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(15-5)

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1988 Thornton and Vukelich

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Pearson Correlation

t-test

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(67. 1988 )

(Beyer, 1979, pp.178-179)

(33. 1986 )

( 7-2) (Preopertional) - (Piaget) -

( 11-7) (Concrete Operations)

(Booth, 1987, p. 24) .( 11) (Formal Operations)

"  
 .(Hoodless, 1996, p.8 44. 1973 ) "  
 " (Burton & Edge, 1985, p. 110)  
 (227. 1981) "

"  
 ... " : (214 . 1983)

(30)

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 " " " "  
 " " " : " "  
 (Burton & Edge, 1985, p. 111 ; Cooper, 1992, p. 24)."  
 (Piaget)  
 .(227 . 1988 )  
 " " (Ames, 1946)  
 .(285 . 1981 )  
 ) (132 . 1976)  
 (21 . 1983) .(124 . 1980) (

(124 . 1980 )

" :

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" " .(144 . 1973 )

.1986 "

(Blyth, 1994, p. 32; Partington,

.1980, p. 31)

(Burton & Edge, 1985, p 111):

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" : (Noble 1986, p.19)

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.(37. 1986

(Historical Time)

1981 ) (Turner & Helms 1979, p. 276)

.(Hoodless, 1996, p. 10) (150.

(78. 1981)

" (285-284. 1981)

(16-15)

.(Levstik & Pappas 1987, p. 25)

" : (Booth, 1987, p. 163)

." (16-15)

.(Sleeper, 1975, p. 96)

:  
 )  
 1969 (Piaget) (Physical time) (  
 (Friedman, 1982) ( )  
 . " "

.(Hoodless, 1996, pp.10-12)

Friedman 1982 Harner  
 (Thornton & Vukelich 1988, pp.70-73) 1982 1978  
 Copper (104 . 1997 ) 1991 Hoge :  
 (Hoodless, 1996, p. 47) 1994 Blyth

" 1988 Thornton and Vukelich  
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		:
		<b>(Concepts)</b>
(Good, 1973)		
"		"
		-

**Time Concept ( )**

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 " (285. 1981) (265. 1982)  
 ( ) " (132. 1976) "  
 ." " (78. 1981) "

**Historical Time**

(Thornton & Vukelich, 1988, p.70)

(dates)

" "



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(298) (4) 11-7  
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	5	3	2	1	.1
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	9	6	3	3	
	11	6	3	3	
	12	3	3	-	.3
	15	3	3	-	
	13	3	-	3	.4
	15	3	-	3	
		30			
	5	6	3	3	.1
	7	6	3	3	.2
	9	6	3	3	
	11	6	3	3	
	13	4	4	-	.3
	15	4	4	-	
	13	4	-	4	.4
	15	4	-	4	
		40			

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	5	3	2	1	.1
	7	4	2	2	.2
	9	4	2	2	
	11	4	2	2	
	13	2	2	-	
	15	3	3	-	.3
	13	2	-	2	.4
	15	3	-	3	
		25			
	5	20	10	10	.1
	7	20	10	10	.2
	9	20	10	10	
	11	20	10	10	
	13	10	-	10	
	15	10	-	10	.3
	13	10	10	-	.4
	15	10	10	-	
		120			

.(2)

t-test

(2)

	0.05	2,306	0,1	5
	0.05	2,306	0,05	7
	0.05	2,306	0,02	9
	0.05	2,306	0,849	11
	0.05	2,306	0,646	13
	0.05	2,306	0,36	15

( ) (15-5)  
 " 1988 (Thornton & Vukelich)  
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 (Content Validity) \*  
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Pearson Correlation

t-test

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.(3)

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8	8	7 4 2 1	5

20	17 6	11-10 8-1	7
32	23 6	16-1	9
36	24 8	18-1	11
40	39 20	20-1	13
50	44 8	25-1	15

: :

(4) t-test

(4)

	( )	( )				
7-5	0 05	2 10	10	15 8	8	5
9-7	0 05	2 10	3 35	2 9	17 6	7
11-9	0 05	2 10	0 9	61 22	23 6	9
13-11	0 05	2 10	10 9	22 4	24 8	11
15-13	0 05	2 10	5 04	12 06	39 2	13
				12 55	44 8	15

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(Fraisse, 1982)

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(Burton & Edge, 1985)

(Noble, 1986)

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(Friedman, 1982)

(Cooper, 1992)

(Hoge, 1991)

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(Thornton and Vukelich, 1988)

.(Levstik and Poppas, 1987)

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(Thornton & Vukelich,

(Friedman, 1978)

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" (Hoge, 1991)  
 (104 . 1997 ) "

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(Thornton, & Vukelich, 1988)

(Harner, 1982)

(Friedman, 1978)

(Blyth, 1994) , (Cooper, 1992)

(Hoodless, 1996) ( 16-15)

$$\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1} = \frac{\sum_{i=1}^n x_i^2 - n\bar{x}^2}{n-1}$$

t-test ( )

$$t = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}} \quad (5)$$

(5)

x	( )	( )					
	2.10	0.9	4.9	7.7	10.2	8 3	5
	2.10	0.8	1.94	17.3	3.7	18	7
	2.10	0.4	15.6	23.4	4.37	23 8	9
	2.10	1.4	30.9	25.7	19.2	24 1	11
	2.10			39.2		39 2	13
	2.10	1.16	8.5	45.4	11.29	44 25	15

0.05

x

(5)

0 05

(Friedman, 1982)

(1997)

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		.(1973)	.17

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0.54	0.50	2
0.63	0.54	3
* 0.21	* 0.25	4
0.64	0.74	5
0.63	0.76	6
0.59	0.52	7
0.49	0.48	8
0.55	0.64	9
0.64	0.67	10
0.51	0.58	11
0.58	0.74	12
0.42	0.72	13
0.55	0.66	14
0.58	0.59	15
0.64	0.54	16
0.63	0.55	17
0.53	0.58	18
0.64	0.49	19
0.63	0.62	20
0.61	0.71	21
0.49	0.53	22
0.21	0.19	23
0.51	0.68	24
0.42	0.54	25
0.53	0.58	26
0.49	0.72	27

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0.62	0.64	28
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