Meta-analysis:
The Process and Interpretation

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The Process …

1. The beginnings – Gene Glass
   Psychotherapy, class size
2. Problem formulation
   The move to RCT, Research quality, hypothesis testing
3. The metric – effect-size
   a. $(X_e-X_c)/s_p * (1 – 3/[4N-9])$
   b. Pre-post vs. exp-ctl
   c. Differences re s_1 differing from s_2; and $s_1=0$?
   d. $R = 2r/(1-r^2)^{.5}$
4. Search Process – estimate pop of studies
5. Coding -- KISS
   a. Substantive
   b. Methods
   c. Sources

Design feature

ADHD

design was ABA	.45	(ns = 31, ne = 383)
crossover	.38	(ns = 30, ne = 733)
treatment-control	.09	(ns = 4, ne = 25)

Carlson and Schmidt (1999) posited two possible reasons for these differences.

1. That treatment-control designs tend to underestimate effect-sizes because the use of post-treatment standard deviations are larger than pre-test standard deviations, primarily because post-treatment standard deviations may be altered by possible interactions.

   The pre-test sd was 9.55, & the post-test sd was 9.12 (a 2% change)

2. Pre-post test designs may lack controls for various extraneous effects, whereas the use of control groups permit any nontraining effects on the dependent variable to be captured and removed during the calculation of effect-sizes (leading to the hypothesis that the control effect-sizes will be positive)

   The post-pretest effect-size for the control groups was -.11

3. Specific attributes of some studies.

   One of the 4 treatment-control effect (Risser & Bowers, 1993), was concerned with neurospychological functioning as assessed by an EEG with a study effect size of -.69. This was in contrast to the average effect of .35 for the other three studies in that group.

The Process, continued

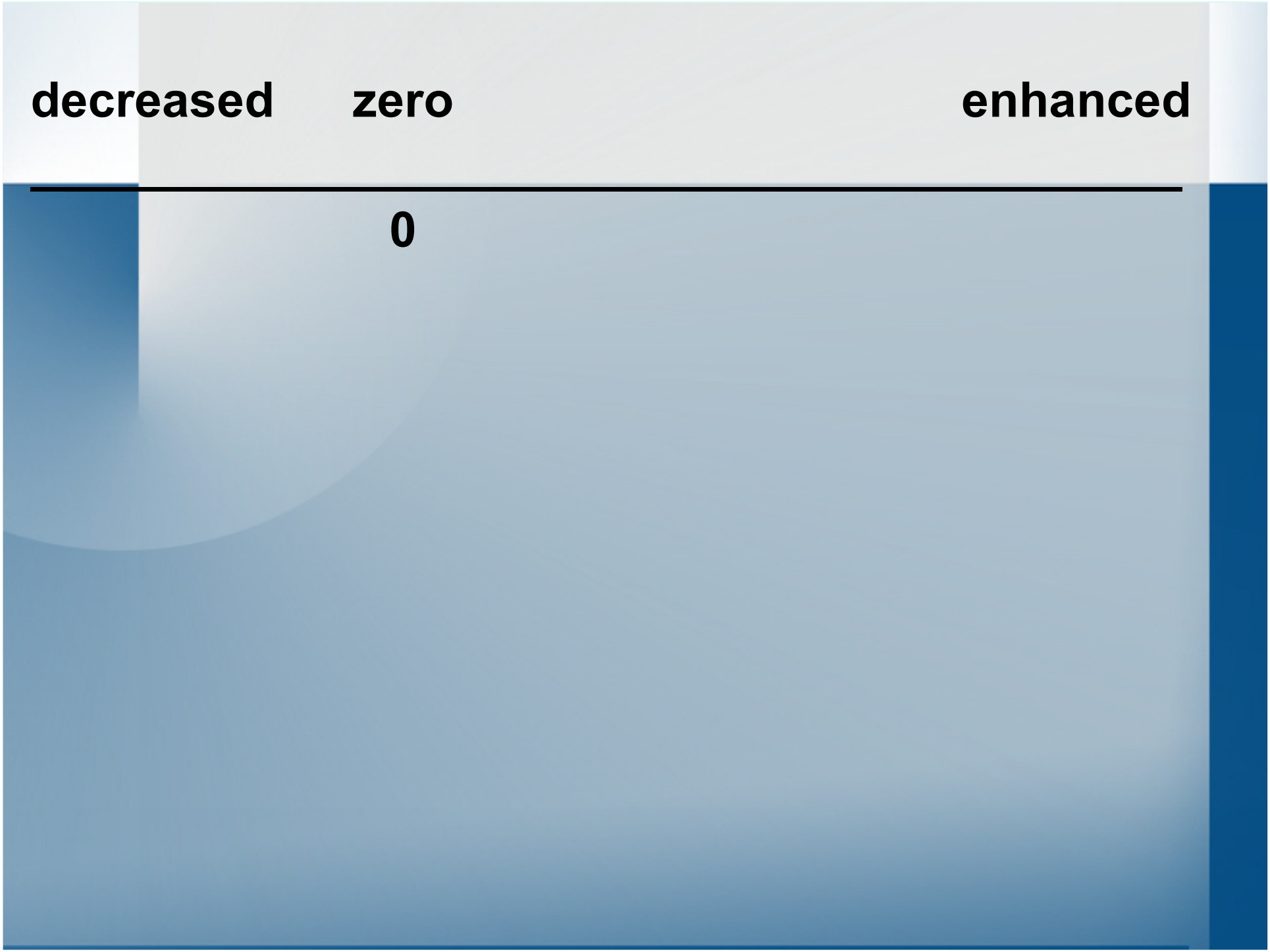
6. Software

7. Data Screening
   a. Outliers
   b. Hunter & Schmidt – corrections for unreliability, restriction of range
   c. Confidence intervals
   d. Homogeneity – do all effects contributing to ave, reflect underlying distribution
   e. Fixed vs. random effect – any variability beyond subject level sampling is random

      $v = v_t + v_l$

      = between + sampling error

8. Interpretation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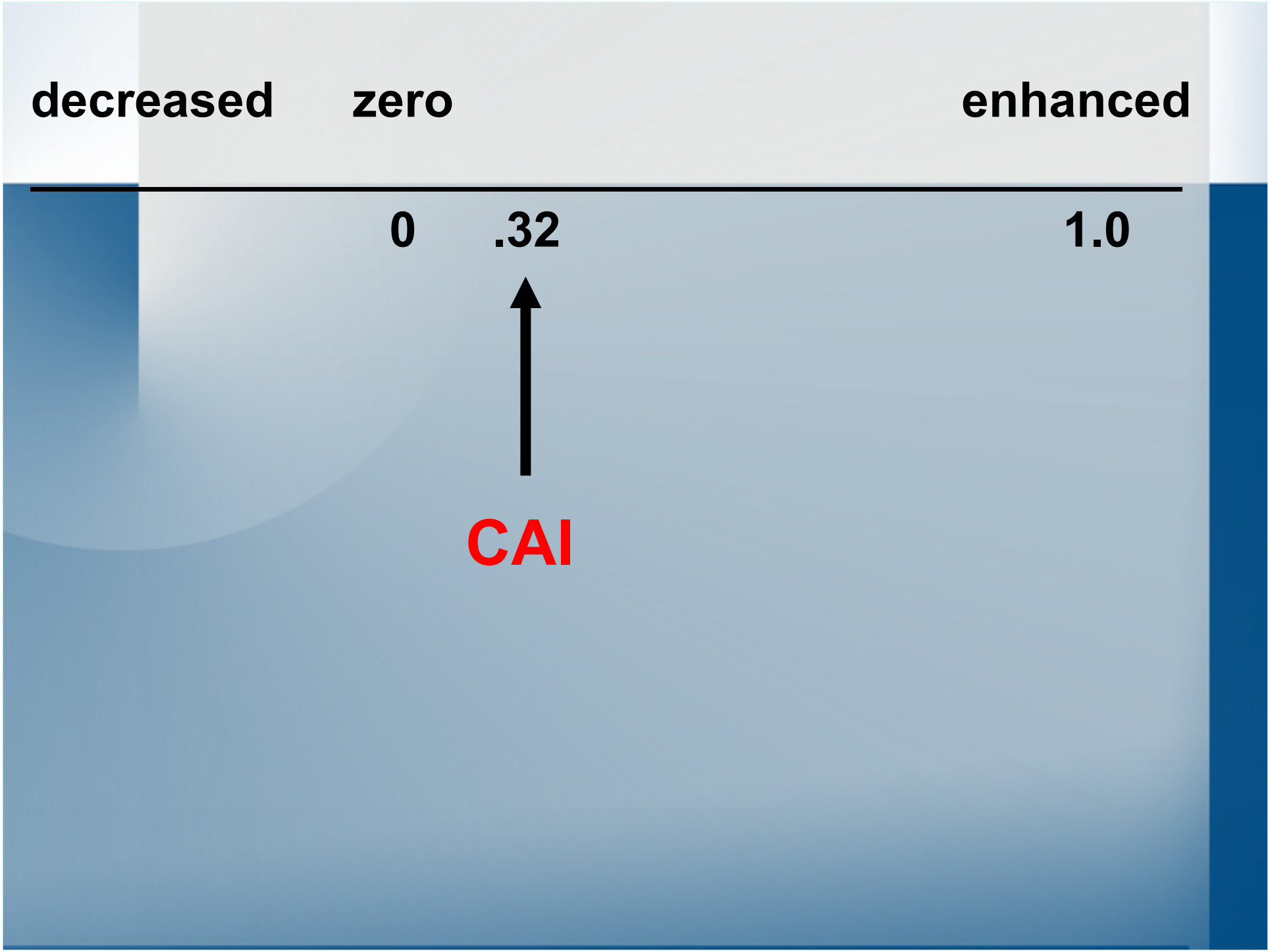
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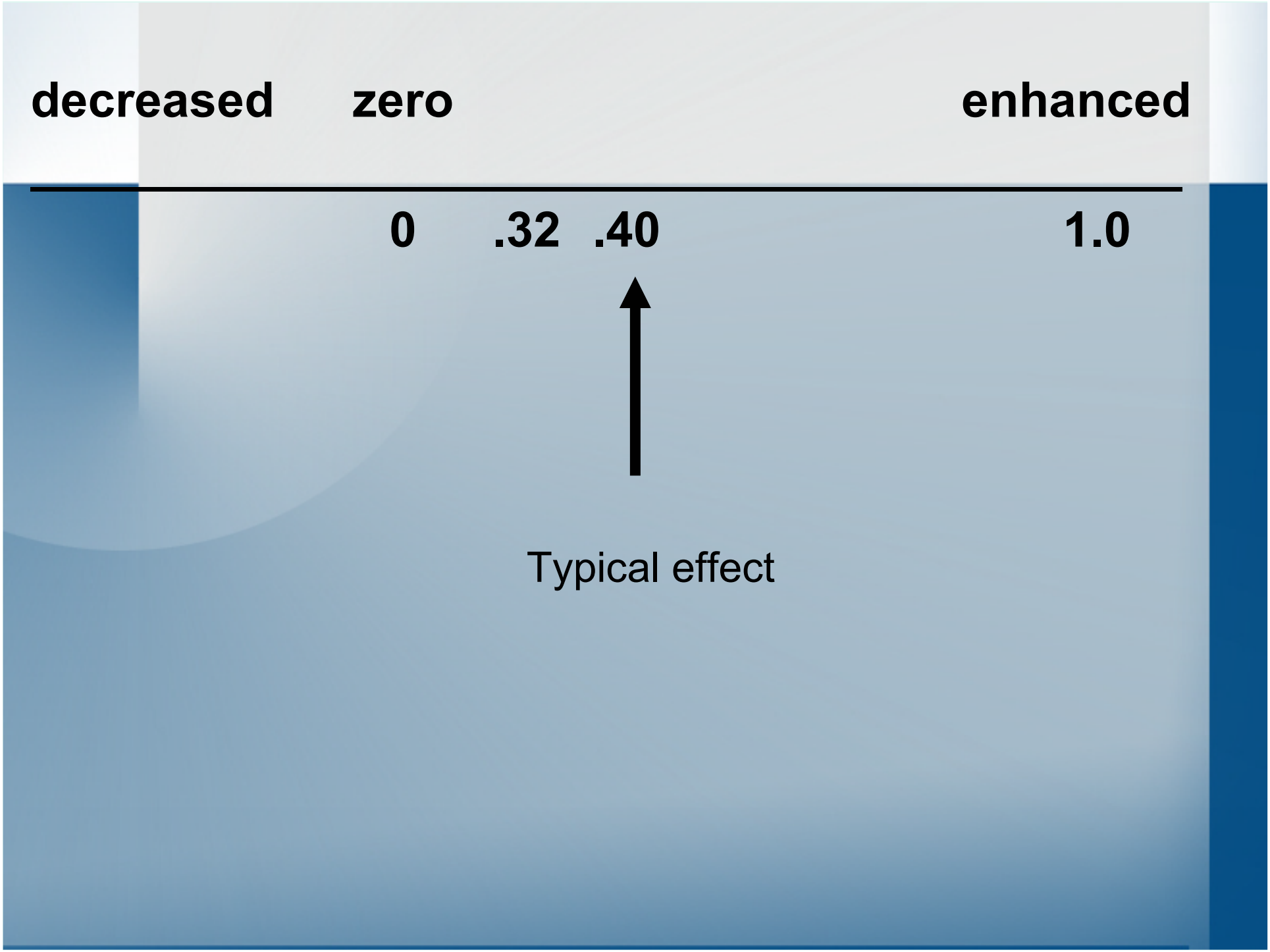
An effect-size of	*.32*	*1.0*
• advancing achievement	3 mo	1 yr
• % improving the rate of learning	15	45
• r variable & achievement	.15	.45
• % of students with treatment exceeding those not treated	62	84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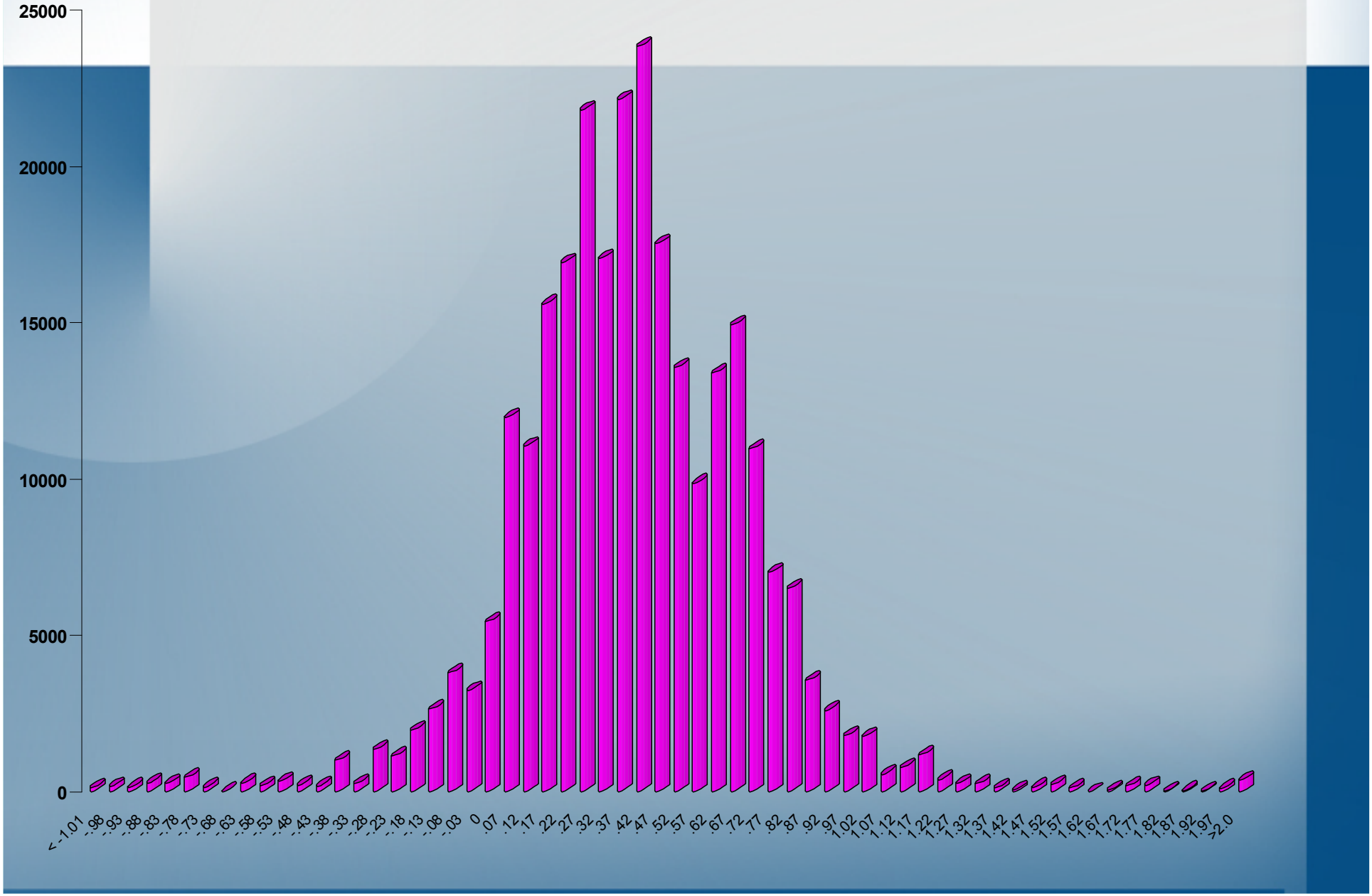
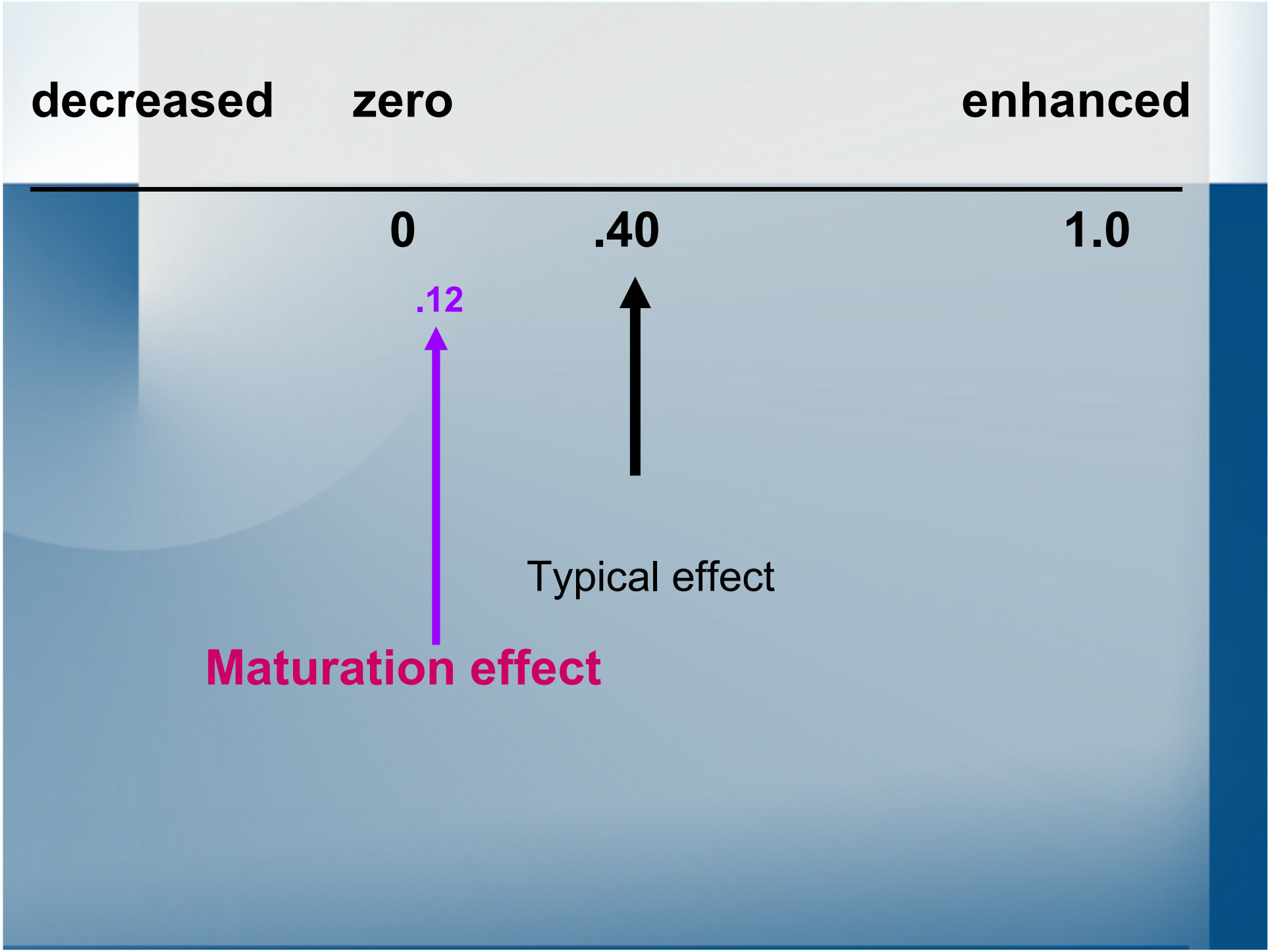
Typical effect

Distribution of effects

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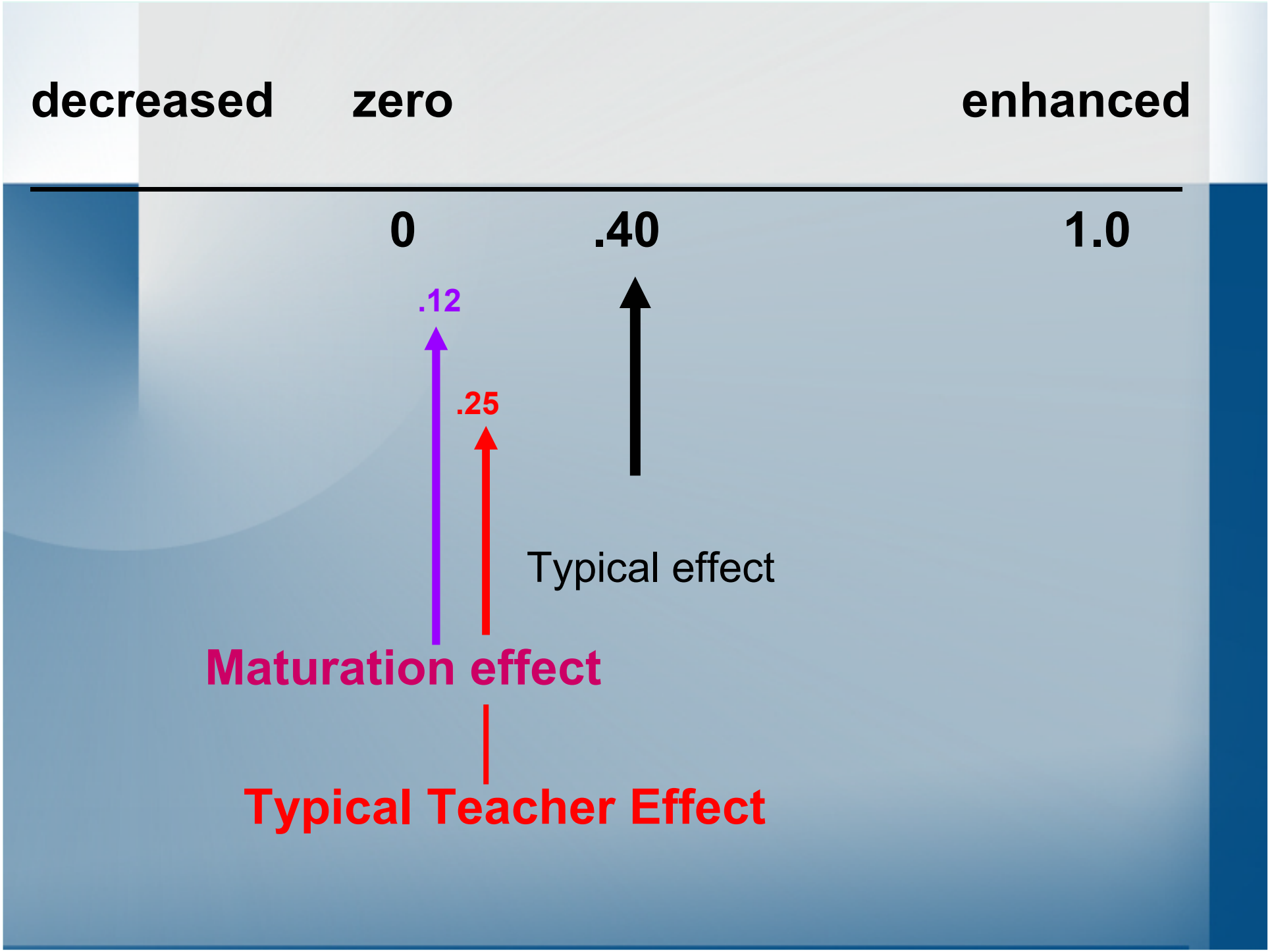
Typical effect
Maturation effect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Typical effect
Maturation effect
Typical Teacher Effect

Rank these 10

(from 1 = lowest effect to 10 = highest effect)

Feedback	13209
Classroom behavior	361
Cooperative learning	1153
Early intervention	30971
Competitive learning	144
Testing	1463
Questioning	493
Diet	255
Class size	2559
Retention (retain a year)	3636

Rank these 10

(from 1 = lowest effect to 10 = highest effect)

1	Feedback	13209	.81
2	Classroom behavior	361	.71
3	Cooperative learning	1153	.59
4	Early intervention	30971	.49
5	Competitive learning	144	.41
6	Testing	1463	.31
7	Questioning	493	.20
8	Diet	255	.12
9	Class size	2559	.05
10	Retention (retain a year)	3636	-.17

The disasters …

71	programmed instruction	801	.14
72	finances	1634	.14
73	problem based learning	41	.12
74	diet	255	.12
75	gender (female-male)	9020	.09
76	inductive teaching	570	.06
77	team teaching	41	.06
78	ability grouping	3355	.05
79	class size	2559	.05
80	open vs. traditional	3426	-.01
81	summer vacation	269	-.06
82	retention	3626	-.17
83	transfer of school	354	-.26
84	disruptive students	1511	-.78

The also rans …

56	metacognitive interventions	921	.29
57	math programs	3326	.27
58	audio-visual	2699	.26
59	gifted programs	47	.25
60	coaching	1076	.24
61	behavior objectives	157	.24
62	calculators	238	.24
63	mainstreaming	1641	.21
64	questioning	493	.20
65	learning hierarchies	168	.19
66	attitude to math	1122	.19
67	desegregation	1590	.18
68	play	129	.16
69	television	4337	.15

Almost there …

42	tutoring	136	.35
43	activity-based programs	674	.35
44	remedial programs	1438	.35
45	classroom climate	2726	.35
46	social skills training	5472	.35
47	time	1680	.34
48	CAI	18231	.32
49	inquiry based teaching	2740	.32
50	preschool	242	.32
51	whole language	198	.31
52	within class grouping	2359	.31
53	testing	1463	.31
54	problem solving	1141	.30
55	background	692	.30

In the middle …

29	parent involvement	2597	.46
30	bilingual programs	1501	.46
31	adjunct aids	659	.45
32	concept mapping	18	.45
33	advance organizers	2106	.44
34	hypermedia instruction	317	.44
35	socio economic status	1657	.44
36	perceptual-motor skills	7592	.42
37	individualised instruction	5948	.42
38	homework	568	.41
39	competitive learning	144	.41
40	simulations	972	.37
41	expectations	912	.36

Worth having …

14	self-assessment	152	.54
15	mastery learning	1933	.53
16	creativity programs	2340	.52
17	interactive video	1152	.52
18	psycho-linguistics	4404	.51
19	goals	959	.51
20	peer influence	366	.50
21	early intervention	30971	.49
22	outdoor education	294	.49
23	science	4124	.49
24	inservice ed	18644	.48
25	acceleration	371	.47
26	motivation	2196	.47

The MAJOR Influences …

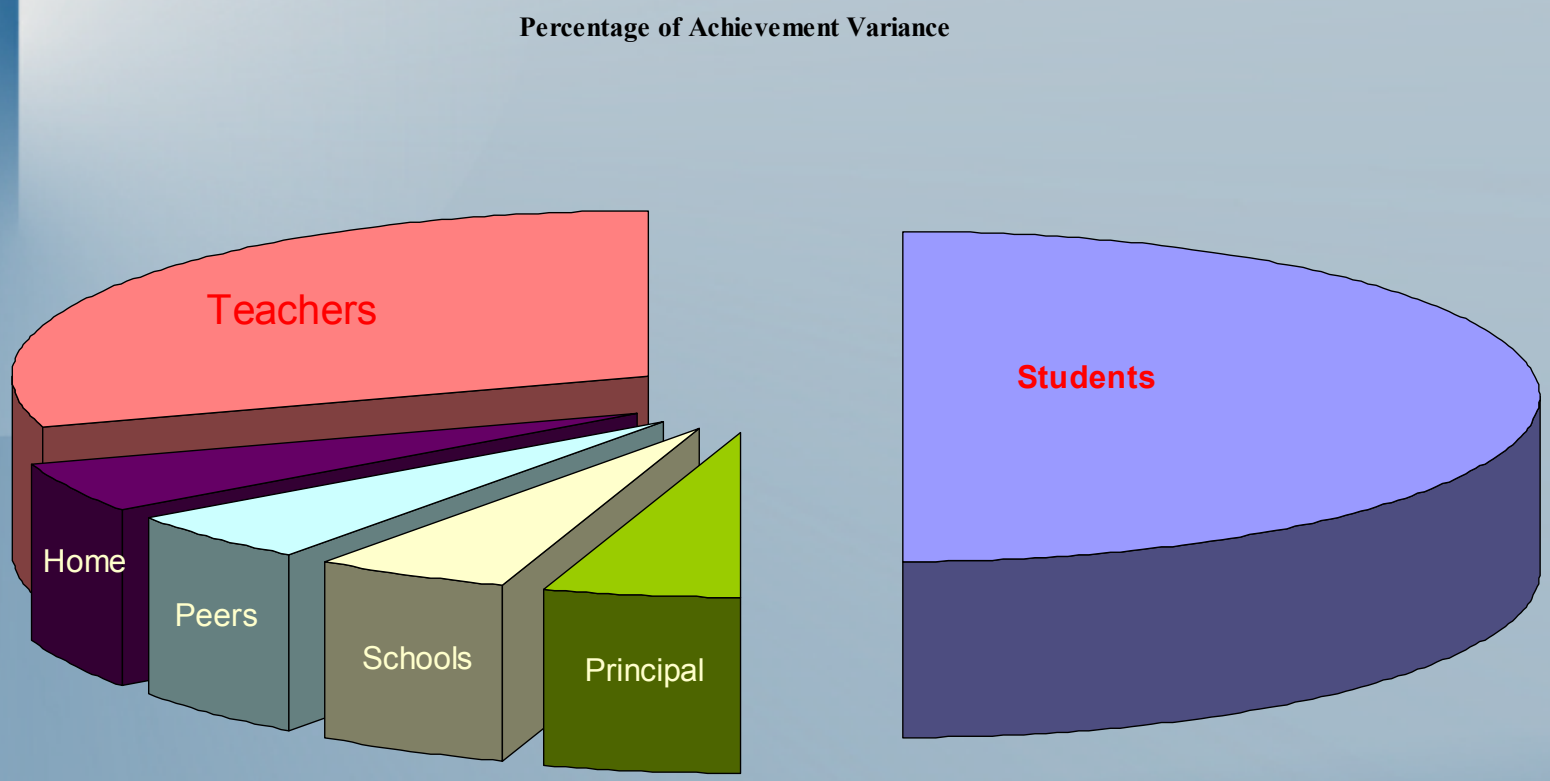
	Influence	No. effect	Mean
1	direct instruction	1925	.93
2	reciprocal teaching	52	.86
3	feedback	13209	.81
4	strategy training	7649	.80
5	classroom behaviour	361	.71
6	*prior achievement*	*2094*	*.71*
7	phonological awareness	2630	.70
8	home environment	25706	.69
9	Piagetian programs	786	.63
10	cooperative learning	1153	.59
11	reading	14945	.58
12	quality of teaching	808	.55
13	study skills	3224	.54

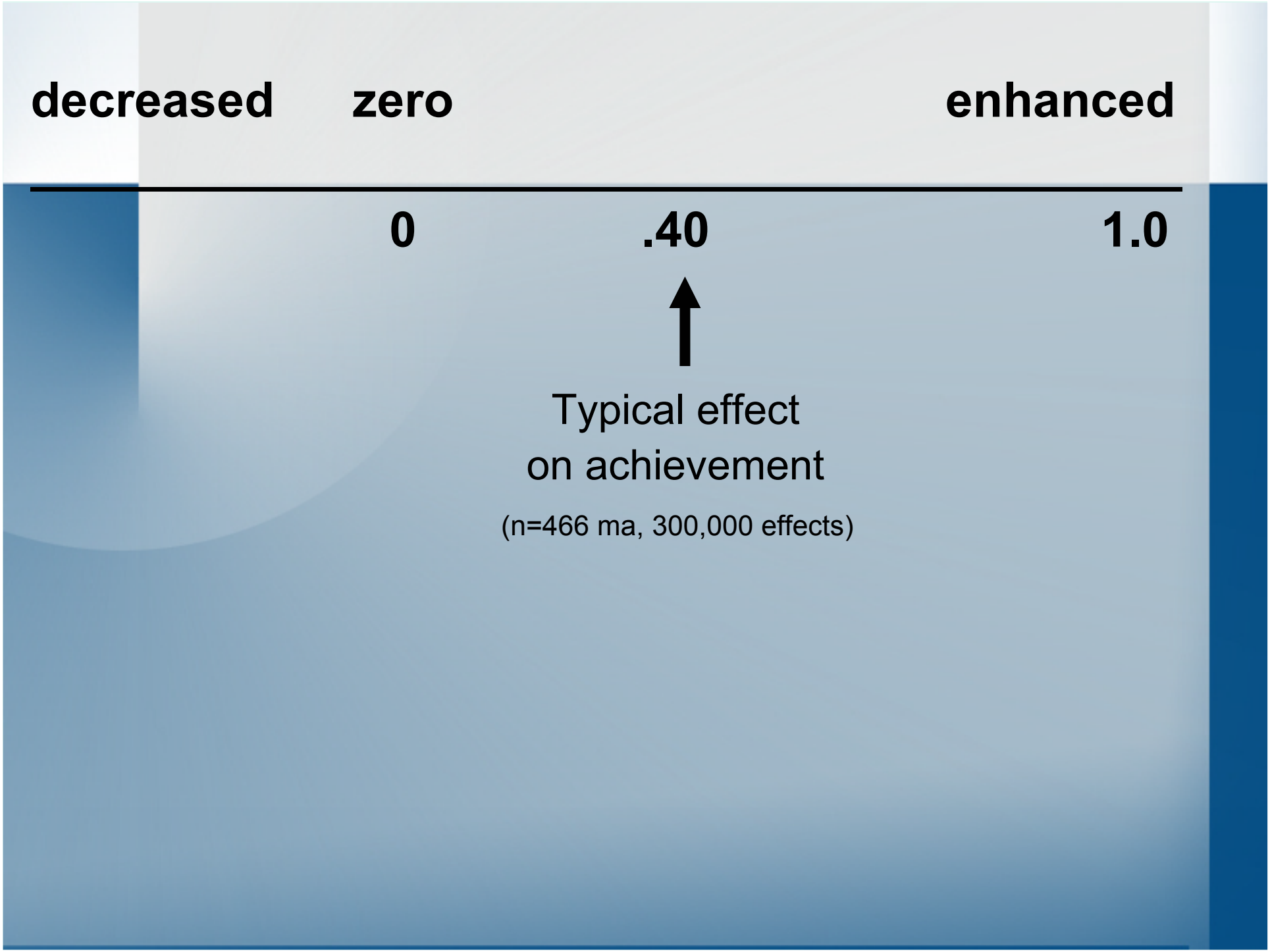
What causes change?

	Above	Below
Teacher	73%	66%
Climate	10%	2%
Learner	10%	9%
Home	8%	2%
Composition	0%	20%

Teacher
Teacher
Teacher
Teacher
Learner
Teacher
Teacher
Home
Teacher
Teacher
Teacher
Teacher
Teacher
Learner
Teacher
Teacher
Teacher
Teacher
Teacher
Learner

What matters?

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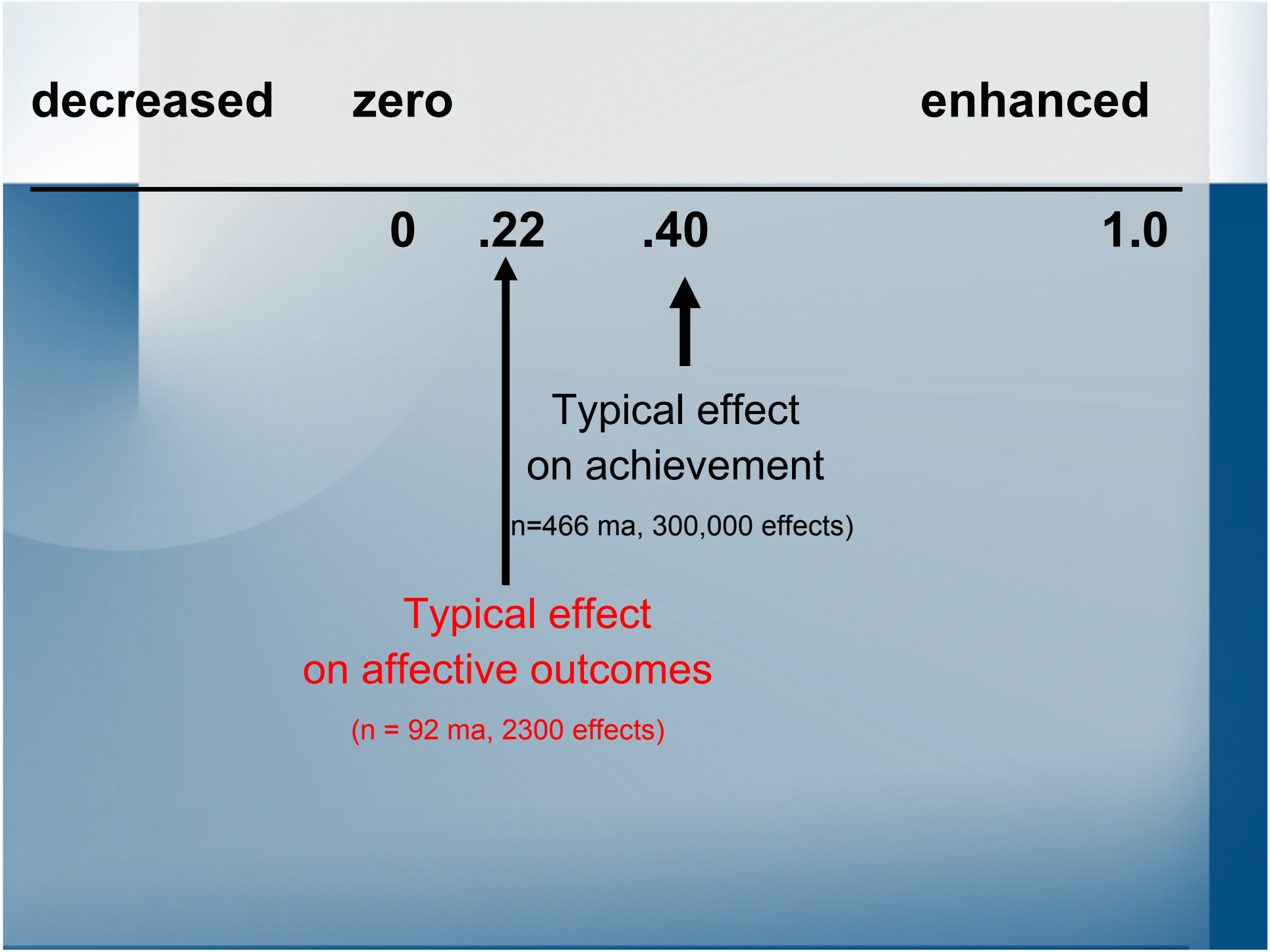
Typical effect
on achievement
(n=466 ma, 300,000 effects)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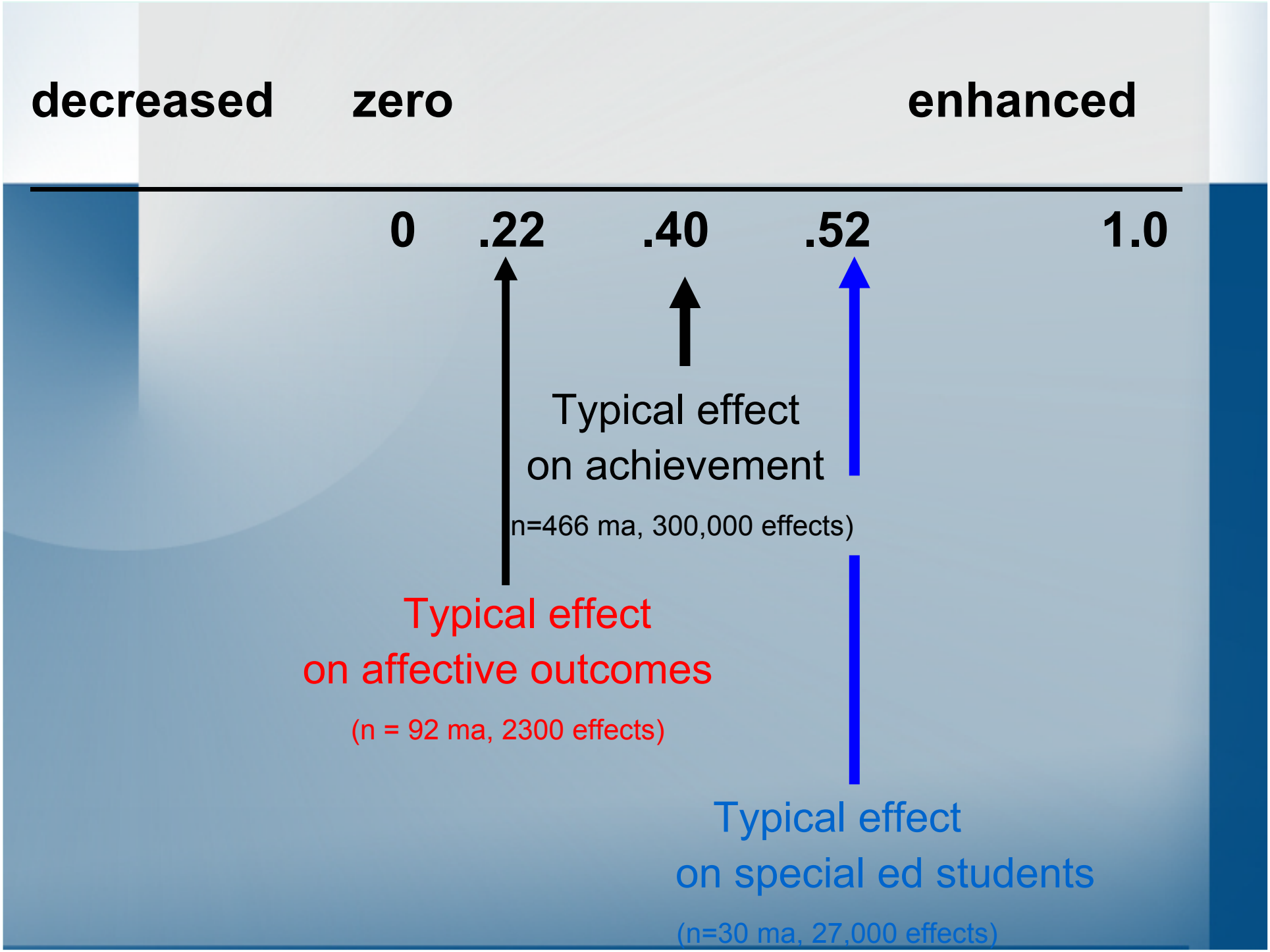
Typical effect
on achievement
n=466 ma, 300,000 effects)
Typical effect
on affective outcomes
(n = 92 ma, 2300 effects)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Typical effect
on achievement
n=466 ma, 300,000 effects)
Typical effect
on affective outcomes
(n = 92 ma, 2300 effects)
Typical effect
on special ed students
(n=30 ma, 27,000 effects)

Special Education

Area	No. ma	No. studies	Effect	se
Feedback	51	1095	1.24	.10
Piagetian	8	102	.93	.39
Direct instruction	10	100	.9	.07
Language intervention	19	508	.86	.10
Achievement	9	468	.62	.07
Tutee	17	134	.59	.07
Linguistics	55	4846	.55	.03
Social/behaviour	7	294	.55	.06
Tutor	18	274	.55	.08
CAI	13	136	.52	.09
Parents	9	427	.51	.07
Early id	71	8916	.50	.02
Cooperative	1	4	.48	.00
Drug	23	2952	.47	.06
Preschool	5	266	.45	.10
Attitude to disability	20	1866	.42	.04
College	15	235	.23	.02
Mainstreaming	35	1347	.21	.06
Diet	9	255	.16	.04
Brain-familial	19	678	.11	.01
Perceptual motor	25	2523	.09	.02

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