

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

Paced Auditory Serial Addition Task: AN EXPERIMENTAL INVESTIGATION

A thesis presented in partial fulfilment of the requirements for the degree of Master of Arts in Psychology at Massey University

Nina Irving

1982

Abstract

This study investigated the effects of seven independent variables upon a Paced Auditory Serial Addition Task (PASAT; Gronwall & Sampson, 1974).

The main effects found were that arithmetic ability and a short-term memory measure were related to performance on this task. Interactive effects were found for measures of anxiety, sex and the strategy used in performing the PASAT.

Theories considered included those of Broadbent (1977), Neisser (1976), Kerr (1973), Kahneman (1973) and Broadbent (1971) with emphasis on the latter two. The findings are most easily interpreted in terms of Kahneman's (1973) theory. Broadbent's (1971) model could not account for the effects of environmental and task conditions upon information-processing capacity.

Further research is needed to examine the effects of individual abilities and biases in selective attention. Also it is suggested that perception and the allocation of effort policy (Kahneman, 1973) be studied further from Broadbent's (1977) perspective of global and local analysis of information.

Clinical implications for the interpretation of the PASAT are discussed. It is suggested that this test could be used more widely as a measure of selective attention. More specifically it is suggested that the administration instructions could be simplified where necessary; and error scores considered together with rate of performance. These measures give an indication of performance effectiveness.

ii

Acknowledgements

I would like to thank Dr Ken McFarland for the time and support he gave, as supervisor, for this study. My thanks also to Mrs Joan Barnes for her assistance in the clinical psychology field and to Mrs Marion Somerville who typed this manuscript.

Contents

Abstract iii Acknowledgements iii List of figures iii List of tables iii Chapter 1 Introduction iii Chapter 2 Cognitive Process iii Chapter 3 The independent variables: theory and measurement 16 Arithmetic ability iii iii Anxiety iii iii Anxiety iii iii Chapter 4 PASAT iii Pastr iii iii Strategy iii iii Chapter 4 PASAT iii The effects of pacing on serial addition iii Ithe development of the PASAT iii Ithe development of the PASAT iii Ithe PASAT investigations iii Ithe PASAT investigations iii Chapter 5 Synthesis iii Chapter 5 The present investigation iii												Page
Acknowledgements <td>Abstract</td> <td>••</td> <td>ii</td>	Abstract	••	••	••	••	••	••	••	••	••	••	ii
List of figures	Acknowledge	ements	••	••	••	••	••	••	••	••		iii
List of tables	List of fig	gures	••	••	••	••	••	••	••	••	••	vii
Chapter 1 Introduction	List of tab	oles	••	••	••	••	••	••	••	••	••	viii
Onapter 1 Introduction I. I	Chapter 1	Introduc	tion									2
Chapter 2 Cognitive Process	Ullapter 1	Aima of	the r		••	••	••	••	••	••	••	2
Chapter 2Cognitive Process <td></td> <td>ALINS OI</td> <td>one F</td> <td>breser</td> <td>IC TIN</td> <td>les cré</td> <td>Sartor</td> <td>1</td> <td>••</td> <td>••</td> <td>••</td> <td>4</td>		ALINS OI	one F	breser	IC TIN	les cré	Sartor	1	••	••	••	4
Chapter 3The independent variables: theory and measurement16Arithmetic abilityShort-term memoryAnxietyAnxietySexChapter 4PASATPaporal integrationThe development of the PASATPASATGronwall and Sampson's 1974 experimentsFurther PASAT dependent variablesChapter 5SynthesisChapter 6The present investigation	Chapter 2	Cognitiv	ve Pro	cess		••	••	••	••	••	••	7
Chapter 3 The independent variables: theory and measurement 16 Arithmetic ability 16 Short-term memory 19 Anxiety 19 Anxiety 12 Strategy 24 Strategy 28 Sex 28 Sex Chapter 4 PASAT The effects of pacing on serial addition <t< td=""><td>a1</td><td>m1 · 1</td><td>1</td><td>1</td><td>. 17</td><td>11-27/25/55</td><td>11</td><td>1990) 121201</td><td></td><td></td><td></td><td>1/</td></t<>	a 1	m1 · 1	1	1	. 17	11-27/25/55	11	1990) 1 21201				1/
Arithmetic ability </td <td>Chapter 3</td> <td>The inde</td> <td>epenae</td> <td>ent va</td> <td>irlabi</td> <td>Les:</td> <td>theol</td> <td>ry and</td> <td>1 mea</td> <td>surem</td> <td>ent</td> <td>10</td>	Chapter 3	The inde	epenae	ent va	irlabi	Les:	theol	ry and	1 mea	surem	ent	10
Short-term memory <td></td> <td>Arithmet</td> <td>tic al</td> <td>pility</td> <td>7</td> <td>••</td> <td>••</td> <td>••</td> <td>••</td> <td>••</td> <td>••</td> <td>16</td>		Arithmet	tic al	pility	7	••	••	••	••	••	••	16
Anxiety		Short-te	erm me	emory		••	••	••	••	••	••	19
Strategy		Anxiety	••	••	••	••	••	••	••	••	• •	24
Sex .		Strategy	У	••	••	••	••	••	••	••	••	28
Chapter 4PASAT <td></td> <td>Sex</td> <td>••</td> <td>••</td> <td></td> <td>••</td> <td>••</td> <td>••</td> <td>••</td> <td>••</td> <td>••</td> <td>30</td>		Sex	••	••		••	••	••	••	••	••	30
Chapter 4PASAT <td></td> <td>~~</td>												~~
The effects of pacing on serial addition33Temporal integrationPractice effectsThe development of the PASATPASATGronwall and Sampson's 1974 experimentsFurther PASAT investigationsPASAT dependent variablesChapter 5SynthesisSynthesisStateStateStateSynthesisSynthesisSynthesisSynthesisSynthesisSynthesisSynthesisSynthesisSynthesisSynthesisSynthesisSynthesisSynthesisSynthesisSynthesisSynthesisSynthesisSynthesisSynthesis<	Chapter 4	PASAT	••	••	••	••	••	••	••	••	••	33
Temporal integration		The eff	ects (of pa	cing (on sei	rial	addit	ion	••	••	33
Practice effects		Temporal	l inte	egrat	ion	••	••		••	••	••	33
The development of the PASAT		Practic	e eff	ects	••	••	••	••	••	••	••	34
PASAT		The dev	elopm	ent o	f the	PASA	Т	••	••	••	••	36
Gronwall and Sampson's 1974 experiments37Further PASAT investigationsPASAT dependent variablesChapter 5SynthesisChapter 6The present investigation53		PASAT	••	••	••	•••	••		••	••	••	36
Further PASAT investigationsPASAT dependent variablesChapter 5SynthesisChapter 6The present investigation		Gronwal	l and	Samp	son's	1974	expe	rimen	ts	••	••	37
PASAT dependent variables<		Further	PASA	T inv	estig	ation	S	••	••	••	••	1414
Chapter 5 Synthesis		PASAT d	epend	ent v	ariab	les		••	••			46
Chapter 6 The present investigation												
Chapter 6 The present investigation	Chapter 5	Synthes	is	••	••	••	••	••	••	••	••	48
	Chapter 6	The pre	sent	inves	tigat	ion						53
Hypotheses 53		Hypothe	ses					••				53

	Experimental	desi	gn	••	••	••	••	••	••	54
	Experiment 1		••	••	••	••	••	••	••	55
	Subjects	••	••	••	••	••	••	••	••	55
	Apparatus a	ind ma	ateria	ls	••	••	••	••	••	55
	Procedure	••	••	••	••	••	••	••	••	56
	Results	••	••	• •	••	••	••	••	••	57
	Supplementary	res	ults	••	••	••	••	••		63
	Comparison wi	.th n	orms	••	••	••	••			64
	Interim discu	••	••	••	••	••	••	65		
Chapter 7	Experiment 2	••	••	••		••			••	70
	Hypotheses	•• '	••		••	••	••	••	••	70
	Experimental	desi	gn	••	••	••	••	••	••	70
	Subjects	••	••	••	••	••	••	••		71
	Apparatus a	and m	ateria	als	••	••	••	••	••	71
	Procedure	••	••	••	•••	••	••	••	••	71
	Results	••		••	•••	••	••	••	••	72
	Supplementar	y res	ults	••	••	••	••	••	••	75
	Comparison w	ith n	orms	••	••	••	••	••	••	79
	Interim disc	ussio	n	••	••	••	••	••	••	80
Chapter 8	General disc	ntrod	uctio	n	••			83		
	The independ	ent v	ariab	les	••	••	••	••	••	83
	The dependen	t var	iable	S	••	••	••	••	••	88
	Implications	for	model	s of :	infor	matio	n pro	cessi	ng	89
	Topics requi	ring	furth	er in	vesti	gatio	n	••		92
	Clinical imp	licat	ions	••	••	••	••	••	••	95
	Conclusions	••	••	••	••	••	••	••	••	96
References			••	••	••	••			••	97
Appendix A	The PASAT	••	••				•••	••		105
Appendix B	Categorizat	ion c	of raw	data			••	••		108

Page

v

Appendix (С	Experiment 1 means, subjects and error terms	••	••	109
Appendix I	D	Supplementary results to Experiment 1	••	••	113
Appendix H	Е	Diagnosis and medication of clinical sample	••	••	115
Appendix H	F	Experiment 2 means, subjects and error terms	••	••	116
Appendix (G	Supplementary results to Experiment 2	••	••	119

Page

List of Figures

Figure		Page
1	Mean percent error score performance on PASAT as a	
	function of arithmetic, digit span, Factor 2 and	
	state anxiety.	60
2	Rate of responding on PASAT as a function of trait	
	anxiety and state anxiety.	61
3	Mean percent error score performance on PASAT as a	
	function of strategy, sex and state anxiety.	62
4	Experiment 2, performance on PASAT as a function of	
	arithmetic ability and state anxiety.	74
5	Experiment 2, mean seconds per correct response	
	performance on PASAT as a function of strategy and	
	state anxiety.	75

List of Tables

Table		Page
1	Expected effects of the independent variables on PASAT	32
2	Underlying dimensions of PASAT measures	47
3	Experiment 1 main effect F values	57
4	Experiment 1 two-way interaction F values	58
5	Experiment 1 ability inter-correlations	63
6	Experiment 1 dependent variable inter-correlations	63
7	Experiment 1 correlations of abilities and dependent	
	variables	64
8	Experiment 2 main effect F values	72
9	Experiment 2 two-way interaction F values	73
10	Experiment 2 correlations of anxiety and PASAT	77
11	Experiment 2 correlations of age and PASAT	77
12	Arithmetic and state anxiety means for Experiment 1	
	and Experiment 2	78
13	Relative frequency of error type for Experiment 1 & 2	79
14	Correlations of categorized independent variables	
	and the dependent variables, Experiment 1	113
15	Correlations of independent variable raw scores and	
	the dependent variables, Experiment 1	115
16	Correlations of categorized independent variables	
	and dependent variables, Experiment 2	119
17	Correlations of independent variable raw scores and	
	dependent variables, Experiment 2	120