Train A	1	1	1	1	A	A	A	A	A
	1	1	1	0	A	A	A	B	A
	1	1	0	1	A	A	B	A	A
	1	0	1	1	A	B	A	A	A
Train B	0	0	0	0	B	B	B	B	B
	0	0	0	1	B	B	B	A	B
	0	0	1	0	B	B	A	B	B
	0	1	0	0	B	A	B	B	B
"Critical" Test	0	1	1	1	B	A	A	A	A
	1	0	0	0	A	B	B	B	B
Other Test	0	0	1	1	B	B	A	A	?
	1	1	0	0	A	A	B	B	?
	0	1	0	1	B	A	B	A	?
	1	0	1	0	A	B	A	B	?
	0	1	1	0	B	A	A	B	?
	1	0	0	1	A	B	B	A	?

Experiment 1

	OS	CA	NCA
Intentional	.07	.68	.25
Incidental	.03	.44	.53

Experiment 2

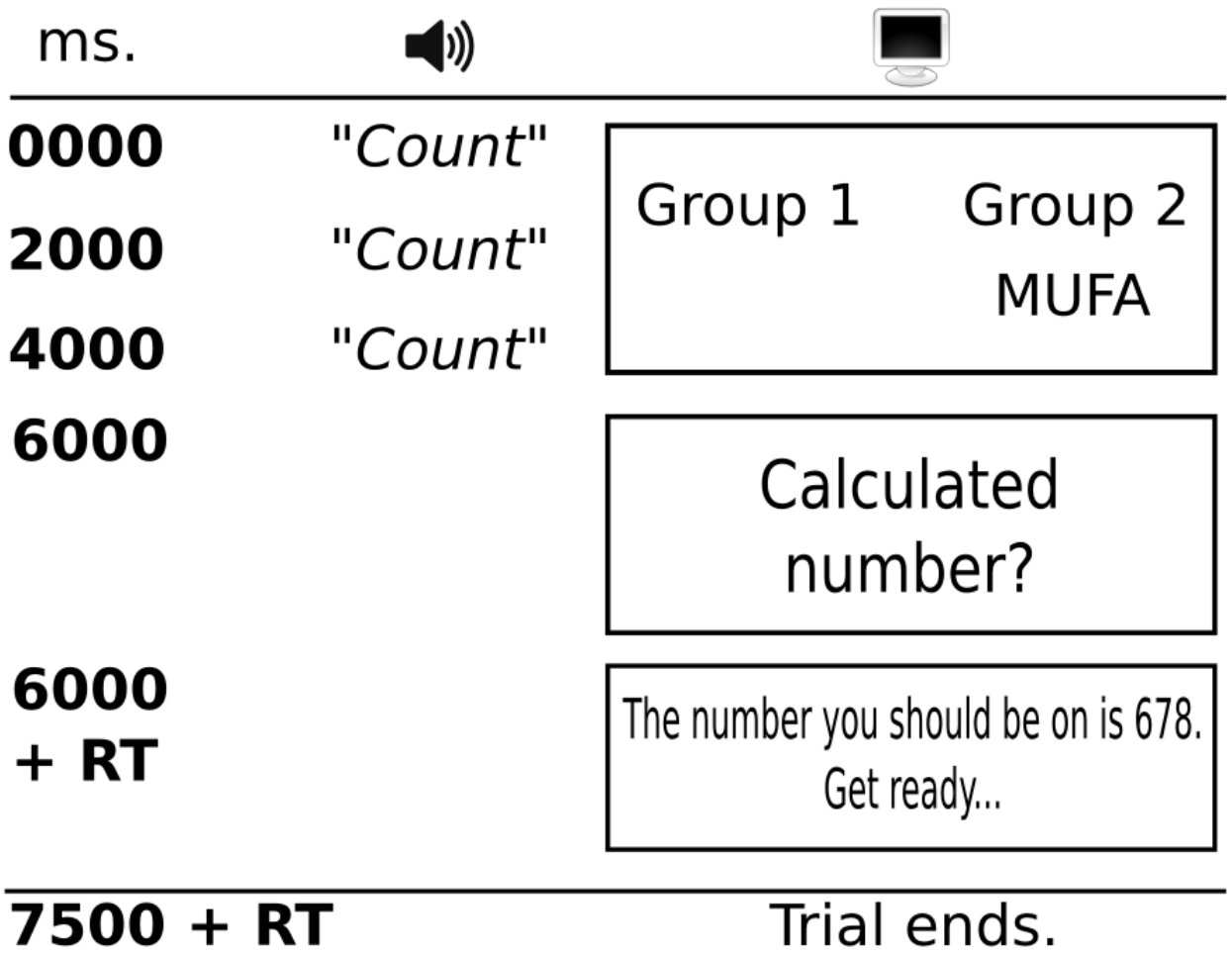
1. Removed OS-ambiguous items from test.
2. Extended incidental training to equate pass rates.

	OS	CA	NCA
Intentional	.09	.63	.28
Incidental	.15	.33	.52

Key Result 2

Smith & Shapiro (1989): Concurrent load increases the prevalence of overall similarity classification.

Concurrent load design



Experiment 3

	OS	CA	NCA
Full attention	.00	.74	.26
Concurrent load	.00	.48	.52

Summary

1. Other studies: Ward (1983), Smith and Kemler Nelson (1984).
2. The data does not seem to require Differentiation Theory, or Differentation-Combination hybrid.
3. Combination Theory provides an adequate and parsimonious account.