

The Role of an Incubation Period in Creative Problem Solving

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abstract

This experimental study tested the spreading-activation hypothesis that an incubation period helps to sensitize problem solvers to relevant concepts. The study also tested the selective forgetting hypothesis that an incubation period helps to desensitize problem solvers to irrelevant concepts. Chinese Chess GO players, 28 experts and 29 novices, solved 18 remote association tasks (RAT) and lexical decision tasks (LDT's) under immediate, rest, and incubation conditions. After each RAT, a set of LDT's incorporating the RAT solution and the irrelevant concept were presented, either immediately, or after a 2-min delay, or after a 2-min delay filled with incubation tasks. The findings of the study support the spreading activation hypothesis and suggest that spreading activation occurs only in a fixated mind. No support was found for the selective forgetting hypothesis.

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Роль инкубационного периода в решении креативных задач.

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Резюме

Данное экспериментальное исследование проверяет гипотезу распространения активации, согласно которой инкубационный период способствует сензитивности испытуемых по отношению к релевантным концептам. В исследовании также проверяется гипотеза селективного забывания, согласно которой инкубационный период способствует десензитивности испытуемых по отношению к нерелевантным концептам. В эксперименте участвовали китайские игроки в шахматы го, 28 экспертов и 29 новичков, которые решали 18 заданий теста на отдаленные ассоциации (RAT) и лексические задания в непосредственных условиях, условиях отдыха и условиях инкубационного периода. После каждой серии RAT, серия лексических заданий включала решение теста RAT и нерелевантный концепт, которые предъявлялись либо сразу, либо после 2-х минутного перерыва, либо после 2-х минутного перерыва, заполненного заданиями теста RAT. Результаты данного исследования подтверждают гипотезу распространения активации и говорят о том, что распространение активации происходит только в случае фиксации сознания. Гипотеза селективного забывания подтверждена не была.

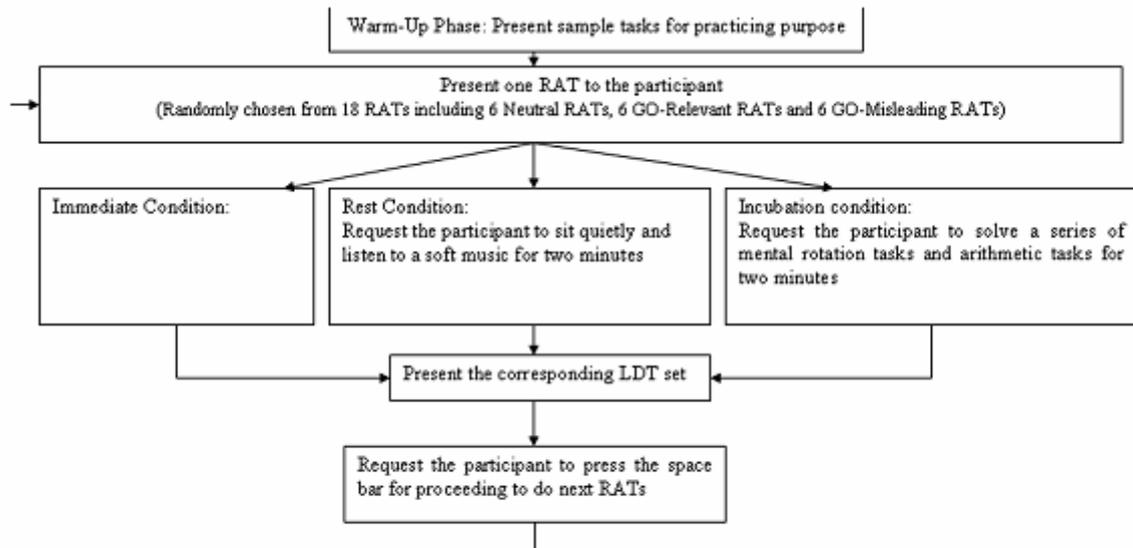


Figure 1. The flow chart of the experiment.

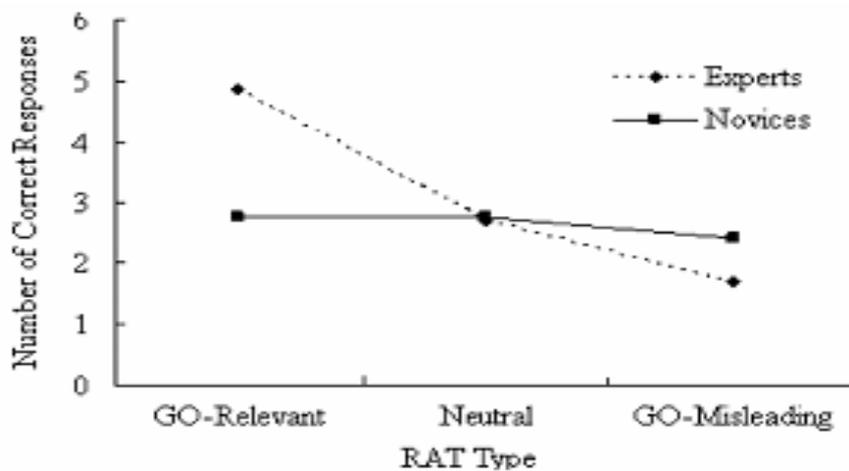


Figure 2. Graph of the interaction between the Degree of Expertise and RAT Type on the number of correct responses on RATs.

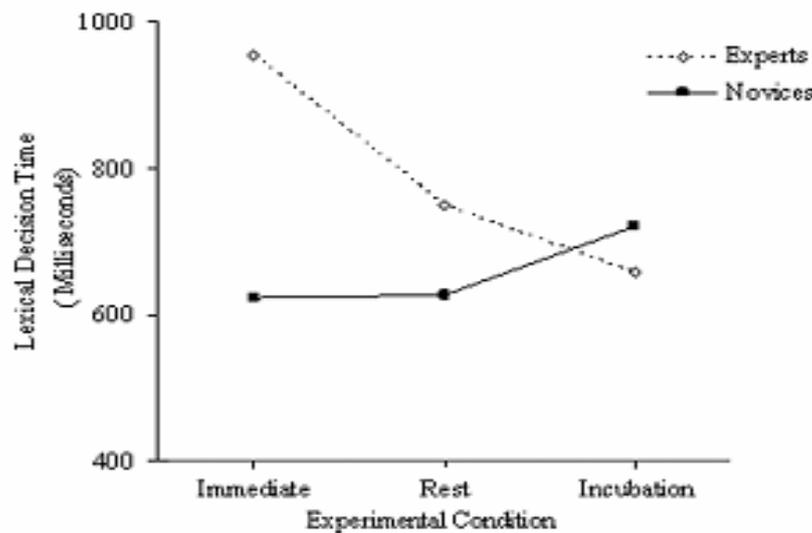


Figure 3. Graph of the interaction between the Degree of Expertise and Experimental Condition on the length of the lexical decision time for solutions of the unsolved GO-Mis leading RATs.

Table 1. Breakdown of Age, Gender, GO Ranking, and Total Amount of Time Spent Playing GO (hours), Gender, Field of Study for Experts and Novices and for the Three Experimental Conditions

Experimental Condition	Age		Ranking Score*		Time		Gender		Field of Study		
	M	SD	M	SD	M	SD	Men	Women	Humanities	Science	Business
Expert											
Overall	21.75	2.47	14.00	1.08	754.21	1037.74	24	4	5	2	21
Immediate	20.90	2.28	12.10	3.63	613.60	669.96	8	2	2	0	8
Rest	21.78	2.86	10.11	4.59	907.56	1352.64	8	1	1	2	6
Incubation	22.67	2.18	10.67	4.27	757.11	1117.45	8	1	2	0	7
Novice											
Overall	20.41	1.32	35.17	1.07	57.10	43.54	23	6	8	4	17
Immediate	20.08	0.37	30.15	8.47	65.85	49.55	12	1	3	0	10
Rest	20.57	0.43	33.22	6.67	59.11	39.49	6	3	2	2	5
Incubation	20.86	0.50	34.75	2.44	38.29	35.69	5	2	3	2	2

*Since there are two categories (kyu and dan) in the GO ranking system, a ranking score based on the participant's GO ranking was computed for the sake of making comparisons between participants. The score ranged from 36 to 1, a score of 36 = 30 kyu, a score of 16 = 10 kyu, a score of 6 = 1 dan, and a score of 1 = 6 dan.

Table 2. *The Means and Standards Deviations of the Original and Logarithmically Transformed (in bracket) Lexical Decision Time (in Milliseconds)*

Source	Experts		Novices	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Solutions of the unsolved neutral RATs				
Immediate condition	892 (2.91)	265 (0.13)	723 (2.82)	236 (0.13)
Rest condition	899 (2.90)	547 (0.20)	585 (2.75)	141 (0.09)
Incubation condition	615 (2.77)	185 (0.10)	698 (2.80)	211 (0.09)
Solutions of the unsolved GO-misleading RATs				
Immediate condition	956 (2.94)	326 (0.14)	623(2.78)	163 (0.10)
Rest condition	751 (2.84)	272 (0.14)	627 (2.78)	144 (0.08)
Incubation condition	659 (2.80)	112 (0.07)	722 (2.83)	214 (0.10)
Intrusive words of the unsolved GO-misleading RATs				
Immediate condition	1104 (3.00)	396 (0.16)	779 (2.85)	316 (0.14)
Rest condition	1024 (2.96)	327 (0.13)	750 (2.83)	252 (0.11)
Incubation condition	745 (2.84)	153 (0.08)	795 (2.84)	270 (0.14)
Neutral words				
Immediate condition	1077 (2.97)	309 (0.11)	789 (2.86)	134 (0.07)
Rest condition	1010 (2.95)	254 (0.11)	750 (2.84)	164 (0.09)
Incubation condition	872 (2.90)	98 (0.04)	797 (2.86)	158 (0.08)

Note. RAT = Remote association task.

Appendix. *The List of Chinese RATs Created for This Study*

Presentation order	RAT Type	First Stimulus	Second Stimulus	Third Stimulus	Possible Solution	Intrusive word
1	Neutral	月(moon)	鐵(metal)	煎(fry)	餅(cake)	
2	GO-Relevant	半(half)	高(high)	貼(stick)	目(eye)	
3	Neutral	輪(wheel)	電(electric)	桌(table)	椅(chair)	
4	GO-Misleading	淨(purify)	點(point)	苦(bitter)	心(heart)	殺 (kill)
5	GO-Misleading	大(large)	拆(break)	木(wood)	門 (door)	飛 (fly)
6	GO-Relevant	緊(tight)	外(outside)	長(long)	氣 (air)	
7	GO-Misleading	叫(shout)	門(door)	雨(rain)	大(big)	吃(cat)
8	GO-Misleading	提 (pick)	消(erase)	震(shake)	防(prevent)	劫(disaster)
9	Neutral	年(year)	雪(snow)	煙(smoke)	花(flower)	
10	GO-Relevant	真(real)	破(destroy)	做(make)	眼(eye)	
11	Neutral	燃(burn)	牛(ox)	石(rock)	油(oil)	
12	GO-Relevant	征(overcome)	提(pick)	數(count)	子(stone)	
13	GO-Misleading	金(gold)	掛(hang)	修(renovate)	飾(decorate)	角(corner)
14	GO-Relevant	雙(pair)	做(make)	死(dead)	活(alive)	
15	GO-Relevant	對(opposite)	劫(disaster)	點(point)	殺(kill)	
16	Neutral	火(fire)	貨(stock)	跑(run)	車(car)	
17	GO-Misleading	外(outer)	厚(thick)	睡(sleep)	衣(apparel)	勢 (situation)
18	Neutral	星(star)	激(stimulate)	管(tube)	光(ray)	

Note. English translate in bracket.