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ISRAELI MILITARY IQ TESTS: GENDER DIFFERENCES SMALL; IQ GAINS LARGE

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From 1971 to 1984, the Israeli Defence Forces administered two tests unaltered that qualify as IQ tests. These were the Matrices and the Instructions tests. The former is an adaptation of Raven's Progressive Matrices, similar to the original in that there are clusters with progressive difficulty and an escalation of difficulty throughout the test. The raw score range is from 4 to 35. The Instructions test is adapted from the old US Army Alpha Instructions Test and is described as an Otis-type verbal test. It includes 21 open-ended instructions. Typical items: write the last letter of the word which is the opposite of black; write the third letter of the largest word among the following four words; find the word beginning and ending with the same letter and write that letter. There are similar questions using numbers rather than letters. Both tests are timed, and most subjects do not complete either. There is no penalty for wrong answers (Col. Moshe Even-Chen, personal communication, 14 March 1990; Gal, 1986, pp. 79 and 95; Judy Goldenberg, personal communications, 4 March 1991 and 25 April 1993).

The groups tested were Jewish males, Druze males and Jewish females. They took the tests at age 17 and a half, and during 1971 to 1984 virtually all males physically present in Israel at that age were tested. The numbers are classified, but the 17-year-old male cohorts ran at about 28,000 per year and of these 98% were Jewish and 2% were Druze. The universality of male testing is signalled by the fact that 92% of the male cohort were actually called to active duty, and some of those not called were abroad. The major exceptions to testing were the institutionalized (virtually nil), the terminally ill, the crippled, and those eliminated by medical screening. The latter eliminated only a few, so even those moderately disabled or with severe psychological problems went on to take the mental tests (Gal, 1986, pp. 32 and 76–78; Judy Goldenberg, personal communications, 4 March 1991 and 25 April 1993; Ari Paltiel, personal communications, 5 June 1997, 12 June 1997, 16 June 1997 and 2 September 1997).

The 17-year-old cohorts of Jewish females ran at about 26,000 per year. The Israeli Defence Forces have provided percentages which represent the number of females tested divided by the number of males tested. During 1971 to 1984, these average at 73 to 74%, although when adjusted for the smaller female cohorts, they average at 79 to 80%. Unlike males, females escaped mental testing if they were married at age 17 and a half, or if their religious beliefs forbad them from leaving their father's care until they married and passed on to their husband's care. Of the 20% (putting males at 100%) who escaped testing, about a fifth (4%) were married and about four-fifths (16%) were exempted on religious grounds. Both groups were primarily, although not entirely,

from highly-Orthodox homes of Eastern European origin (Judy Goldenberg, personal communication, 25 April 1993 and 18 September 1994; Ari Paltiel, personal communications, as cited above, plus 1 September 1997 and 7 September 1997).

The period from 1971 to 1984 is dictated by a variety of considerations. Computerized records began in 1970, but the data recorded for that year are clearly incomplete; 1984 was the last year in which all those assessed took the Matrices. Data for the year 1980 are missing. As for test protocol during this period, subjects first took the Matrices, then took a Hebrew language test, and those who passed went on to take the Instructions test (Judy Goldenberg, personal communications, 4 March 1991, 18 September 1994 and 5 February 1995).

Table 1a presents the Matrices data, that is the raw scores, year by year, for the means and SDs of both females and males. It also reports the percentages tested for females, and then adjusts these, using multipliers to compensate for the fact that the female 17-year-old cohorts were smaller than the male. The ratios of Jewish males to females ran at about 1·05 to one, but thanks to the Druze among the male cohorts, the multipliers average about 1·07 to one. These data were obtained directly from the Central Bureau of Statistics (see Paltiel citations above) because the published data inflate the number of males for certain years. The best way to interpret the adjusted percentages is this: at 100%, females tested would match males tested as a proportion of the relevant 17-year-old cohort. Even the adjusted percentages fall short of this ideal, the highest standing at 91·55%.

Therefore, to get a projection of female IQ at 100%, Table 1b attempts to find a relationship between female IQ and the adjusted percentage of females tested. For reasons to be explained later, the years 1976 to 1984 have been selected for greater emphasis than the whole period of 1971 to 1984. The method of determining the relationship is exemplified in Table 1b, but its logic is this. Derive an average female mean IQ for the 8 years from 1976 to 1984 taken together (recall that data for 1980 are missing). This gives a female IQ of 100·968, with the male mean and SD set at 100 and 15, respectively (see calculations in Table 1b). Obtain the average female percentage for those 8 years, which is 79·45%. Then see if female IQ rises as you go to lower percentages, simply by deducting the high percentage years starting with the highest; and see if female IQ drops as you go to higher percentages, by deducting the low percentage years starting with the lowest. Table 1a gives each year a rank in terms of the adjusted percentage of females, designating the highest year as 1.

Table 1b lists the results. For the years 1976 to 1984, female IQ on the Matrices stands at 101·426 for 75·28% and steadily falls to 99·681 for 91·55%. Table 2a and Table 2b give exactly the same information and analysis for the Instructions test data. For 1976 to 1984, female IQ on this Verbal test stands at 103·330 for 80·77% and falls to 101·372 for 96·93%.

The relationships that emerge generate the projections presented in Figs 1 and 2. Figure 1 shows the relationship for the Matrices between female IQ and the percentage of females tested: it is so close to linear as to be quite extraordinary. The best-fit equation is not only linear, but also gives IQ values that match real values almost exactly. The differences range from nil to a maximum of 0·065 IQ points, the average being two-hundredths of a point. The projection bridges the gap between the last percentage of 91·55 and 100%, giving an estimate of 98·8 as female mean IQ.

However, our critical faculties must not be dazzled by the Pythagorean beauty of

Table 1a. Matrices test: gender data by year

Year	Females		Males							Rank[d]	
	Mean	SD	Mean	SD	% F[a]		Cohort M ÷ F[b]		Adjusted % F[c]	76–84	71–84
1971	20·270	4·935	20·156	5·239	70	(×)	1·065	(=)	74·55	—	9
1972	20·097	4·903	20·286	5·288	81	(×)	1·066	(=)	86·35	—	2
1973	20·603	4·904	20·470	5·284	74	(×)	1·067	(=)	78·96	—	6
1974	20·554	4·953	20·695	5·219	68	(×)	1·068	(=)	72·62	—	12
1975	20·090	4·791	20·778	5·336	68	(×)	1·069	(=)	72·69	—	11
1976	21·195	4·888	21·009	5·251	76	(×)	1·072	(=)	81·47	4	5
1977	21·271	4·943	21·134	5·183	78	(×)	1·071	(=)	83·54	3	4
1978	21·341	4·794	21·448	5·169	85	(×)	1·077	(=)	91·55	1	1
1979	21·872	4·631	21·696	5·068	78	(×)	1·078	(=)	84·08	2	3
1980	—	—	—	—	—		—		—	—	—
1981	22·462	4·427	21·804	5·019	66	(×)	1·077	(=)	71·08	8	13
1982	22·768	4·296	22·179	4·905	70	(×)	1·082	(=)	75·74	5	7
1983	22·949	4·237	22·413	4·821	69	(×)	1·081	(=)	74·59	6	8
1984	23·110	4·207	22·689	4·819	68	(×)	1·081	(=)	73·51	7	10
1971–1984											
Totals	278·582	60·909	276·757	66·601	951·00		13·954		1020·73		
Av.	21·429	4·685	21·289	5·123	73·15		1·073		78·52		
1976–1984											
Totals	176·968	36·423	174·372	40·235	590·00		8·619		635·56		
Av.	22·121	4·553	21·797	5·029	73·75		1·077		79·45		

[a]Number of females tested ÷ number of males tested = percentage of females tested.
[b]17-year-old males ÷ 17-year-old females.
[c]Percentage females tested × cohort ratios = adjusted percentage of females tested.
[d]Ranked by adjusted percentage of females tested. Highest percentage = 1.

Table 1b. Matrices test: derivation of female IQs for adjusted percentage of females tested

1976–1984			1971–1984		
Years used (by rank)	Av. % F	Av. IQ	Years used (by rank)	Av. % F	Av. IQ
4–8	75·28	101·426	5–13	75·02	100·588
3–8	76·66	101·256	4–13	75·88	100·569
2–8	77·72	101·152	3–13	76·62	100·565
1–8	79·45	100·968	2–13	77·43	100·471
1–7	80·64	100·826	1–13	78·52	100·411
1–6	81·83	100·754	1–12	79·14	100·285
1–5	83·28	100·585	1–11	79·73	100·348
1–4	85·16	100·292	1–10	80·43	100·584
1–3	86·34	100·205	1–9	81·20	100·512
1–2	87·82	100·103	1–8	82·04	100·535
1	91·55	99·681*	1–7	83·10	100·387
			1–6	84·33	100·164
			1–5	85·40	100·119
			1–4	86·38	100·012
			1–3	87·33	99·883
			1–2	88·95	99·567
			1	91·55	99·687*

*IQ values will differ slightly between 1976–1984 and 1971–1984 because the Av. male SDs differ: 5·029 for the former, 5·123 for the latter.

Method same for both 1976–1984 and 1971–1984, but using former to illustrate. First, use all years (see 1–8 above) and get averages (Av.) from totals. (1) 176·968 (female mean) − 174·372 (male mean) = 2·596; ÷ 8 (years) = 0·3245; ÷ 5·029 (Av. male SD) = 0·0645257; × 15 (IQ SD) = 0·968 (IQ points); + 100 = **100·968**, as 'Av. IQ'. (2) 635·56 (adjusted % F) ÷ 8 (years) = **79·45**, as 'Av. % F'. To move up to lower percentages, deduct the highest ranked years progressively. For example: 2–8 omits 1 (the highest year), 3–8 omits 1 and 2 (the two highest years) and so forth. To move down to higher percentages, deduct the lowest ranked years progressively. All of the values used are contained in Table 1a.

it all. Let us dissect the female population as follows. Use the average percentage tested to distinguish those 'usually tested', the percentiles nil to 79·45, from those 'not usually tested', the percentiles 79·45 to 100. Recall that those not usually tested are predominantly from Orthodox homes of Eastern European origin, and they are known to have a lower IQ profile than the rest of the Jewish population (Judy Goldenberg, personal communication, 25 April 1993). Should there not be a large IQ gap between the usually tested and the usually not tested? In reply, that is exactly what the

Table 2a. Instructions test: gender data by year

Year	Females		Males				Cohort		Adjusted	Rank[d]	
	Mean	SD	Mean	SD	% F[a]		M ÷ F[b]		% F[c]	76–84	71–84
1971	12·781	4·218	12·042	4·777	87	(×)	1·065	(=)	92·66	—	2
1972	12·367	4·207	11·890	4·883	79	(×)	1·066	(=)	84·21	—	7
1973	12·719	4·151	11·894	4·913	73	(×)	1·067	(=)	77·89	—	12
1974	12·447	4·203	11·875	4·820	74	(×)	1·068	(=)	79·03	—	9
1975	12·856	4·010	11·789	4·989	81	(×)	1·069	(=)	86·59	—	6
1976	12·748	4·141	11·966	4·807	86	(×)	1·072	(=)	92·19	2	3
1977	12·723	4·160	12·015	4·686	86	(×)	1·071	(=)	92·11	3	4
1978	12·706	4·048	12·283	4·669	90	(×)	1·077	(=)	96·93	1	1
1979	13·147	3·976	12·496	4·576	81	(×)	1·078	(=)	87·32	4	5
1980	—	—	—	—	—		—		—	—	—
1981	13·597	3·825	12·393	4·653	73	(×)	1·077	(=)	78·62	7	11
1982	13·756	3·741	12·600	4·634	75	(×)	1·082	(=)	81·15	5	8
1983	13·861	3·713	12·720	4·534	72	(×)	1·081	(=)	77·83	8	13
1984	13·953	3·652	12·973	4·430	73	(×)	1·081	(=)	78·91	6	10
1971–1984											
Totals	169·661	52·045	158·936	61·371	1030·00		13·954		1105·44		
Av.	13·051	4·003	12·226	4·721	79·23		1·073		85·03		
1976–1984											
Totals	106·491	31·256	99·446	36·989	636·00		8·619		685·06		
Av.	13·311	3·907	12·431	4·624	79·50		1·077		85·63		

[a]Number of females tested ÷ number of males tested = percentage of females tested.
[b]17-year-old males ÷ 17-year-old females.
[c]Percentage females tested × cohort ratios = adjusted percentage of females tested.
[d]Ranked by adjusted percentage of females tested. Highest percentage = 1.

Table 2b. Instructions test: derivation of female IQs for adjusted percentage of females tested

1976–1984			1971–1984		
Years used (by rank)	Av. % F	Av. IQ	Years used (by rank)	Av. % F	Av. IQ
4–8	80·77	103·330	5–13	81·28	102·447
3–8	82·66	103·157	4–13	82·37	102·427
2–8	84·02	103·069	3–13	83·26	102·433
1–8	85·63	102·857	2–13	84·04	102·426
1–7	86·75	102·736	1–13	85·03	102·621
1–6	88·10	102·541	1–12	85·63	102·538
1–5	89·94	102·413	1–11	86·34	102·530
1–4	92·14	102·079	1–10	87·11	102·400
1–3	93·74	102·069	1–9	88·02	102·321
1–2	94·56	101·954	1–8	89·15	102·384
1	96·93	101·372*	1–7	90·29	102·200
			1–6	91·30	102·314
			1–5	92·24	102·099
			1–4	93·47	102·107
			1–3	93·93	102·059
			1–2	94·80	101·846
			1	96·93	101·344*

*IQ values will differ slightly between 1976–1984 and 1971–1984 because the Av. male SDs differ: 4·624 for the former, 4·721 for the latter.

Method same for both 1976–1984 and 1971–1984, but using former to illustrate. First, use all years (see 1–8 above) and get averages (Av.) from totals. (1) 106·491 (female mean) − 99·446 (male mean) = 7·045; ÷ 8 (years) = 0·880625; ÷ 4·624 (Av. male SD) = 0·1904465; × 15 (IQ SD) = 2·857 (IQ points); + 100 = **102·857**, as 'Av. IQ'. (2) 685·06 (adjusted % F) ÷ 8 (years) = **85·63**, as 'Av. % F'. To move up to lower percentages, or down to higher percentages, see the section on Method in Table 1b. All of the values used are contained in Table 2a.

projection shows. The exact projected IQ at 100% is 98·767; the equation value for nil to 79·45% is 100·968; this gives those from 79·45 to 100% a mean IQ of 90·258. The IQ gap between the usually tested and the usually not tested is a robust 10·7 points (100·968 − 90·258).

Let us do a further dissection, splitting the not usually tested into two groups. Use the highest percentage tested in any year (1978) to distinguish the 'sometimes tested', percentiles 79·45 to 91·55, from those 'never tested', percentiles 91·55 to 100. Should not the tail, the never tested, show an even greater IQ deficit? In reply, the linear relationship of Fig. 1 does not imply constancy of IQ from one percentile to another. Rather, for any population, a *linear* drop in the mean score as the percentage included

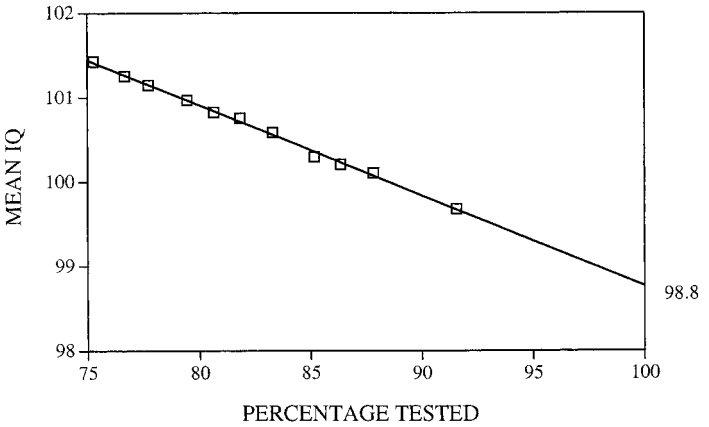

Fig. 1. Matrices test 1976 to 1984. Data show linear relationship (best-fit equation: $y = -0{\cdot}107145x + 109{\cdot}481$) between female IQ and percentage of females tested. Female mean of 98·8 projected at 100% (100% connotes females tested match males tested as a proportion of cohort of 17 year olds).

rises, entails an *escalating* drop among the percentage excluded as that percentage falls. More calculatons. The exact equation IQs for 100% and nil to 91·55% are 98·767 and 99·672; these values give those from 91·55 to 100% a mean IQ of 88·962. With that value, the mean of those from 79·45 to 91·55% can be obtained, which is 91·162. So now the required dissection is achieved, between the sometimes tested and the never tested. The IQ gap between the former, percentiles 79·45 to 91·55, and the latter, percentiles 91·55 to 100, is 2·2 IQ points (91·162 − 88·962). The tail, the last 8·45%, does show an even greater deficit.

I consider the Matrices projection vindicated, and its estimate of 98·8 for female IQ reliable. However, let us abandon projections for something more conservative: an algebraic estimate based on actual values and a limiting assumption. Take the actual values from 1978, the year in which the female percentage was 91·55 and female IQ was measured at 99·681. Let us put the last 8·45% at as low a value as seems plausible. A mean IQ of 86 qualifies: it is 3 points below the equation estimate; it puts this last 8 + % of the population fully 5 points below the preceding 12%; it puts them a full SD below the usually tested (100·968 − 86 = 14·968 IQ points); as we shall see, it matches the IQ of the last 3% of the Instructions test population. The algebra runs as follows: 91·55 (99·681) + 8·45 (86) = 100 (98·525). I will call this estimate of female IQ on the Matrices at 98·5 my 'conservative estimate'.

Figure 2 shows the relationship for the Instructions test between female IQ and percentage of females tested. The best-fit equation is quadratic but as the eye can see, the deviation from the linear is slight. The fit between equation IQs and real values is good, the differences ranging from 0·002 to 0·131 IQ points, the average being six-hundredths of a point. The relationship is almost as impressive as the Matrices, if the filter is taken into account: that subjects had to pass the Hebrew test to go from the Matrices to the Instructions test. The projection bridges the gap between the last percentage of 96·93 and 100%, giving an estimate of 101·0 as female mean IQ.

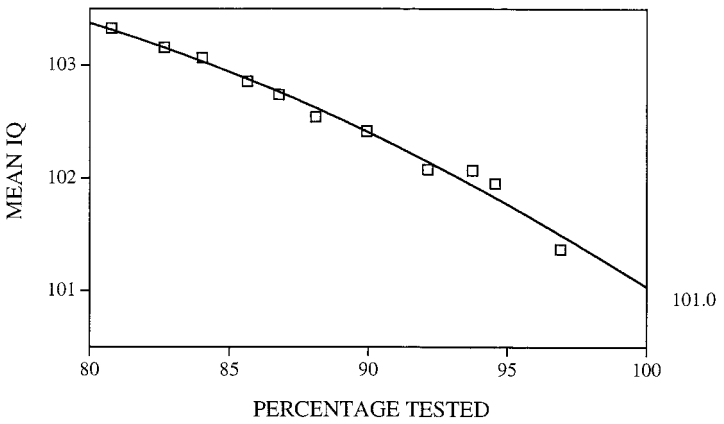

Fig. 2. Instructions test 1976 to 1984. Data show near-linear relationship (best-fit equation: $y = -0{\cdot}001993x^2 + 0{\cdot}2417x + 96{\cdot}793$) between female IQ and percentage of females tested. Female mean of 101·0 projected at 100% (100% connotes females tested match males tested as a proportion of cohort of 17 year olds).

The same dissection is now performed as for the Matrices. The average percentage tested splits the female population into the 'usually tested', percentiles nil to 85·63, and the 'usually not tested', percentiles 85·63 to 100. The exact projected IQ at 100% is 101·033; the equation value for nil to 85·63% is 102·876; this gives those from 85·63 to 100% a mean IQ of 90·051. The IQ gap between the usually tested and the usually not tested is 12·8 points (102·876 − 90·051). The highest percentage tested in any year (1978) splits the usually not tested into the 'sometimes tested', percentiles 85·63 to 96·93, and the 'never tested', percentiles 96·93 to 100. The exact equation IQs for 100% and nil to 96·93% are 101·033 and 101·496; these values give those from 96·93 to 100% a mean IQ of 86·415. With that value, the mean of those from 85·63 to 96·93% can be obtained, which is 91·039. Therefore, the IQ gap between the sometimes tested, percentiles 85·63 to 96·93, and the never tested, percentiles 96·93 to 100, is 4·6 IQ points (91·039 − 86·415). This gap is about double the corresponding gap for the Matrices, which makes sense: the tail here is only 3·07% as compared with 8·45% for the Matrices, so a larger IQ deficit would be expected.

I consider the Instructions projection of 101·0 for female mean IQ to be reliable. But once again, it will be supplemented with an algebraic estimate. In 1978, the year in which the female percentage was 96·93, female IQ was measured at 101·372. This is 0·125 IQ points below the equation value and if projections are to be abandoned in favour of actual data, the lower value must be taken. Once again, the missing group, the last 3·07%, will be put at 86: this puts them at 1·124 SDs below the 85·63% who were usually tested (102·857 − 86 = 16·857 IQ points). The algebra runs as follows: 96·93 (101·372) + 3·07 (86) = 100 (100·900). This estimate of female IQ on the Instructions test of 100·9 qualifies for the label of my 'conservative estimate'.

It is time to justify the preference for data from the years 1976 to 1984. For the longer period of 1971 to 1984, Fig. 3 shows the relationship for the Matrices between female IQ and the percentage of females tested. The projection for female IQ at 100%

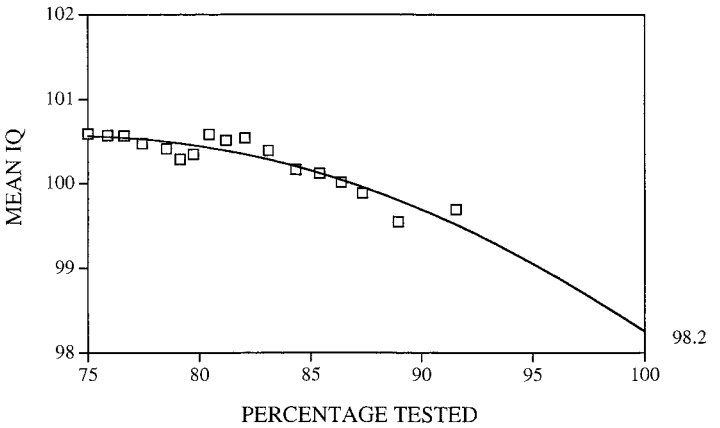

Fig. 3. Matrices test 1971 to 1984. Data show departures from a linear relationship (best-fit equation: $y = -0{\cdot}00343x^2 + 0{\cdot}5074x + 81{\cdot}786$) between female IQ and percentage of females tested. Female mean of 98·2 projected at 100% (100% connotes females tested match males tested as a proportion of cohort of 17 year olds).

is 98·2, a value below the 98·8 from the 1976 to 1984 data. However, it is immediately apparent something has gone wrong. It is not just that the best-fit quadratic equation shows significant departures from a linear relationship. Rather, it is that 6 percentages out of 17 show female IQs *higher* than the values for one or more preceding percentages: the pattern for female IQ to diminish as percentages rise has been disrupted. In Fig. 4, the figure for the Instructions test from 1971 to 1984, the projection hardly differs from the 1976 to 1984 projection: 100·9 as compared with 101·0. But now, the relationship has become quite eccentric. The best-fit line actually rises between percentiles 80 and 85, showing a positive relationship between female IQ and percentage of females tested. If the merger between the years 1976 to 1984, and the years 1971 to 1975, affects the total period in this way, it seems worth focusing on the earlier years in isolation.

Look at the unadjusted percentages for each year in Tables 1a and 2a. The year 1971 shows 70% as many females as males taking the Matrices; then both take the Hebrew test; then 87% as many females go on to the Instructions test. No plausible differential failure rate could cause the 17% jump. For example, if 5% of females flunked the Hebrew test, then 23·54% of males had to flunk. Any jump from Matrices to Instructions of more than 10% is suspect, which rules out the year 1975. Also note the pattern over the years 1971 to 1975: the high percentage jump in 1971 is followed by a percentage drop in 1972 (Matrices percentage at 81, Instructions at 79) and another drop in 1973 (Matrices 74, Instructions 73). How likely is it that from one year to the next, females went from a failure rate on the Hebrew test far below males, on to a failure rate above males? The years 1976 to 1984, on the other hand, show plausible unadjusted percentages. My conclusion for 1971 to 1975 is this: either the test protocol of Matrices to Hebrew to Instructions was not followed; or the computer was fed some flawed data. Recall that computerization only began in 1970 and that the data for that year were clearly incomplete (Judy Goldenberg, personal

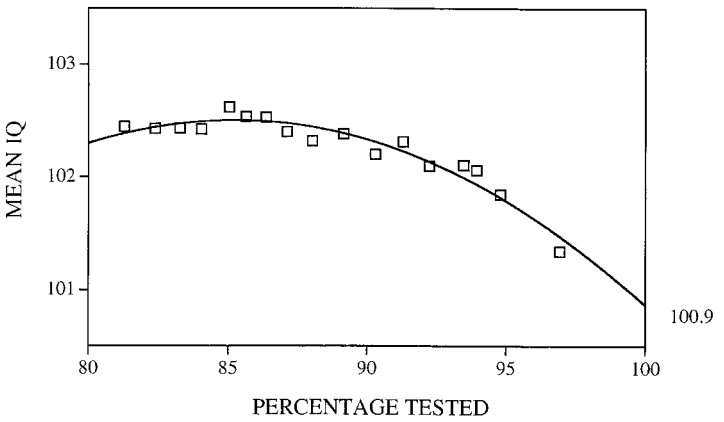

Fig. 4. Instructions test 1971 to 1984. Data show eccentric relationship (best-fit equation: $y = -0{\cdot}00750x^2 + 1{\cdot}2791x + 47{\cdot}998$) between female IQ and percentage of females tested. Female mean of 100·9 projected at 100% (100% connotes females tested match males tested as a proportion of cohort of 17 year olds).

communication, 5 February 1995). It looks as if it took another 5 years to process all data accurately.

Now turn to female IQs and adjusted percentages. Using Table 1a, divide the early years into Matrices low percentage years, 1971 and 1974 and 1975, as distinct from Matrices high percentage years, 1972 and 1973. The former show an average adjusted percentage of 73·29; and the average mean IQ computes at 99·30. The latter show a percentage of 82·66 and an IQ of 99·92. So the tendency for IQ to drop as percentage of females tested rises has been completely reversed. Using Table 2a, the same partitioning of years for the Instructions test gives the same result (compare 1973 and 1974, with 1971 and 1972 and 1975). Needless to say, the later years of 1976 to 1984 present no such problem and strongly show the expected tendency.

Finally, what of variance? As the percentage of females tested rises, the female SD would be expected to rise as a percentage of the male SD. During 1971 to 1975, nothing happened on either test. The low Matrices years put female SD at 92·96% of male; the high years at 92·77%. The low Instructions years give 85·85% and the high years 84·95%. Once again, the years 1976 to 1984 show the expected tendency. They also yield a projection of female variance at 100%. At 100%, the Matrices female SD would equal the male; the Instructions female SD would be just over nine-tenths of male.

That done, I will offer my summary analysis of Israeli female IQ. The best estimates are the computer estimates for the years 1976 to 1984. However, our algebraic calculations, which replaced projections with actual data and limiting assumptions, are a useful check, and provide conservative or bottom-line estimates. The estimates which include the years 1971 to 1975 are suspect, and have been given primarily for the sake of completeness. One problem remains: how to allow for the Druze in the male sample, so we get values based on the Jewish population alone. There are no relevant data for the Israeli Druze. No one has filled their skulls with shot, weighed their brains at autopsy, or collected IQ data. They live mainly in their own settlements in Galilee,

although some commute to or live in the city of Haifa. They practise a wide range of occupations, although the more traditional would still be farmers. I have put male Druze IQ at 90. This is almost undoubtedly too low: a colleague expert in the area judges them comparable to Jewish Israelis from the Middle East. At any rate: 2% Druze in the male sample, with a mean IQ 10 points below the Jewish mean, entails deducting two-tenths of a point from all of our IQ estimates; with so few Druze, we cannot go far astray.

Table 3 gives a best estimate for Israeli female IQ of 98·6 for the Matrices, 100·8 for the Instructions test (an Otis-type verbal IQ), and 99·7 for overall IQ. The algebraic calculations offer conservative values of 98·3, 100·7 and 99·5 respectively. As for the female deficit on the Matrices, I wish to call attention to the fact of time pressure so great that most subjects did not finish. Females are well-known to suffer from a spatial visualization deficit. Time pressure on the Matrices advantages subjects with a good visual memory. It is advantageous to be able to glance at eight patterns, the alternative missing pieces, and have them fixed in your mind when you look back at the parent matrix. I suspect that if the Israeli Defence Forces had administered the Matrices untimed, females would have matched males. If so, the debate between Carroll and Jensen, as to whether Raven's Progressive Matrices contains a significant spatial visualization factor, turns on whether the test is administered timed or untimed (Carroll, 1997, p. 35; Jensen, 1980, p. 646). The second band of Table 3 summarizes the dissection of the female population: showing that female IQ drops, when the usually tested are compared with the not usually tested, and the sometimes tested with the never tested. It will be recalled that the fall in female IQ across these categories matched our expectations, given the cultural background of females who escaped testing.

The last band in Table 3 uses the Israeli data to measure IQ gains over time. Concerning the suspect 1971 to 1975 data, I have no reason to doubt the reliability of the means and SDs given for male performance on the Matrices. However, the flawed data on the percentage of females tested, as compared with males, could arise from: inaccuracies concerning the number of females who took the Matrices; or the number of males who took the Instructions test; or the females who took the Instructions test; or any combination of these. Therefore, Table 3 uses the early years only to compare male gains on the Matrices from 1971 to 1976, with male gains on the Matrices from 1976 to 1984. It looks as if the rate of gain escalated, going from 15 points per generation (30 years) to 18 points. The actual gain over the total period of 13 years is 7·35 points, for a generational rate of 17 points, exactly in line with Matrices gains in other nations during this period (Flynn, 1998).

The 1976 to 1984 data allow a comparison of male gains with female gains on both tests. They are virtually identical, allowing for the fact that the adjusted percentage of females tested was higher in 1976 to 1978 than it was in 1982 to 1984. Females gained 0·2 points more on the Matrices, and 0·1 IQ points less on the Instructions test. Matrices gains for both sexes run well above Verbal IQ gains. The male gains on the Matrices (4·89 IQ points) and on the Instructions test (2·92) give a ratio of 1·675 to one; the female gains (5·09 and 2·82) give a ratio of 1·805 to one. This pattern is also in line with international data, although the ratios are not as high as some (Flynn, 1998). The method of calculating gains uses 3-year averages, from the beginning and

Table 3. Estimates of Israeli female IQ, dissection of female population, IQ gains over time

(a) Estimates of female IQ

Basis of estimate	Matrices[a]	Instructions[a]	Overall[a]
Years 1971–1984	98·0	100·7	99·4
Algebraic calculation	98·3	100·7	99·5
Years 1976–1984[b] (best estimates)	98·6	100·8	99·7

(b) Dissection of female population

Matrices		Instructions	
Percentiles[c]	Female IQ[d]	Percentiles[c]	Female IQ[d]
0·00–79·45	100·97	0·00–85·63	102·88
79·45–100·00	90·26	85·63–100·00	90·05
79·45–91·55	91·16	85·63–96·93	91·04
91·55–100·00	88·96	96·93–100·00	86·42

(c) IQ gains over time

	Matrices			Instructions		
	Rate per year[e]	Total gain	Projected 30 years	Rate per year[e]	Total gain	Projected 30 years
Males 1971–1976[f]	0·510	2·55	15·31	—	—	—
Males 1976–1984[f]	0·600	4·80	18·01	—	—	—
Males 1976–1984[g]	0·611	4·89	18·34	0·365	2·92	10·96
Females 1976–1984[g]	0·637	5·09	19·11	0·352	2·82	10·57

[a]Values adjusted for Druze among males tested. Applies only to Estimates section (see d below).
[b]Text gives rationale for label 'best estimates'.
[c]The percentiles refer to those usually tested, usually not tested, sometimes tested, and never tested (see text).
[d]Values not adjusted for Druze. To do so, deduct 0·20 points.
[e]Rates per year are based on 3-year averages at the beginning and end of the period (e.g. 1976–1978 and 1982–1984). The rate times the number of years in a period (1976–1984 = 8 years) gives the Total gain, and times 30 years the Projected gain. Female gains have been adjusted for the fact that the percentages tested were lower in 1982–1984 than in 1976–1978.
[f]Based on male SD 1971–1984, so as to compare male gains between two periods within those years.
[g]Based on male SD 1976–1984, so as to compare male and female gains over that period.

end of the relevant period, and is described at the bottom of Table 3. To compensate for the decline in the percentage of females tested, 1·169 IQ points were deducted from their apparent Matrices gain, and 1·409 points from their apparent Instructions gain. The deductions were derived, of course, from the equation IQ values generated for Figs 1 and 2. Those who wish to duplicate these calculations, or any other herein, will find the author most helpful.

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