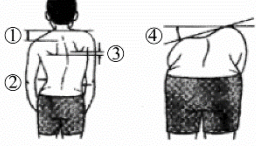

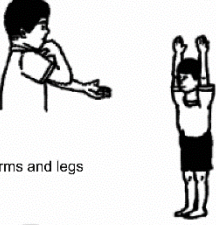



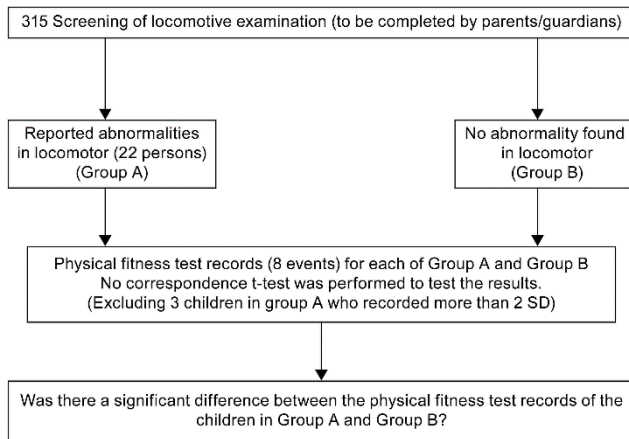


Appendix 1. Reference material of “Questionnaire on locomotorium (spine/thorax, extremity, bone joint)”
used in Osaka Prefecture

Reference material for the locomotive questionnaire (spine/thorax, extremity, bone, joint) III. Please use this when answering the questions (this is meant only as a reference)		
1	<p>The spine is bent</p> 	<p>Four checkpoints</p> <p>① There is a difference in height between the left and right shoulders.</p> <p>② There is a difference in the lines of the left and right sides.</p> <p>③ There is a difference in height and position of the left and right shoulder blades.</p> <p>④ When the waist is bent, there is a difference in the heights of the left and right back sides.</p> <p>※ If any of these are true, or if you are in doubt, please check <input type="checkbox"/></p>
2	<p>There is pain when bending or warping the waist</p> <p>※ If you have pain, please visit a medical institution immediately. Do not wait for an examination at school</p> 	<p>▷ I have pain when I bend my back and move my body forward.</p> <p>▷ There is a pain when relaxing my body and leaning back.</p> <p>※ If either of these is true, please check <input type="checkbox"/></p>
3	<p>I have pain when I move my arms and legs</p> <p>※ If you have pain, please visit a medical institution immediately. Do not wait for an examination at school</p> 	<p>▷ I have pain when I place my hands forward, turn my palms upward and bend or stretch my elbows (left or right)</p> <p>▷ I have pain when I raise my hands straight and move my arms up to my ears.</p> <p>▷ I have pain in the hip joints, knees and ankles when I try to place my hands forward and crouch</p> <p>※ Please check <input type="checkbox"/> if any of these is true.</p>
4	<p>Trouble moving arms and legs</p> 	<p>▷ My elbow does not completely bend and does not fully extend when my hands are placed forward, my palms are facing up and my elbows are bent or stretched.</p> <p>▷ When both hands are stretched straight upward and I am trying to move my arms to my ears, both arms do not meet the ears or the head is bent.</p> <p>▷ When putting the hands forward and squatting, the hip joints, knees and ankles cannot bend and cannot be touched</p> <p>※ If any of these is true, or if you are in doubt, please check <input type="checkbox"/></p>
5	<p>One leg standing cannot be more than 5 seconds</p> 	<p>▷ Is it possible or impossible to stand on one foot for 5 seconds without tilting or staggering the body?</p> <p>※ Please check <input type="checkbox"/> if you cannot.</p>
6	<p>Cannot squat</p> 	<p>▷ I cannot completely crouch by putting the soles of my feet on the floor and spread my legs to shoulder width.</p> <p>※ However, if you can completely crouch but fall backward immediately, please check <input type="checkbox"/></p>

Appendix 2. Experimental protocol



Appendix 3. Number of Children with Reported Symptoms in the Locomotive Disorder Screening by Grade
(2022, Unit: Children).

Number reported in the screening	3rd grade	4th grade	5th grade	6th grade	Total
1. Bend in the spine (including scoliosis)	1	3	1	1	6
2. Pain when bending or arching the lower back					0
3. Pain when moving the arms or legs	1				1
4. Poor movement in parts of the arms or legs		1			1
5. Inability to stand on one leg for more than five seconds		2			2
6. Inability to crouch down	1	3	1	4	9
7. Unknown					0
8. Combination of the above items (e.g., 5 and 6)	1		1	1	3
Total (percentage of grade)	4 (5.3%)	9 (11.3%)	3 (3.6%)	6 (7.9%)	22 (7.0%)

Appendix 4. Records of Physical Fitness Test of Participants in 2022 for School B (3rd-6th Grade).

Grade	Boys	Grip strength (kg)		Sit-ups (times)		Seated forward bend (cm)		Side-step (times)		20-m shuttle run (times)		50-m run (seconds)		Standing long jump (cm)		Softball throw (m)	
		Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD
3rd		10.9	2.7	15.1	7.0	26.7	6.9	31.9	7.1	25.8	16.8	10.2	1.0	135.7	19.4	12.2	5.9
4th		13.3	3.4	17.5	6.7	28.6	6.1	33.6	7.1	27.6	13.0	10.1	1.2	137.8	24.5	15.1	5.9
5th		14.5	3.8	18.1	6.6	29.6	6.9	38	7.9	43.4	21.2	9.9	3.4	153.9	27.7	21.6	10.0
6th		18.8	4.6	18.9	6.1	28.5	8.9	46.2	6.6	49.1	23.7	9.2	1.2	159.7	20.7	24.3	10.6
Grade	Girls	Grip strength (kg)		Sit-ups (times)		Seated forward bend (cm)		Side-step (times)		20-m shuttle run (times)		50-m run (seconds)		Standing long jump (cm)		Softball throw (m)	
		Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD
3rd		9.2	1.9	13.3	5.0	30.5	6.6	29.8	5.4	19.4	10.7	10.6	0.8	119.7	15.4	7.4	2.1
4th		12.2	2.6	14.7	6.6	32.3	7.6	32.2	5.9	22.7	10.5	10.4	1.3	133.8	16.0	9.5	3.3
5th		14.2	3.7	15.8	4.2	35.7	7.4	35.5	7.3	27.9	13.2	9.9	0.8	143.4	24.3	12	5.0
6th		18.9	4.1	22.1	4.6	37.7	7.6	40.1	7.0	40.7	11.9	9.2	0.7	157.5	18.5	15.1	5.9

Appendix 5. Results of the T-test Between the Group in which Parents Reported that their Child's Locomotive Condition was Abnormal in the Locomotive Examination and the Group in which there was no Abnormality (by Grade, Sport, and Sex) (Detailed version).

Grade	Boys	Grip strength			Sit-ups			Trunk forward flexion			Side-step		
		P-value	screening submitter	healthy person	P-value	screening submitter	healthy person	P-value	screening submitter	healthy person	P-value	screening submitter	healthy person
3rd		P < 0.01	8.25	11.15	P < 0.001	5.7	16.03	0.1696	23.5	27.05	0.1647	28.5	32.2
4th		0.2729	12.4	13.42	P < 0.01	11.2	18.45	P < 0.01	25.4	29.06	P < 0.05	28.2	34.45
5th		P < 0.05	13	14.57	0.6286	19.33	18	0.5067	29.67	29.6	0.7201	40.67	37.83
6th		0.9862	22.5	17.93	0.2782	17.5	19.2	0.7692	31	27.93	0.3977	45.5	46.31
Grade	Boys	20-m shuttle run			50-m run			Standing long jump			Softball throw		
		P-value	screening submitter	healthy person	P-value	screening submitter	healthy person	P-value	screening submitter	healthy person	P-value	screening submitter	healthy person
3rd		0.3575	22.33	26.1	P < 0.01	11.35	10	0.1935	127.5	136.5	0.7338	14	12
4th		0.1513	21.8	28.42	P < 0.05	10.9	9.98	P < 0.001	116.2	141.03	P < 0.01	11.2	15.7
5th		0.2595	47.5	43.15	0.3659	9.27	9.98	0.500	173.33	152.44	0.2877	18.67	21.85
6th		0.3047	44.5	50.14	0.2164	9.57	9.13	P < 0.01	140.8	163.35	0.8339	28.6	23.38
Grade	Girls	Grip strength			Sit-ups			Trunk forward flexion			Side-step		
		P-value	screening submitter	healthy person	P-value	screening submitter	healthy person	P-value	screening submitter	healthy person	P-value	screening submitter	healthy person
3rd		—	—	9.16	—	—	13.27	—	—	30.5	—	—	29.77
4th		0.1281	10.75	12.31	0.2505	12.5	14.89	0.2037	29.25	32.69	0.2481	30.25	32.39
5th		—	—	14.22	—	—	15.75	—	—	35.69	—	—	35.55
6th		—	—	18.89	—	—	22.13	—	—	37.71	—	—	40.1
Grade	Girls	20-m shuttle run			50-m run			Standing long jump			Softball throw		
		P-value	screening submitter	healthy person	P-value	screening submitter	healthy person	P-value	screening submitter	healthy person	P-value	screening submitter	healthy person
3rd		—	—	19.45	—	—	10.57	—	—	119.67	—	—	7.42
4th		0.69	25.25	22.42	P < 0.05	11.63	10.25	0.2187	127.75	134.49	0.4352	9.25	9.54
5th		—	—	27.94	—	—	9.92	—	—	143.38	—	—	12.03
6th		—	—	40.71	—	—	9.15	—	—	157.47	—	—	15.08

