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Original Citation

Whitaker, Simon (2013) Defining Learning Disability: critique of current: can we measure low IQ? In: Definition in Context Furture Direction in Defining Learning Disability, 7th June 2013, London, UK. (Unpublished)

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Simon Whitaker

Defining Learning Disability: critique of current approaches

Can we measure low IQ?

BPS (2000)

“there are three core criteria for learning disability:

- Significant impairment of intellectual functioning;
- Significant impairment of adaptive/social functioning;
- Age of onset before adulthood.”

Page 4

BPS (2000)

“significant impairment of intellectual functioning has, by convention, become defined as a performance more than two standard deviations below the population mean……More than two standard deviations below the mean thus corresponds to an Intelligence Quotient (IQ) of 69 or less.”

Page 5.

There is an IQ cutoff point.

Can we measure IQ in the low range accurately enough to have a cutoff point?

95% confidence interval

If the degree of chance error is known then a 95% confidence interval (95% CI) can be calculated by:

$$95\%\ CI = 1.96 \times SD \times \sqrt{(1-r)}$$

SD is the standard deviation of the test and r is the reliability coefficient.

It is reported to be about 4-5 points for the

WISC-IV and WAIS-IV

Concerns about WISC and WAIS 95% confidence interval

- Chance error only.
- It is based on the performance of the standardization sample, who on the whole had average IQs so may not be representative of people with low IQs
- It is based on one source of error only per subtest, usually that due to a lack of internal consistency.

Sources of error in the measurement of IQ

Chance errors:

- Lack of internal consistency.
- Temporal error.
- Scorer error.

Systematic error:

- Flynn effect.
- Floor effect (low range only).
- Lack of consistency between tests.

Internal Consistency Error

Wechsler (2008) in the WAIS-IV manual. Given to 75 adults with mild ID and 35 with mod. The internal consistency was about .98 which gives a 95% confidence interval of about 4 points.

Temporal Error

The test re-test reliability check.

A meta-analysis

Whitaker (2008) A meta-analysis of the literature on the test re-test reliability of intelligence tests when applied to people with low intellectual ability (IQ<80).

The mean correlation between first and second test was 0.82.

This corresponds to a 95% confidence interval of 12.47 points.

It was also found that 14% of IQs change by 10 points or more.

Which is close to what a 95% confidence interval of 12.5 would predict.

Combining error

A measure of lack of internal consistency does not include temporal error.

A measure of temporal error does not include internal consistency but may include score error.

Error due to lack of internal consistency in low range is 1 - .98 (Wechsler 2008) = .02.

Error due to temporal changes is 1 - .82 (Whitaker 2008) = .18

Total chance error is .20.

Effective reliability is .80.

Effective 95% confidence interval for “true IQ” is 13 points.

Systematic error

The Floor effect

Floor effect 1:
Scaled score of 1 for low raw scores

WISC-IV Digit Span

Age group 16:00 to 16:30

Raw Score:	18	17	16	15	14	13	12	11	10	0-9
Scaled Score:	10	9	8	7	6	5	4	3	2	1

Age group 6:00 to 6:30

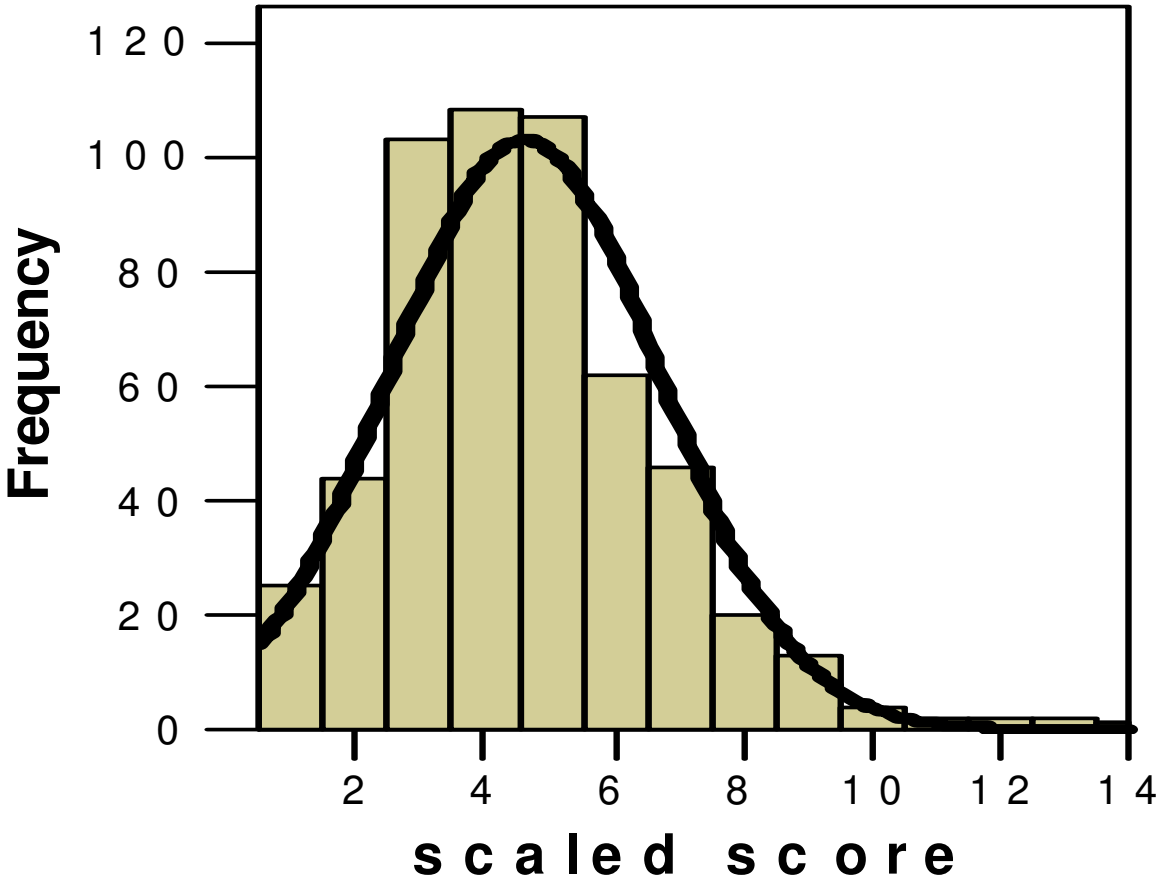
Raw Score:	11	10	8-9	7	6	5	-	4	3	0-2
Scaled Score:	10	9	8	7	6	5	4	3	2	1

Whitaker and Wood (2008)

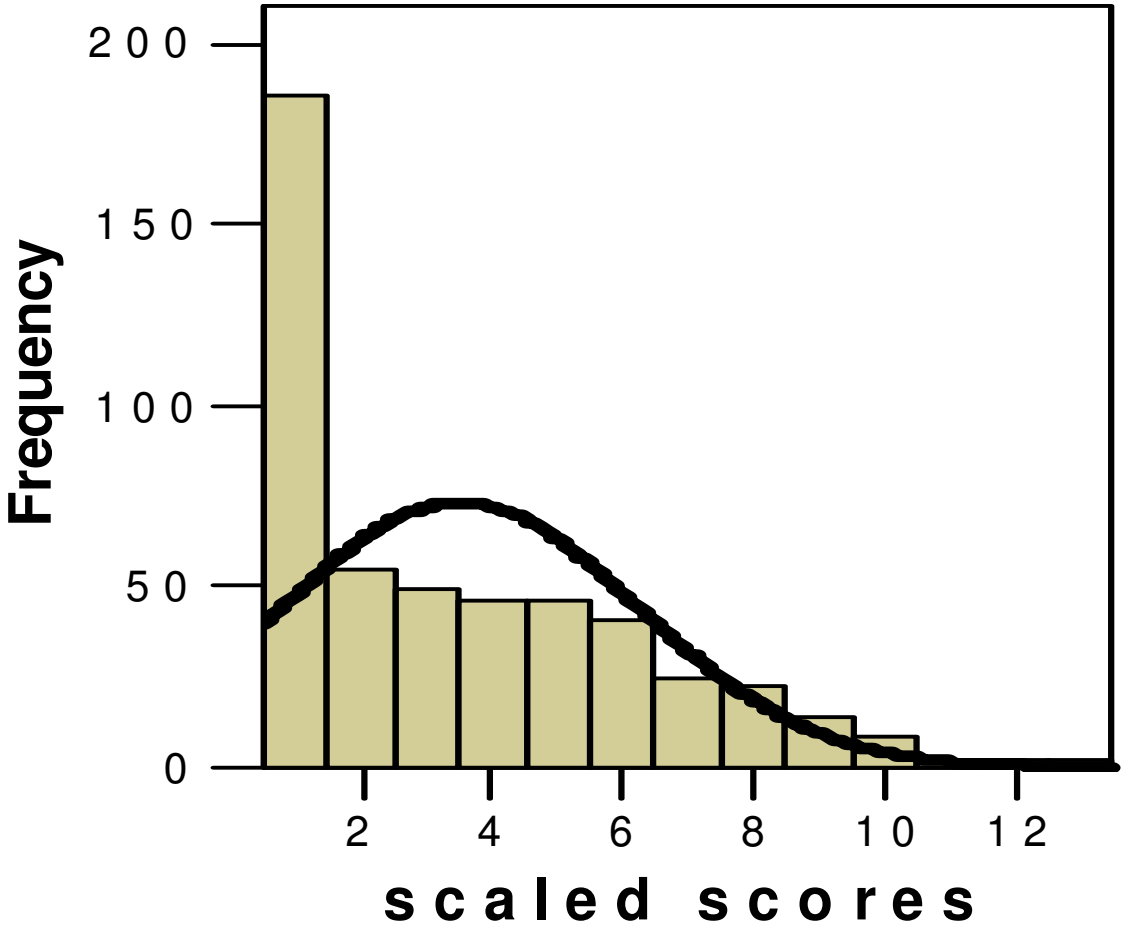
50 WISC-III: Mean FSIQ 58.04; SD 9.92

49 WAIS-III: Mean FSIQ 65.20; SD 7.03

Frequency of WAIS-III scaled scores



Frequency of WISC-III scaled scores



Criteria for 16 yr olds to get a Scaled Score 2 on WISC-III and WAIS-III

Coding

WISC-III	WAIS-III
raw score 39	raw score 14

Criteria for Scaled Score 2 on WISC-III and WAIS-III (16 year olds)

WISC –III Vocabulary	WAIS-III Vocabulary
Raw score 22 What does brave mean?	Raw score 4 Tell me what ship means.

Criteria for Scaled Score 2 on WISC-III and WAIS-III (16 year olds)

WISC –III Block Design	WAIS-III Block Design
Raw score 29 Completion of one 2-block model and six 4-block models gaining full bonus points for time on three of the models.	Raw score 3 Completion of two 2-block models, being given a second trial on one model when an error occurred on the first trial.

Criteria for Scaled Score 2 on WISC-III and WAIS-III

WISC –III Similarities	WAIS-III Similarities
Raw score 11 In what way are an elbow and knee alike?	Raw score 4 In what way are a dog and a lion alike?

Criteria for Scaled Score 2 on WISC-III and WAIS-III

WISC –III Arithmetic	WAIS-III Arithmetic
Raw score 13 Jim had 8 crayons and he bought 6 more. How many crayons did he have altogether?	Raw score 4 If you have 3 books and give one away, how many do you have left?

Lack of agreement between tests

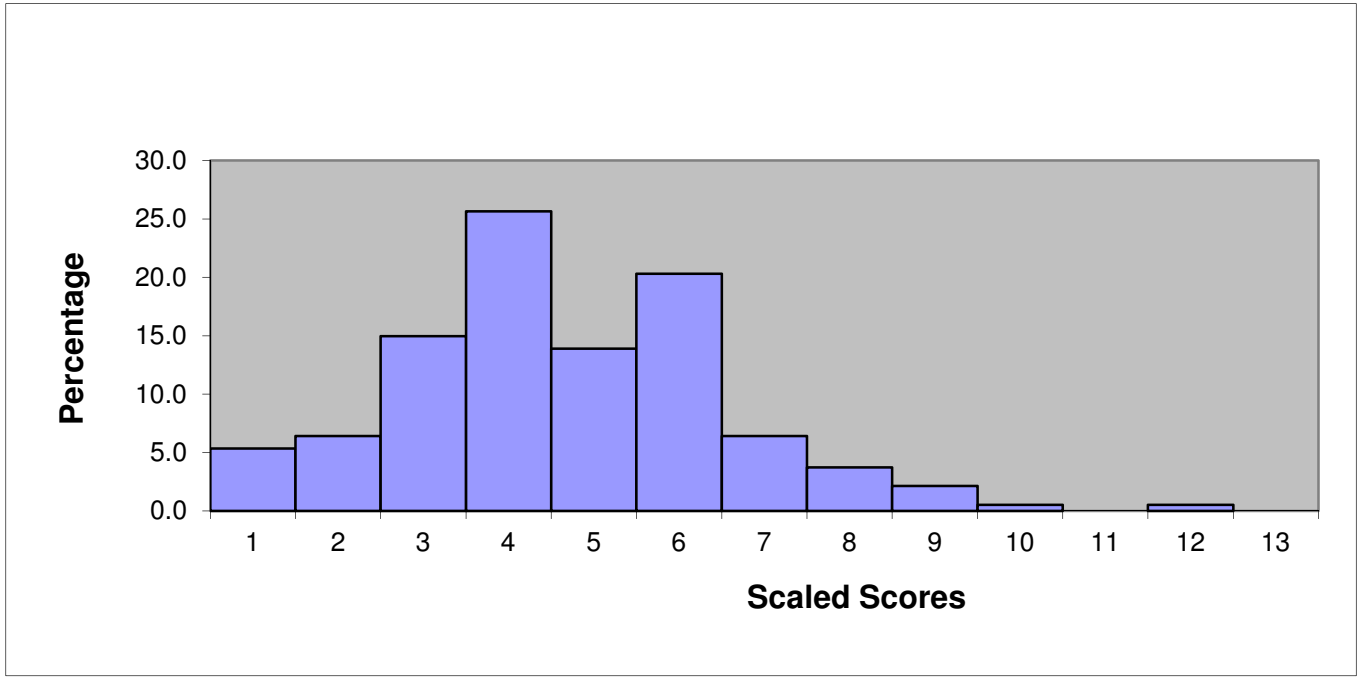
We (Gordon et al 2010) compared the WISC-IV and the WAIS-III in an empirical study on seventeen 16-year-olds in special education.

Results

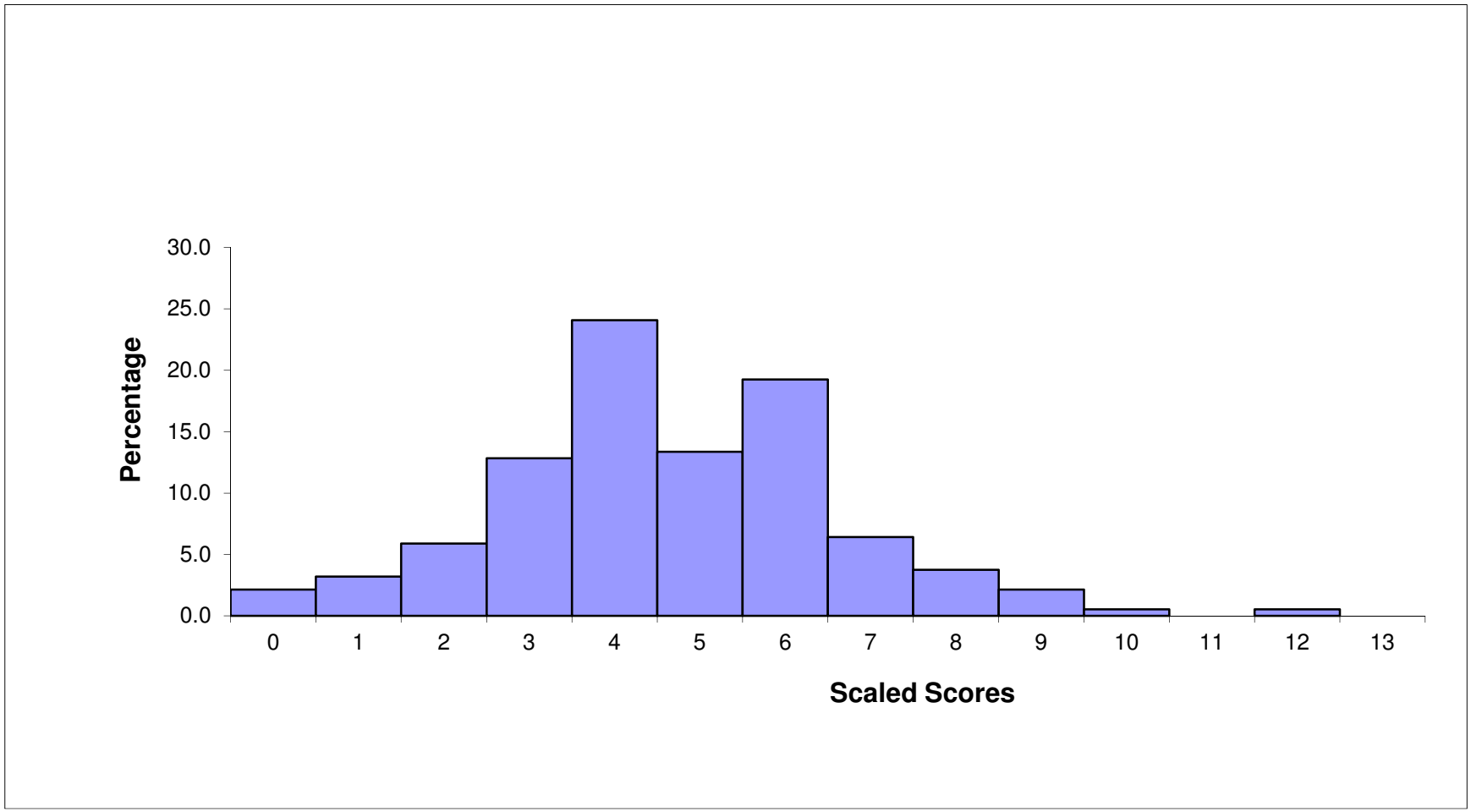
	WISC-IV	WAIS-III	dif	r
FS IQ	53.00	64.82	11.82	.93

The Floor effect II

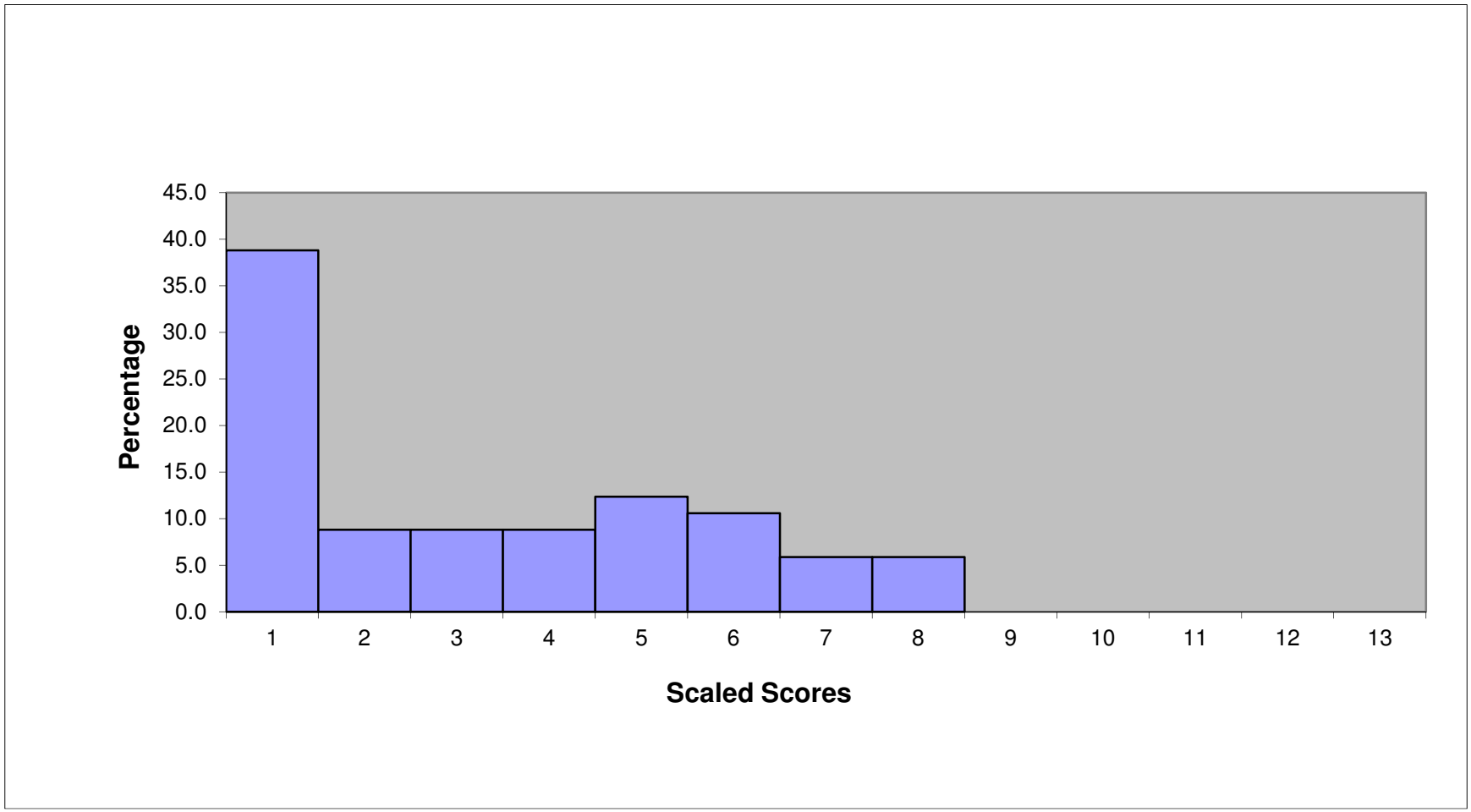
Distribution of Scaled Scores WAIS-III



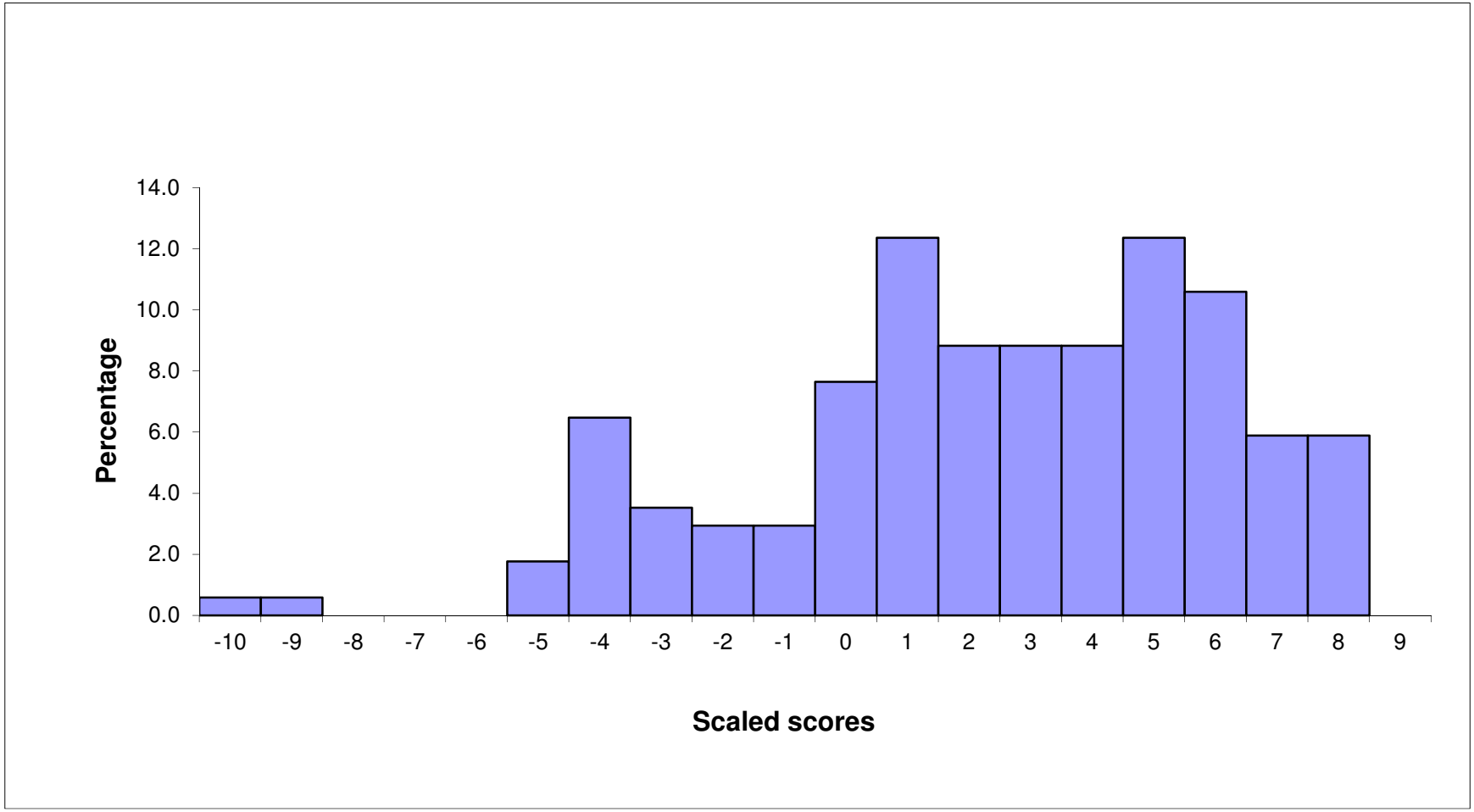
Distribution of Scaled Scores corrected for Floor Effect (WAIS-III)



Distribution of Scaled Scores (WISC-IV)



Distribution of Scaled Scores Corrected for Floor Effect (WISC-IV)



WISC-IV

	Subjects	Uncorrected	Corrected	Difference in
		WISC FS IQ	WISC FS IQ	FS IQs
	1	41	25	16
	2	58	56	2
	3	57	54	3
	4	40	13	27
	5	54	54	0
	6	60	60	0
	7	55	54	1
	8	40	26	14
	9	72	72	0
	10	60	60	0
	11	58	58	0
	12	52	52	0
	13	40	25	15
	14	40	9	31
	15	48	42	6
	16	58	58	0
	17	68	68	0
Mean		**53.0**	**46.0**	

The Flynn Effect

The intellectual ability of the population as a whole is increasing at a rate of about 3 points a decade or 0.3 of a point per year.

Change in low IQ over the years

Flynn (1985) found that the gains appeared to be higher at the low levels: .396 per year for IQs 55 to 70 as compared to .272 per year for IQs in the range 125-140.

Recent Evidence

Teasdale and Owen (2005) looked at Danish military data, up to 2004, and found that there was a peak in average intellectual ability in 1998, followed by a decline until 2004.

Also after 1995 there was an increased number of people scoring at the lower end of the tests, showing a decline in the intellectual ability for people with lower IQ.

There is therefore evidence that in Scandinavia for people with low IQs the Flynn effect may have gone into reverse.

So what is happening in the UK?

True confidence intervals

When all the various sources of error are taken into account the level of accuracy is different for the WISC-IV and the WAIS-III when used to measure low IQ.

WISC-IV

There is a chance error of 13 points, to which must be added three points due to the uncertainty as to the Flynn Effect.

It may also measure 10 points too low due to other systematic errors demonstrated by the difference with WAIS-III.

Also it may measure one or two points too high due to the floor effect.

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If these sources of error are added together then the effective confidence interval extends 24 points above the measured IQ and 16 points below.

WAIS-III

There is a chance error of 13 points, to which must be added four points due to uncertainty as to the degree of the Flynn Effect.

It may also measure 10 points too high due other systematic error demonstrated by difference with WISC-IV.

Also it may measure one point too high due to the floor effect.

If these sources of error are added together then the effective confidence interval extents 17 points above the measured IQ and 28 points below.

I do not believe that as the tests are at the moment they are sufficiently accurate for a definition of ID to specify a cut off point.