Territory-wide Physical Fitness Survey for the Community

Final Summary Report

Commissioned by

Community Sports Committee of the Sports Commission

Co-ordinated by

Leisure and Cultural Services Department

Submitted by

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Executive Summary

1. Background

1.1. The present survey is the third citywide community fitness survey in Hong Kong, commissioned by Community Sports Committee (CSC) and coordinated by the Leisure and Culture Service Department (LCSD). The data collection was conducted between July 2021 to December 2022.

1.2. Similar to the second survey in 2012, the data of this survey was collected by random sampling method. The sample size calculation was based on the age and gender distribution reported by the Hong Kong Government's 2021 Population Census.

1.3. The age covered from 7-79 years old in 3 major batches: 1) 7-11, 2) 12-16, and 3) 17-79 years old.

1.4. The data collection was divided into two parts: 1) physical fitness assessments, and 2) questionnaire survey on physical activity (PA) and lifestyle.

1.5. Overall, 9,326 participants were collected in the present survey, which exceeded the targeted sample size (i.e., 8,500). After filtering and excluding incomplete and invalid data, a total of 8,419 data entered the final analysis.

2. Objectives

2.1. The objectives of the present survey:

(1) To enable the people of Hong Kong participating in the Survey to have a general understanding of his/her own fitness condition;

(2) To set up a database on the physical fitness of people of Hong Kong;

(3) To identify the relationship between physical exercise pattern and physical fitness of people of Hong Kong; and

(4) To assist the Government in identifying priority areas for improvement to enhance the overall physical fitness of the community.

3. Data Analysis

3.1. After collected the physical fitness and questionnaire data, the data analysis was conducted to reveal the sample distribution, descriptive statistics, association between testing

parameters, such as the correlation between the physical activity participation and physical fitness performance.

3.2. The present survey report categorizes the body mass index (BMI) into four groups: 1) obese, 2) overweight, 3) underweight and 4) normal. The adult groups are classified according to the Asia-Pacific body mass index classifications, while the children and adolescent groups are classified by 2 criteria: 1) World Health Organization (WHO) Child Growth Standard and (2) Hong Kong weight-to-height growth chart.

3.3. The present survey report also analyzes the physical activity sufficiency for each age group according to the WHO recommended PA level.

4. Children (Age: 7-11)

4.1. Participants

The sample was selected on a school basis. A total of 9 primary schools were recruited from six districts, i.e., Hong Kong East, Hong Kong West & Islands, Kowloon East, Kowloon West, New Territory West, and New Territory East, according to the district sampling distribution. Four boys and four girls from each grade of each school were randomly selected (i.e. total 48 students per school). The survey took place at schools from June to November 2022.

4.2. Physical Fitness Performance

Overall, there were 225 boys and 201 girls included in the analysis. The average physical fitness performance among children were: 1) PACER = 19.7±11.1 laps, 2) sit-and-reach = 25.7±7.5 cm, 3) handgrip strength (both hands total) = 27.1±9.3 kg, 4) 1-min sit-up = 15.8±9.3 repetitions, 5) standing long jump = 114.2±27.1 cm, and 6) body fat = 18.7±9.0 %.

	Mean		
	Boy	Girl	Total
Body composition			
Height (cm)	137.2	137.0	137.1
Weight (kg)	34.8	32.1	33.6
BMI (kg/m^2)	18.1	16.9	17.5
Body Fat (%)	18.7	18.8	18.7
Skinfold - Triceps (mm)	11.7	11.2	11.5
Skinfold - Calf (mm)	11.4	11.2	11.3
Skinfold – Total (mm)	23.1	22.4	22.8
Cardiovascular Endurance			
15m PACER (laps)	21.1	18.1	19.7
VO$_{2max}$ (ml/kg/min)	34.2	34.2	34.2
Flexibility			
Sit-and-reach (cm)	24.7	27.8	25.7
Muscular Fitness			
Handgrip – both hands (kg)	32.1	26.5	27.1
1-min Sit-up (reps)	16.4	15.2	15.8
Standing Long Jump (cm)	117.0	111.1	114.2

4.3. **Prevalence of Overweight and Obesity**

33.0% of children were recognized as overweight and obese by the body mass index (BMI) for age-gender reference criteria from the World Health Organization (WHO). 18.2% of children were overweight or obese according to the Hong Kong Weight-for-Height Growth Chart.

	Boys (%)	Girls (%)	Total (%)
The WHO BMI for Age-Gender Growth Standard			
Severe Thinness	0	0	0
Thinness	2.8	2.1	2.4

Normal	58.4	71.2	64.5
Overweight	19.6	20.0	19.8
Obesity	19.2	6.7	13.2
Hong Kong Weight-for-Height Growth Chart			
Non-overweight	75.4	89.0	81.8
Overweight (including obesity)	24.6	11.0	18.2

4.4. Physical Activity Level

66.3% of children do not met the WHO recommended PA level (i.e., an average of at least 60 minutes per day of MVPA across the week). However, 84.4% of children perceived that they had sufficient PA levels. The results suggest a discrepancy between the actual and perceived PA sufficiency among the children. The situation is even worse for girls. 80.7% of girls did not meet the WHO PA recommendation, but 85.1% of girls perceived that they had sufficient PA.

	Boys (%)	Girls (%)	Total (%)
Met the WHO-recommended PA level			
Yes	46.9	19.3	33.7
No	53.1	80.7	66.3
Self-perceived sufficiency on PA			
Definitely sufficient	30.8	21.0	26.2
Sufficient	52.8	64.1	58.2
Insufficient	14.0	13.3	13.7
Definitely insufficient	2.3	1.5	2.0

4.5. Favorite Sports and Major Barrier to Physical Activity

The top 5 favorite sports for boys were 1) ball games (67.8%), 2) swimming (49.5%), 3) cycling (48.1%), 4) distance running (36.0%), and 5) track and field (29.9%). For girls, the top 5 favorite sports were: 1) swimming (53.8%), 2) rope skipping (46.2%), 3) cycling (43.1%), 4) dance (42.1%), and 5) ball games (32.8%). The top three barriers to

participation in physical activity were: 1) bad weather (60.4%), 2) busy with homework (40.8%), and 3) feeling tired (34.7%).

4.6. Further Analysis

4.6.1. Compared to the 2012survey, both boys and girls in current survey demonstrated better cardiovascular fitness (boys ran 4.5 more laps in 15m PACER, whereas girls ran 3.2 more laps). Handgrip strength of boys also improved (increase 5.1 kg), in contrary, the 1-min sit-up for both boys and girls declined (3 reps less), all other fitness parameters are similar.

4.6.2. Boy who met the WHO PA recommendation have better cardiovascular and muscular fitness compared to those who did not meet the WHO PA recommendation. Furthermore, we found that parent involvement in exercise could significantly improve the weekly PA level of children.

4.6.3. Boys perform significantly better in 15 meters PACER test and standing long jump than girls. Girls have significantly greater sit-and-reach performance compared with boys. Furthermore, body fatness parameters (i.e., total body fat and total skinfold) were negatively correlated with the performance of 1) 15m PACER and 2) handgrip strength, and 15-meter PACER performance was positively correlated with the muscular fitness (i.e., handgrip, 1-min sit-up, and standing long jump) for both genders. For boys, body fatness parameters (i.e., total body fat and total skinfold) were negatively correlated with the performance of 1-min sit-up and standing long jump.

4.7. Recommendation

4.7.1. Cardiovascular fitness of children was better compared to 10 years ago, however, muscular endurance declined. It is suggested that children should engaged in more aerobic exercise to maintain and improve cardiovascular fitness and control weight, so as to improve overall health. Muscular endurance training should also strengthen.

4.7.2. It is important to continuously monitor the children's physical fitness (i.e., cardiovascular fitness, muscular strength, muscular endurance, flexibility, and body composition). We recommended that the norm of physical fitness should be shared via designated websites and mobile applications.

4.7.3. A large discrepancy was observed between the actual physical activity level and the perceived sufficiency of physical activity among children. We recommended that stakeholders work together to 1) promote the WHO physical activity recommendations to children and parents and 2) educate the children, parents, and teachers on the strategies of skills to evaluate and monitor the daily PA level of children.

4.7.4. Additional after-school sports or exercise activities are needed for children. We suggested that stakeholders organize more sports activities based on their favorite sports.

4.7.5. We suggested several strategies for overcoming obstacles to PA: 1) provide parents and children with information on home-based exercise; 2) emphasize the quality of homework (優質課業) to schools rather than its quantity; and 3) continuously promote sufficient sleep time (i.e., ≥ 9 hours).

4.7.6. Parent involvement was an important factor influencing the PA participation of children. More family-based exercise events should be organized after school, over the weekends, and on holidays. Promoting PA, sports, and physical fitness reward programs among children could be a feasible approach to encourage their participation in sports.

5. Adolescents (Age: 12-16)

5.1. Participants

Both the fitness test and questionnaire data for the young adolescents were collected by the Education Bureau (EDB) during two periods, from September 2019 to January 2020 and from February to June 2021. The research team randomly extracted 350 data from the data pool provided by EDB, including 36 males and 34 females from each age, to serve as partial data for this survey.

5.2. Physical Fitness Performance

Overall, there were 180 boys and 170 girls included in the analysis. The average physical fitness performances among adolescents were: 1) PACER = 37.2±20.1 ml/kg/min, 2) sit-and-reach = 26.9±10.1 cm, 3) standing long jump = 150.3 ± 35.4 cm, 4) 1-min sit-up = 24.2 ±11.7 repetitions, 6) push-up = 10.3±10.3 repetitions, and 6) body fat = 21.8±9.7%.

	Mean		
	Boys	Girls	Total
Body composition			
Height (cm)	165.9	158.4	162.3
Weight (kg)	57.8	51.1	54.5
BMI (kg/m^2)	20.8	20.3	20.6
Body Fat (%)	17.3	26.6	21.8
Skinfold - Triceps (mm)	13.8	17.0	15.4
Skinfold - Calf (mm)	13.5	16.4	14.9
Skinfold - Total (mm)	27.3	33.4	30.2
Cardiovascular Endurance			
15m PACER (lap)	46.7	27.1	37.2
VO$_{2max}$ (ml/min/kg)	41.5	37.1	39.4
9-min Run / Walk (m)	1392.2	1235.8	1316.3
Flexibility			
Sit-and-reach (cm)	23.1	31.1	26.9
Muscular Fitness			
Standing Long Jump (cm)	167.7	131.9	150.3
1-min Sit-up (rep)	28.4	19.9	24.3
Push-up (rep)	11.2	9.5	10.3

5.3. Prevalence of Overweight and Obesity

27.7% of adolescents were identified as overweight and obese by the WHO BMI for age-gender growth chart, and 23.2% were recognized as overweight and obese by the Hong Kong weight-to-height growth chart standard.

	Boys (%)	Girls (%)	Total (%)
The WHO BMI for Age-Gender Growth Standard			
Severe Thinness	1.7	0	0.9
Thinness	5.6	2.9	4.3
Normal	60.0	74.7	67.1
Overweight	18.3	15.9	17.1
Obesity	14.4	6.5	10.6
Hong Kong Weight-for-Height Growth Chart			
Non-overweight	74.2	79.6	76.8
Overweight (including obesity)	25.8	20.4	23.2

5.4. Physical Activity Level

50.7% of adolescents indicated that their PA level did not meet the WHO recommendation (i.e., an average of at least 60 minutes per day of MVPA across the week), which was better than the prevalence (i.e., 66.3%) among children aged 7-11. However, only 34.4% of adolescents perceived that they had insufficient PA.

	Boys (%)	Girls (%)	Total (%)
Met the WHO recommended PA level			
Yes	52.0	46.4	49.3
No	48.0	53.6	50.7
Self-perceived sufficiency on PA			
Very sufficient	18.3	8.8	13.7
Sufficient	22.8	15.3	19.1
Average	31.7	34.1	32.9
Insufficient	20.0	31.2	25.4
Very insufficient	7.2	10.6	8.9

5.5. Favorite Sports and Major Barrier to Physical Activity

The top 5 favorite sports for boys were 1) ball games (72.2%), 2) swimming (21.7%), 3) track and field (12.2%), 4) distance running (11.7%), and 5) rope skipping (7.8%). For girls, the top 5 favorite sports were: 1) ball games (50.6%), 2) swimming (34.7%), 3) dance (26.5%), 4) skating/roller skating (25.9%), and 5) rope skipping (17.1%). The top four barriers for adolescents to participation in physical activity were: 1) muscle soreness (45.0%), 2) lack of time (42.0%), 3) bad weather (41.4%), and 4) too tired (41.1%).

5.6. Further Analysis

5.6.1. Compared to 2012 survey, cardiovascular fitness of both boys and girls improved (boys ran 6 more laps in 15m PACER, whereas girls 5.1 laps more). Girls' push-up also improved (increase 3.1 reps). In contrary, standing long jump of boys declined (reduced 11.2 cm), all other fitness parameters were similar.

5.6.2. Boys who met the WHO-recommended PA level performed significantly better in push up. In contrast, girls who met the WHO recommended PA level had significantly greater performance in 1) 15-meter PACER, 2) 9-minute run/walk test, and 3) Standing Long Jump.

5.6.3. For boys, body adiposity was negatively correlated with cardiovascular fitness and all muscular fitness parameters, while cardiovascular fitness was positively correlated with lower body flexibility and all muscular fitness parameters. For girls, body adiposity was negatively associated with cardiovascular fitness and muscular power, while cardiovascular fitness was positively correlated with lower body flexibility and all muscular fitness parameters. Furthermore, boys perform significantly better in 1) 15-meter PACER, 2) 9-minute run/walk, 3) 1-minute sit-up, and 4) standing long jump. We also found that boys have significantly lower body fat compared with girls. On the other hand, girls have significantly greater sit-and-reach performance compared with boys.

5.7. Recommendation

5.7.1. Cardiovascular fitness of children was better compared to 10 years ago, it is suggested that children should engage in aerobic exercise to maintain and improve

cardiovascular fitness and control weight, so as to improve overall health. , however, muscular endurance declined. Muscular fitness training should also be strengthened, especially muscular power in boys which may be improved via plyometric exercise.

5.7.2. More subcutaneous fat was observed among adolescents compared with data collected in 2012. Stakeholders should provide more weight management education and exercise programs specific to obesity.

5.7.3. Adolescents should have sufficient knowledge to identify their performance in physical fitness (i.e., cardiovascular fitness, muscular strength, muscular endurance, flexibility, and body composition). Normative values of physical fitness should be provided to adolescents via the internet, mobile applications, and social media.

5.7.4. Stakeholders should work together to support adolescents with poor physical fitness through additional exercise and fitness training. More interesting PA initiatives, such as IT-based virtual fitness programs with mobile applications and school-based fitness workshops should be promoted.

5.7.5. We suggested that stakeholders should organize more sports activities based on their favorite sports, such as organizing ball games (1st favorite sport), organizing more swimming (2nd favorite sport) courses, and organizing skating/roller skating (3rd favorite sport). Furthermore, we recommended that the stakeholders should work together to encourage students to participate in at least one sport after school or leisure time (一人一運動計劃) and educate the student about the understanding of WHO recommended PA level.

5.7.6. Major obstacles for secondary school adolescents to refrain from participation in PA: 1) muscle soreness, 2) lack of time, and 3) bad weather conditions. We suggested a few different approaches to tackle those obstacles to PA: 1) educate adolescents on some fundamental post-exercise recovery knowledge, such as appropriate cool-down exercises, self-myofascial release techniques, and adequate amounts of sleep; 2) focus on the quality of homework (優質課業), rather than the quantity of homework, and 3) examples of home-based exercises should be share via internet, mobile application, and social media.

6. Adults (age: 17-79)

6.1. Participants

6.1.1. The sampling for these age groups considered their employment status and covered all the working industries. In addition to the age and gender, the proportion of the working and non-working population was used to calculate the sample size. All the adopted percentages for calculation were from the data of the 2021 Population Census.

6.1.2. Data collection involved various corporations or companies, government or non-government organizations, and large-scale working unions. When recruiting working participants, companies and federations were invited to participate through random sampling on a pro-rata basis based on the economic groups' framework provided by the Census & Statistics Department for the working population. Arrangements were then made on mutual agreement for those willing to get involved. To recruit the non-working participants, tertiary education institutions, District Social Welfare Offices, and non-government organizations with broad district coverage were invited. The participants were invited through the network and influence of these institutions/organizations.

6.1.3. Apart from the recruitment through various companies, organizations, or institutions, public test days were organized at large-scale events and LCSD leisure venues to recruit participants from specific age and gender groups to enhance the representation of the sample.

6.2. Physical Fitness Performance

Participants in the current survey generally performed better in cardiovascular fitness, muscular strength, muscular endurance, and muscular power than in the 2012 survey. However, participants in the current survey typically had poorer balance than those in 2012.

	Age: 17-19	
	Mean	
	Male	Female
Body Composition		
Height (cm)	173.1	160.6
Weight (kg)	68.0	55.5
Waist Circumference (cm)	77.3	69.1
BMI (kg/m^2)	22.7	21.5
Body Fat (%)	18.1	29.1
Muscle Mass (%)	46.9	33.6
Cardiovascular Endurance		
3-min Step Test (Post Exercise HR)	136.4	153.3
3-min Step Test (Recovery HR)	113.5	128.2
Estimated VO$_{2max}$ (ml/kg/min)	43.8	40.9
Flexibility		
Sit-and-reach Test (cm)	28.6	32.1
Muscular Fitness		
Handgrip Strength (Both Hands) (kg)	73.9	50.5
Vertical Jump (cm)	49.7	36.5
Plank (sec)	114.1	77.7
1-min Sit-up Test (rep)	31.5	25.8
Agility and Balance		
Single Leg Stance with Eyes Closed (sec)	21.8	25.2

	Age: 20-39	
	Mean	
	Male	Female
Body Composition		
Height (cm)	172.5	159.7
Weight (kg)	71.2	56.4
Waist Circumference (cm)	81.9	71.9
BMI (kg/m^2)	23.9	22.1
Body Fat (%)	20.5	30.3
Muscle Mass (%)	53.2	36.2
Cardiovascular Endurance		
3-min Step Test (Post Exercise HR)	139.4	145.3
3-min Step Test (Recovery HR)	117.4	120.1
Estimated VO$_{2max}$ (ml/kg/min)	41.4	40.4
Flexibility		
Sit-and-reach Test (cm)	23.8	30.4
Muscular Fitness		
Handgrip Strength (Both Hands) (kg)	77.1	49.7
Vertical Jump (cm)	46.6	31.7
Plank (sec)	109.1	75.8
1-min Sit-up Test (rep)	27.5	20.8
Agility and Balance		
Single Leg Stance with Eyes Closed (sec)	19.4	23.2

| | Age: 40-59 | |
| | Mean | |
	Male	Female
Body Composition		
Height (cm)	170.0	157.7
Weight (kg)	70.7	57.0
Waist Circumference (cm)	85.0	76.0
BMI (kg/m^2)	24.4	22.9
Body Fat (%)	21.7	31.7
Muscle Mass (%)	51.6	36.0
Cardiovascular Endurance		
3-min Step Test (Post Exercise HR)	135.4	143.8
3-min Step Test (Recovery HR)	115.0	119.9
Estimated VO$_{2max}$ (ml/kg/min)	38.0	36.4
Flexibility		
Sit-and-reach Test (cm)	21.5	29.5
Muscular Fitness		
Handgrip Strength (Both Hands) (kg)	75.3	48.3
Vertical Jump (cm)	38.8	25.8
Plank (sec)	117.3	81.8
1-min Sit-up Test (rep)	21.1	14.8
Agility and Balance		
Single Leg Stance with Eyes Closed (sec)	11.2	11.6

| | Age: 60-69 | |
| | Mean | |
	Male	Female
Body Composition		
Height (cm)	166.8	153.9
Weight (kg)	67.0	55.5
Waist Circumference (cm)	85.4	79.0
BMI (kg/m^2)	24.1	23.5
Body Fat (%)	22.8	33.7
Muscle Mass (%)	48.3	34.1
Cardiovascular Endurance		
2-min Step Test (times)	99.3	92.6
Flexibility (Upper and Lower Body)		
Sit-and-reach Test on Chair (cm)	11.1	11.9
Back Scratch Left (cm)	15.5	9.8
Back Scratch Right (cm)	12.6	8.2
Muscular Fitness		
Handgrip Strength (Both Hands) (kg)	67.1	42.7
Arm Curl (rep)	15.5	13.2
Chair Stand Test (rep)	16.0	15.2
Agility and Balance		
8-Feet Up and Go (sec)	5.0	5.6
Single Leg Stance with Eyes Open (sec)	53.3	55.9

	Age: 70-79	
	Mean	
	Male	**Female**
Body Composition		
Height (cm)	164.6	152.6
Weight (kg)	64.7	55.0
Waist Circumference (cm)	86.9	81.4
BMI (kg/m^2)	23.9	23.7
Body Fat (%)	24.5	34.7
Muscle Mass (%)	46.0	33.4
Cardiovascular Endurance		
2-min Step Test (steps)	91.1	85.8
Flexibility (Upper and Lower Body)		
Sit-and-reach Test on Chair (cm)	11.2	10.0
Back Scratch Left (cm)	18.6	10.9
Back Scratch Right (cm)	15.2	9.7
Muscular Fitness		
Handgrip Strength (Both Hands) (kg)	59.2	39.9
Arm Curl (rep)	12.9	12.2
Chair Stand Test (rep)	13.6	13.3
Agility and Balance		
8-Feet Up and Go (sec)	6.0	6.8
Single Leg Stance with Eyes Open (sec)	25.1	23.9

6.3. **Prevalence of Obesity and Central Obesity**

34.2% of males and 23.7% of females had general obesity (defined by BMI > 25), and 26.6% of males and 34.3% of females had central obesity (waist circumference ≥ 90 cm for men; ≥80 cm for women). A high prevalence of central obesity was observed among females aged 40-59 years old and adults aged 60 or above.

		Obese II (BMI≥30.0)	Obese I (BMI 25-29.9)	Overweight (BMI 23-24.9)	Normal (BMI 18.5-22.9)	Underweight (BMI <18.5)
17-19	Male	6.5%	16.1%	20.4%	47.3%	9.7%
	Female	7.3%	9.1%	3.6%	61.8%	18.2%
20-39	Male	6.5%	25.8%	22.5%	41.7%	3.5%
	Female	3.3%	12.3%	15.3%	57.6%	11.4%
40-59	Male	5.3%	31.5%	27.0%	34.6%	1.6%
	Female	3.8%	18.3%	19.1%	54.0%	4.8%
60-69	Male	3.2%	32.0%	26.3%	36.6%	1.9%
	Female	6.2%	23.4%	20.6%	44.0%	5.7%
70-79	Male	2.2%	31.3%	26.0%	37.2%	3.4%
	Female	5.1%	27.7%	23.1%	38.1%	5.9%
Total	Male	4.9%	29.3%	25.1%	38.0%	2.7%
	Female	4.4%	19.3%	19.0%	50.5%	6.8%
	Both gender	4.6%	23.1%	21.3%	45.7%	5.2%

		Central Obesity (Waist circumferences ≥ 90 cm for men and ≥ 80 cm for women)	Normal
17-19	Male	15.1%	84.9%
	Female	10.9%	89.1%
20-39	Male	20.7%	79.3%
	Female	16.6%	83.4%
40-59	Male	27.3%	72.7%
	Female	31.1%	68.9%
60-69	Male	30.2%	69.8%
	Female	44.3%	55.7%
70-79	Male	38.5%	61.5%
	Female	57.2%	42.8%
Total	Male	26.6%	73.4%
	Female	34.3%	65.7%

6.4. Prevalence of Hypertension

Overall, 31.0% of males and 22.4% of females had hypertension (systolic blood pressure ≥ 140 mmHg, diastolic blood pressure ≥ 90 mmHg). A high prevalence of hypertension was observed among adults aged 60 or above.

		Hypertension (SBP≥ 140 mmHg or DBP ≥ 90 mmHg	Normal
17-19	Male	20.4%	79.6%
	Female	5.5%	94.5%
20-39	Male	18.6%	81.4%
	Female	6.5%	93.5%
40-59	Male	34.2%	65.9%
	Female	18.3%	81.7%
60-69	Male	40.2%	59.8%
	Female	34.0%	66.0%
70-79	Male	43.1%	56.9%
	Female	43.3%	56.7%
Total	Male	31.0%	69.0%
	Female	22.4%	77.6%

6.5. Physical Activity Level

Overall, 53.8% of adults did not meet the WHO PA recommendation (i.e., ≥ 150 minutes of MVPA per week). A high prevalence (~60%) of physical inactivity was observed among adults aged 20-59.

	Age Group					
	17-19	20-39	40-59	60-69	70-79	Total
Met the WHO recommended PA level						
Male						
No	34.9%	49.9%	61.0%	39.8%	32.1%	49.3%
Yes	65.1%	50.1%	39.0%	60.2%	67.9%	50.7%
Female						
No	59.6 %	67.8%	60.6%	47.9%	38.9%	56.8%
Yes	40.4 %	32.2%	39.4%	52.1 %	61.1%	43.2%
Total						
No	44.2%	59.2%	60.7%	44.5%	36.8%	53.8%
Yes	55.8%	40.8%	39.3%	55.5%	63.2%	46.2%

6.6. Favorite Sports and Major Barrier to Physical Activity

For 17–19 years old adults, the most favorable sport was ball games. For 20-39 years old men, the most favorable sport was running/jogging. For 20-79 years old women and 40-79 years old men, the most favorable sport was walking. Half the male adults aged 17-59 reported that "lack of time" and "feel tired" were barriers to engaging in PA, whereas "feel tired", "lazy", and "lack of time" were the main obstacles for the female adults from the age group of 17-59 years. Bad weather was the main barrier for the elderly (60-79 years old) to participate in physical activity.

6.7. Further Analysis

6.7.1. Compared to 2012 survey, the general obesity of current survey reduced, especially in age groups of 20-59 years-old men (reduced by 3.4 – 4.6%), and 40-

69 years-old women (reduced by 2.8 – 9.9%)。Central obesity (waist circumference) of 40-69 years-old men and women also reduced.

6.7.2. Adults who met the WHO PA recommendation perform significantly better in 1) body composition (i.e., lower body fat and higher muscular mass), 2) cardiovascular fitness (i.e., lower recovery heart rate in step test), 3) lower limb flexibility, 4) handgrip strength, 5) core muscular strength and endurance, 6) lower limb power, and 7) balance (i.e., lower time in single leg stance with eyes closed).

6.7.3. Men have significant greater 1) muscle mass, 2) step test performance, 3) lower body flexibility, 4) all muscular fitness parameters, and 5) agility, while girls have better upper body flexibility. Moreover, girls have less 1) BMI, 2) waist circumference, 3) body fatness, and 4) blood pressure. Younger adults have better physical fitness than those with older age.

6.8. Recommendation

6.8.1. Adults in the current survey typically had worse balance than respondents from 2012. Therefore, additional balance exercises should be provided to this generation of adults.

6.8.2. We recommended several suggestions for stakeholders to organize more community-based physical fitness tests for adults to monitor their fitness levels: 1) establish self-test fitness corners near exercise venues. The tests should be easy for citizens to conduct (test examples: electric blood pressure, height and weight scales with BMI chart, Bioelectrical impedance analysis for body fat measurement, handgrip, and sit-and-reach), 2) organize regular fitness test workshops led by trained testers, and 3) provide physical fitness consultation service, to improve the citizen's fitness via appropriate exercise prescription recommended by well-trained fitness professional. Furthermore, we suggest providing more home-based physical tests for adults to monitor their physical fitness level. An online physical fitness norm table could also enhance the feasibility for adults to assess and review their fitness levels.

6.8.3. A high prevalence of central obesity and hypertension was observed in the older age population. We suggested stakeholders launch a series of exercise programs

to manage obesity and hypertension, and to promote the awareness and concept of "Exercise-is-Medicine".

6.8.4. Intriguingly, most of the age and gender groups with a high prevalence of physical inactivity were interested in walking, running, yoga, or stretching. We recommended that stakeholders should organize more exercise courses or workshops based on the abovementioned favorite type of exercise, such as the QualiWalk program (優質健行), body and mind relaxation class (身心伸展), and running course. Moreover, "lack of time" was the commonly cited barrier for adults to participate in physical activity. We recommended that stakeholders collaborate to offer more online or video-based training courses to people with little time for physical activity.

7. Conclusion

7.1 This study provides the government and relevant sports promotion stakeholders with the latest physical fitness data of Hong Kong citizens, which serves as a reference for them to develop targeted policies in the future. Moreover, publishing the research results can also allow the public to understand the current physical fitness level of Hong Kong citizens and the importance of regularly participating in sports and physical activities.

7.2 The previous citywide physical fitness test was conducted ten years ago. Most of the physical fitness parameters have improved across different age groups. This improvement may be attributed to the sports atmosphere and awareness in Hong Kong over the past decade. In recent years, Hong Kong athletes have achieved success in various international competitions, and relevant stakeholders have actively promoted various programs for regular physical activities, which have positively contributed to improving the physical fitness of Hong Kong citizens. However, physical fitness can decline if not continuously maintained, and we still need to work on various community physical activity promotion programs, provide appropriate sports activities based on the physical conditions and exercise preferences of different age groups and genders, and support athlete training and

professional development through hosting large-scale events. Moreover, we need to educate the public on the benefits of regular exercise and understand that "exercise is medicine", particularly in weight control, preventing osteoporosis and sarcopenia, and treating and preventing various chronic diseases, all of which have a positive impact on improving the overall sports atmosphere of society.

7.3 The data shows that the higher the participation in physical activity, the better the physical fitness. However, more than half of adults and young people have not met the World Health Organization's standards for physical activity, and over 60% of children have not met the standards. Therefore, promoting nationwide physical activity is crucial for improving physical fitness. Policy makers in education, healthcare, business, social institutions, and other fields should consider promoting physical activity one of their important goals.

7.4 To increase public awareness of physical activity and physical fitness improvement, it is recommended to use different media channels, such as news releases, social media, interviews, websites, and documentaries, to share the key findings and recommendations of the research report with the public. This will help them understand Hong Kong citizens' current physical fitness levels.

7.5 Through different promotional channels, such as dedicated webpages, video productions, and touring exhibitions, the public can be educated on the "Physical Activity Guidelines." This includes children and adolescents engaging in at least 60 minutes or more of MVPA daily, and adults accumulating at least 150 minutes of MVPA per week. Individuals who meet these guidelines can gradually increase their level of physical activity and eventually establish regular exercise habits.

7.6 Using big data to develop simple self-assessment methods for physical fitness levels based on different age groups, allowing citizens to monitor their physical fitness levels at any time; or designing mobile applications to record their daily physical activity levels, thereby increasing the database of data.

7.7 It is warranted to evaluate the physical fitness of Hong Kong citizens regularly. We recommend conducting territory-wide physical fitness surveys every five years and conducting longitudinal studies to gain an in-depth understanding of the relationship between physical activity habits and physical fitness levels.

7.8 It is noteworthy that this is a cross-sectional survey. Except for the actual descriptive statistics, the interpretation of the results was based on correlation, not causal relationships. For example, this study found that higher education levels are associated with lower physical activity. However, this is only a correlation, not a causal relationship.

The End