From 1998 to 2019, Sit-ups, Side Steps, and the 50 m Dash Improved in All 12 Age-Sex Groups, While the Ball Throw Declined in All 12 Groups and Grip Strength in 11 — the Direction Split by Test Item. From 2019 to 2024, Sit-ups Declined in All 12 Groups and the 20 m Shuttle Run in 11, While Sit-and-Reach Improved in 10. The Total Score Rose in All 12 Groups from 1998 to 2019 (Median +5.5%), but It Is One Number Combining Items That Moved in Different Directions [M109]

Change in the total score = combination of changes by item ── What separates them is whether the direction splits by test item or moves together by year

Yuuki YAMAGISHI (山岸 勇輝) ／ Independent Researcher

ORCID 0009-0006-8587-3450

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Abstract

Using the Japan Sports Agency's Survey on Physical Fitness and Motor Ability (school year 2024, trends in physical fitness and motor ability, Table 1, youth, ages 7–19, boys and girls), this paper looked at the yearly shape of fitness test results item by item. Are the years of improvement and decline the same for running, jumping, throwing, and gripping? No new mathematical theorem and no new law are claimed.

First, **from 1998 to 2019, sit-ups, side steps, and the 50 m dash improved in all 12 age-sex groups (median change +20.4%, +11.8%, and +1.1%), and the 20 m shuttle run and sit-and-reach improved in 10 of 12 groups. The ball throw declined in all 12 groups and grip strength in 11 (medians −6.8% and −5.3%)** (Section 4).

Second, this is the core of the paper. **From 2019 to 2024, sit-ups declined in all 12 groups (median −3.5%), the 20 m shuttle run in 11 (−6.0%), and the endurance run in all 6 (−3.7%). Sit-and-reach improved in 10 groups (+0.9%) and the standing long jump in 8.** From 1998 to 2019 the direction split by item; from 2019 to 2024 many items declined together (Section 4).

Third, **the total score of the new fitness test rose in all 12 groups from 1998 to 2019 (median +5.5%) and fell in 11 of 12 groups from 2019 to 2024 (−1.9%). The total score is one number combining items that moved in different directions** (Section 4).

Fourth, **the best year differs by item. For the ball throw, all 12 groups had their best year in 1965–1985; for the endurance run, all 6 groups in 1980 or 1985; for the 50 m dash, 10 of 12 groups in 1980 or 1985. For sit-ups, side steps, and the 20 m shuttle run, all 12 groups had their best year in 2010 or later, and for sit-and-reach, 8 of 12 groups in 2021–2024** (Section 5).

Fifth, **the best years for grip strength are scattered over 1975–2003, and for boys aged 16 it kept falling: 44.22 kg in 1985, 42.36 kg in 1998, 39.85 kg in 2019, and 38.89 kg in 2024** (Section 5).

Sixth, what separates them is **whether the direction splits by test item or moves together by year**. When you hear that "children's fitness has risen (fallen)," check which item the number is for, or whether it is the total score.

Scope note: **This paper claims no new mathematical theorem and no new law** — the means by item are in a public table, and this paper only took direction-aligned rates of change and counted the groups that improved. **This paper is a structural interpretation of the shape of numbers in public aggregate data; it is not medical advice, not a diagnosis, and not a treatment recommendation. The author is not a physician. Decisions about individual health should be discussed with a physician or a medical institution. This is a preprint that has not been peer reviewed. The numbers are averages over groups of children and are not a standard for judging any one child's fitness or ability. The reasons the direction differs by item (play, daily life, classes, measurement, and so on) cannot be separated with this table and are not discussed. Nor are the reasons many items declined from 2019 to 2024.** Following the table's note, 2020, when timing and sample sizes differed, was not compared. Values before 1998 were compared as the table lines them up in one series (whether the measurement was the same has not been checked from this table). **About the data**: the Survey on Physical Fitness and Motor Ability (Japan Sports Agency) was taken from e-Stat and used under the Government of Japan Standard Terms of Use (Version 2.0); the rates of change, counts of groups that improved, medians, values with 1998 = 100, and best years in this paper were processed from it. What this paper adds: **lining up direction-aligned changes by item, and separating, under the total score, a period when items split in direction from a period when they declined together**.

1. Notation and question

- **Group**: age (7, 9, 11, 13, 16, 19) × sex. Most items have 12 groups; the endurance run has 6 (ages 13, 16, 19).
- **Ball throw**: the softball throw (ages 7, 9, 11) and the handball throw (ages 13, 16, 19) together, 12 groups.
- **Direction-aligned rate of change**: positive when better. The endurance run and 50 m dash are in seconds, so smaller is better.

- **Periods**: 1998→2019 (from the first year all items of the new fitness test are available, up to before 2020) and 2019→2024.

Question: Does the yearly shape of fitness test results differ by item? Which items' movement is the movement of the total score?

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2. Preview and design

Written honestly: the design was decided after looking at the table.

	Content
Table	Survey on Physical Fitness and Motor Ability, school year 2024, trends, Table 1, youth (ages 7–19, boys and girls)
Noticed in the preview	From 1998 to 2019, sit-ups and side steps rose while grip strength and the ball throw fell
Noticed in the preview (2)	From 2019 to 2024, many items including the 20 m shuttle run and sit-ups fell, while sit-and-reach rose
Noticed in the preview (3)	The table's note says that timing and sample sizes differed in 2020
Comparison	By item, the number of groups that improved and the median rate of change (two periods), the best year, and values with 1998 = 100 for boys aged 11

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3. Data and checks

Calculation 3.1 The retrieved file was fixed by SHA-256, and the following were checked.

- The 11 items of Table 1 (youth) can be read. The softball throw, endurance run, and handball throw have 6 groups; the others have 12.

- The years run either 34 times from 1965 (Showa 40) to 2024 (Reiwa 6) (every year from 1998) or 27 times from 1998 to 2024.
- Notes in 11 places say that "in Reiwa 2, timing and sample sizes differed because of COVID-19." 2020 was not compared.

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4. The core — direction by item

Calculation 4.1 Number of groups that improved, and median direction-aligned rate of change

Item	1998→2019 improved	Median (%)	2019→2024 improved	Median (%)
Sit-ups	12/12	+20.4	0/12	−3.5
Side steps	12/12	+11.8	2/12	−0.8
Sit-and-reach	10/12	+3.0	10/12	+0.9
20 m shuttle run	10/12	+14.5	1/12	−6.0
Endurance run	4/6	+3.4	0/6	−3.7
50 m dash	12/12	+1.1	2/12	−1.0
Standing long jump	5/12	−0.7	8/12	+0.2
Grip strength	1/12	−5.3	2/12	−2.0
Ball throw	0/12	−6.8	3/12	−0.6
Total score	12/12	+5.5	1/12	−1.9

Observation 4.2: **From 1998 to 2019, sit-ups (all 12 groups, +20.4%), side steps (12, +11.8%), and the 20 m shuttle run (10, +14.5%) improved, while the ball throw (0, −6.8%) and grip strength (1, −5.3%) declined. The direction split by item.**

Observation 4.3: **From 2019 to 2024, sit-ups (0 groups), the 20 m shuttle run (1), the endurance run (0/6), side steps (2), the 50 m dash (2), and grip strength (2) declined, while sit-and-reach (10 groups) and the standing long jump (8) improved. Many items declined together.**

Observation 4.4: **The total score rose in all 12 groups from 1998 to 2019 (median +5.5%, +1.8% to +18.1%), but underneath it grip strength and the ball throw were declining.** A rise in the total score does not mean every item improved.

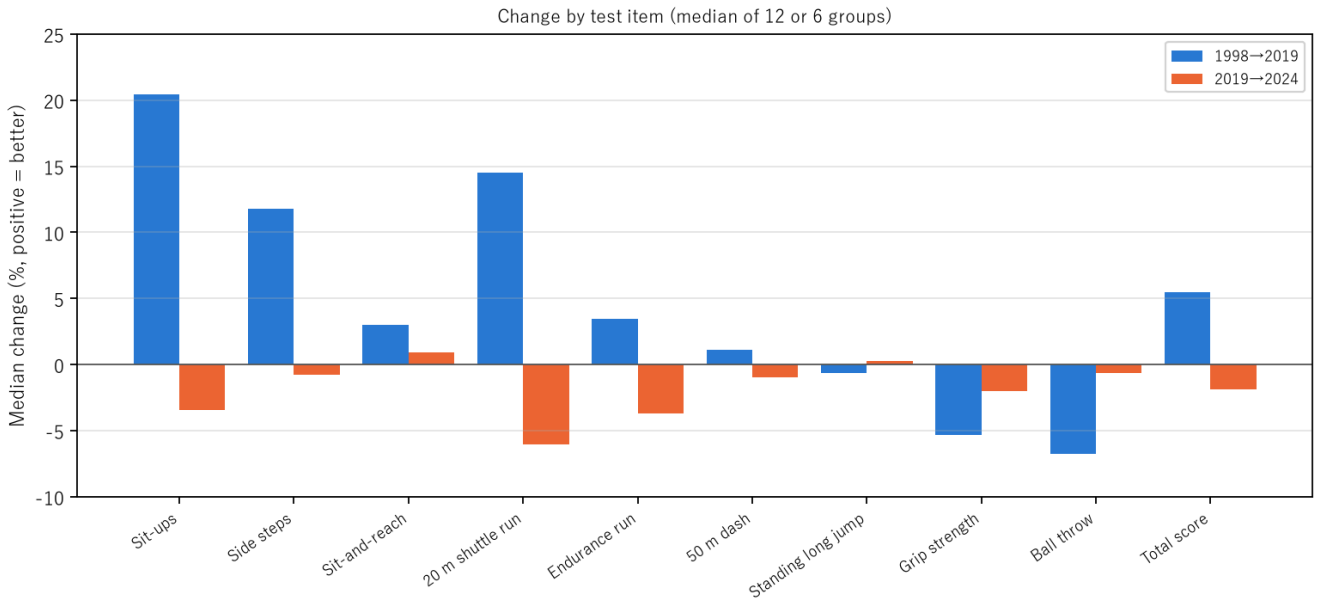


Figure 1: Median direction-aligned rate of change by item (positive = better). Blue is 1998→2019, orange is 2019→2024.

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5. The best year

Calculation 5.1 Best year (excluding 2020, by group)

Item	Distribution of best years
Ball throw	All 12 groups in 1965–1985 (1965×4, 1970×1, 1980×3, 1985×4)
Endurance run	All 6 groups in 1980 or 1985 (1980×3, 1985×3)
50 m dash	1980×3, 1985×7, 2017×1, 2018×1
Grip strength	Scattered over 1975–2003 (1975×2, 1980×3, 1985×1, 1993×1, 1998×2, 2002×2, 2003×1)
Sit-ups, side steps, 20 m shuttle run	All 12 groups in 2010 or later (sit-ups: 2018×6, and so on)
Sit-and-reach	8 of 12 groups in 2021–2024

Observation 5.2: **The best years for throwing, running long, and running fast gather in 1965–1985, while those for sit-ups, side steps, and the 20 m shuttle run gather in 2010 or later, and those for sit-and-reach in 2021–2024.** The peak year differs by item.

Observation 5.3: **Grip strength kept falling: 44.22, 42.36, 39.85, and 38.89 kg for boys aged 16 in 1985, 1998, 2019, and 2024, and 47.47, 45.16, 41.44, and 40.66 kg for boys aged 19.** The ball throw for boys aged 11 was 33.98, 29.77, 26.65, and 25.67 m.

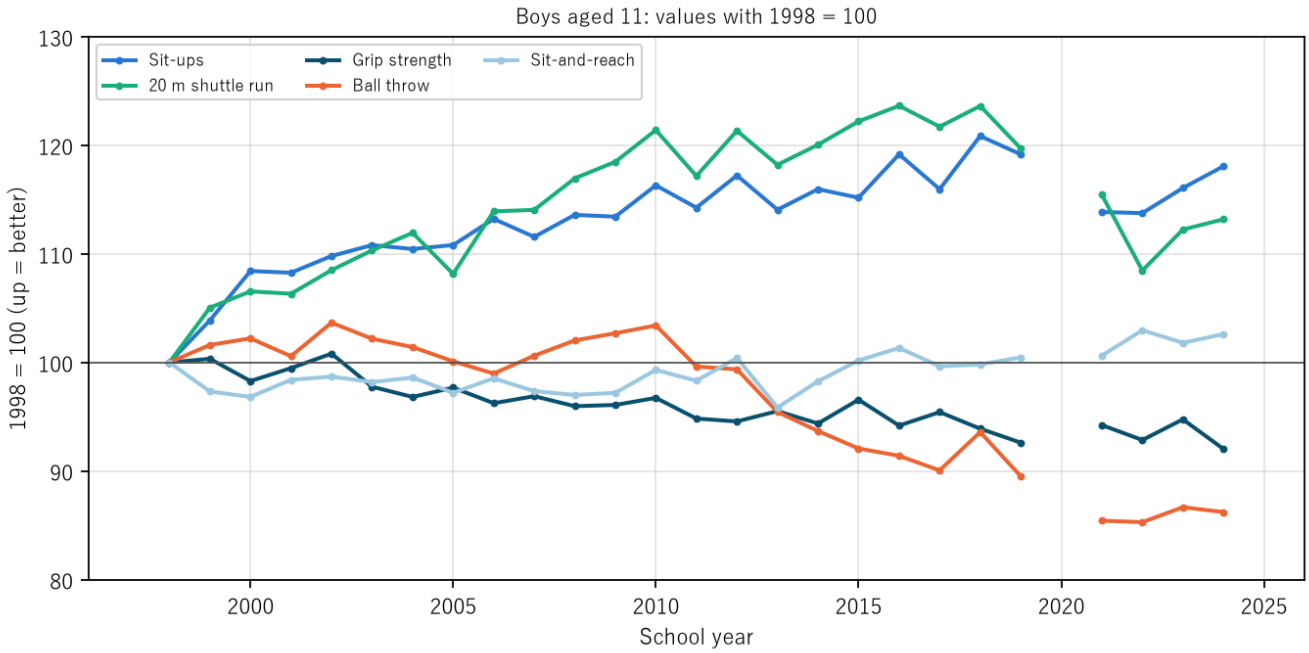


Figure 2: Values with 1998 = 100 for boys aged 11 (up = better). Sit-ups and the 20 m shuttle run rose until 2019, while grip strength and the ball throw fell. 2020 is not drawn.

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6. Limitations

1. **The numbers are averages over groups of children and are not a standard for judging any one child's fitness or ability. The reasons the direction differs by item, or why many items declined from 2019 to 2024, are not discussed.**
2. Values before 1998 were compared as the table lines them up in one series. Whether the measurement was the same has not been checked from this table.
3. Only means were examined. Spread, or the gap between children who are good at an item and those who are not, was not.
4. 2020 was not compared, following the table's note. The table measures different children each year.
5. "Groups that improved" counts only direction; it does not check whether small differences exceed rounding or sampling variation.

Conclusion

From 1998 to 2019, sit-ups, side steps, and the 50 m dash improved in all 12 groups, while the ball throw and grip strength declined. The direction split by item. From 2019 to 2024, many items declined together, while sit-and-reach improved. The total score is one number combining these items that moved in different directions.

What separates them is one thing — whether the direction splits by test item or moves together by year.

When you hear that "children's fitness has risen (fallen)," **check which item the number is for, or whether it is the total score.**

Data and reproduction

Data	Survey on Physical Fitness and Motor Ability, school year 2024, trends in physical fitness and motor ability, Table 1, youth (Japan Sports Agency, e-Stat) (retrieved 27 September 2026)
Terms of use	e-Stat follows the Government of Japan Standard Terms of Use (Version 2.0). The rates of change, counts of groups that improved, medians, values with 1998 = 100, and best years in this paper were processed from it and are not numbers produced by the government
Coverage	Japan; 1965–2024 (items of the new fitness test from 1998); ages 7–19; boys and girls
Verification	`検算/M109.py` (`--zu` also draws the figures). Every number in the text is taken from `検算/M109_output.txt`
Raw data	`data/` holds the retrieved file and `SOURCES.md` (URL, retrieval date, SHA-256, terms of use, definitions and how the calculations were set up)
Figures	`図/M109_zu1` and `図/M109_zu2` (png, svg, English versions)

References

- Japan Sports Agency. Survey on Physical Fitness and Motor Ability, school year 2024, trends in physical fitness and motor ability, Table 1: Youth (in Japanese). e-Stat (accessed 27 September 2026). https://www.e-stat.go.jp/