



2022년 대한임상건강증진학회  
추계학술대회

# 신체활동량 증진을 위한 웨어러블 디바이스 활용 방안

박세정 (한국스포츠정책과학원)



대한임상건강증진학회  
Korean Society for Health Promotion and Disease Prevention





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## 신체활동의 다양한 이점

건강, 사회, 경제적 편익 제공



신체적, 정신적 건강 증진  
삶의 질 제고  
학업성취, 청소년 성장발달  
여성의 권리 옹호  
생산성 향상, 의료비 감소  
불평등 감소  
사회 통합  
환경 보호

World Health Organization, 2018



## 신체활동 선택 → 필수

전 세계인의 사망 위험요인 4위

	Risk factor	Deaths (millions)	Percentage of total
<b>World</b>			
1	High blood pressure	7.5	12.8
2	Tobacco use	5.1	8.7
3	High blood glucose	3.4	5.8
4	Physical inactivity	3.2	5.5
5	Overweight and obesity	2.8	4.8
6	High cholesterol	2.6	4.5
7	Unsafe sex	2.4	4.0
8	Alcohol use	2.3	3.8
9	Childhood underweight	2.2	3.8
10	Indoor smoke from solid fuels	2.0	3.3

World Health Organization, 2009

### 신체활동 부족

(physical inactivity)으로 인해

- 조기사망 9%
- 유방암 10%
- 대장암 10%
- 당뇨병 7%
- 관상동맥질환 6%

Lee et al., 2012; Lancet



# 체력 수준에 따른 의료비 차이

Table 4. The association between the levels of cardiorespiratory fitness and healthcare utilization and costs in the next year

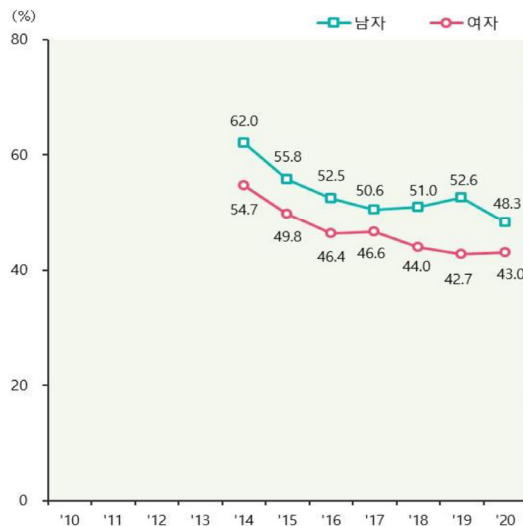
Variables	Group	N	Total				Inpatient				Outpatient			
			Mean	SD	beta	p	Mean	SD	beta	p	Mean	SD	beta	p
Number of visits	Low risk	877	12.58	13.50	1		0.10	0.36	1		12.49	13.38	1	
	Middle risk	660	14.20	15.66	0.686	.315	0.15	0.59	0.050	.070	14.05	15.50	0.641	.348
	High risk	243	17.94	17.94	2.890	.003*	0.22	0.63	0.118	.002*	17.72	17.74	2.804	.003*
Visit days	Low risk	877	12.98	14.25	1		0.50	2.46	1		12.48	13.39	1	
	Middle risk	660	14.84	16.81	0.920	.224	0.80	3.58	0.259	.126	14.04	15.50	0.635	.347
	High risk	243	18.78	19.51	3.177	.003*	1.07	3.70	0.479	.044*	17.72	17.74	2.807	.003*
Treatment days	Low risk	877	15.89	29.23	1		1.02	4.41	1		14.87	28.34	1	
	Middle risk	660	19.25	33.79	3.052	.029*	1.69	6.93	0.649	.052	17.56	31.37	2.422	.055
	High risk	243	29.41	59.95	4.534	.021*	2.47	8.37	1.363	.004*	26.94	58.16	3.372	.057
Prescription days	Low risk	877	111.98	178.82	1		-	-	-		-	-	-	
	Middle risk	660	146.48	193.57	6.710	.274	-	-	-		-	-	-	
	High risk	243	173.85	210.48	27.215	.002*	-	-	-		-	-	-	
Healthcare costs	Low risk	877	394,067	709,350	1		69,510	296,071	1		312,899	553,224	1	
	Middle risk	660	556,456	1,395,995	173,016	.006*	201,468	592,750	85,765	.030*	392,686	775,676	85,644	.012*
	High risk	243	780,783	1,811,269	324,840	<.001*	271,017	758,425	197,087	<.001*	503,624	1,218,951	114,520	.016*

Adjusted for BMI, income, healthcare utilization and healthcare costs in the previous year by multiple linear regression.

\*p<.05, \*\*p<.01.

이승희, 이효진, 오인환, 정현경, 이미현, 박세정(Exercise Science 2021)

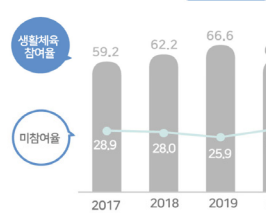
# 우리 국민의 유산소 신체활동 실천량 추이



출처: 2020 국민건강통계(보건복지부, 질병관리본부, 2022)

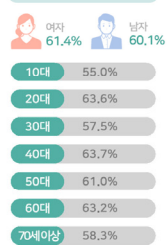
※ 유산소 신체활동 실천율: 일주일에 중강도 신체활동을 2시간 30분 이상 또는 고강도 신체활동을 1시간 15분 이상 또는 중강도와 고강도 신체활동을 섞어서(고강도 1분은 중강도 2분) 각 활동에 상당하는 시간을 실천한 비율  
만19세 이상 2005년 추계인구로 연령표준화

## 생활체육 참여율



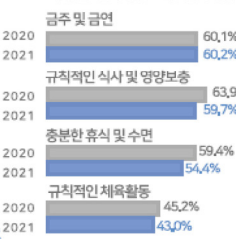
\* 생활체육 참여율: 주 1회 이상, 1회 운동 시 30분 이상 규칙적으로 생활체육에 참여한 비율

## 성/연령별 생활체육 참여율



## 건강 및 체력 유지를 위한 요인별 수행률

\* 수행률: 잘 수행함 + 매우 잘 수행함



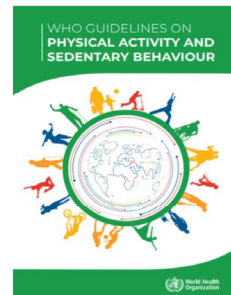
출처: 2021 국민생활체육조사(문화체육관광부)



## 운동의 건강 이점

소아, 청소년, 성인, 노인, 질환자, 장애인, 임산부

- 사망률, 심혈관질환 사망률 ↓
- 심혈관 질환(심장질환, 뇌졸중) ↓
- 암(대장암, 유방암, **폐암, 자궁암** 등)
- 고혈압, 제2형 당뇨병, 고지혈증 ↓
- 비만, 고혈압, 고지혈증 관련 위험요인 ↓
- 체력(심폐 능력, 근력 & 근지구력)
- **치매 ↓, 우울, 불안 ↓**
- **인지 기능 ↑**
- **수면 ↑**
- 일상생활에서 기능적 능력 ↑, 삶의 질 ↑
- 뼈 건강, 체중관리
- 넘어짐 또는 넘어짐 손상 ↓
- **관절염 통증 ↓**



## Move More and Sit Less

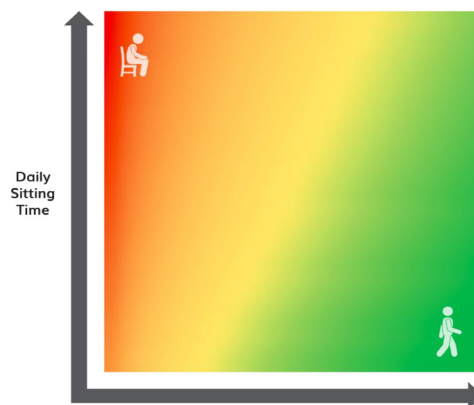
좌식습관(Sedentary behavior)의 위험성

- 모든 원인의 사망률
- 심혈관계 질환 사망률
- 심혈관계 질환
- 제2형 당뇨병
- 대장암, 자궁암, 폐암



<https://edition.cnn.com/cnn-underscored/electronics/apple-watch-activity>

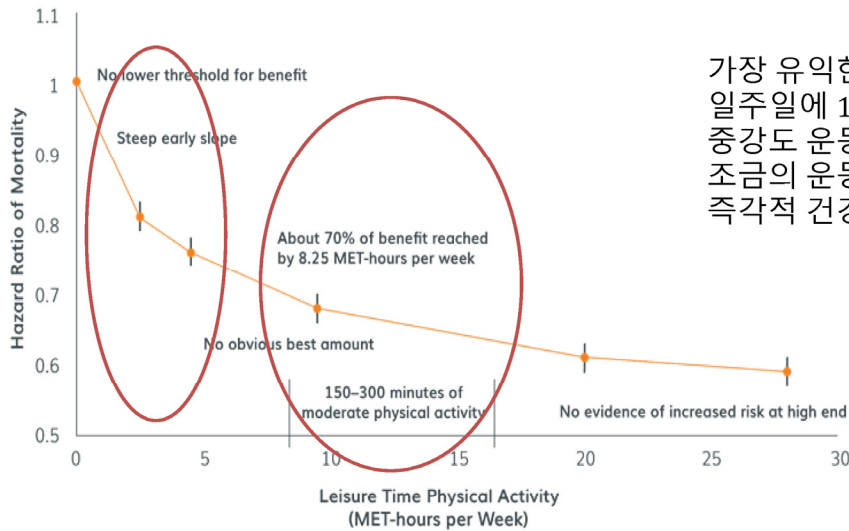
Relationship Among Moderate-to-Vigorous Physical Activity, Sitting Time, and Risk of All-Cause Mortality in Adults



Risk of all-cause mortality decreases as one moves from red to green.

(U.S. Department of Health and Human Services, 2018)

## 건강관리(사망률) 감소를 위한 운동량



가장 유익한 운동량:  
일주일에 150-300분  
중강도 운동  
조금의 운동도 유익  
즉각적 건강 이득

(U.S. Department of Health and Human Services, 2018)

## 건강관리를 위한 운동 인포그래픽

### EVERY MOVE COUNTS

Being active has significant health benefits for hearts, bodies and minds, whether you're walking, wheeling or cycling, dancing, doing sport or playing with your kids.



WHO guidelines on physical activity and sedentary behaviour (2020).  
For more information, visit: [www.who.int/health-topics/physical-activity](http://www.who.int/health-topics/physical-activity)

LET'S Be active  
Everyone Everywhere Everyday

World Health Organization

## 신체활동 참여 증진을 위한 중재 방법

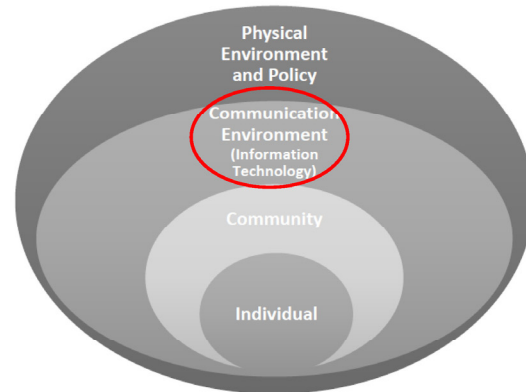
### 2018 Physical Activity Guidelines Advisory Committee Scientific Report

To the Secretary of Health and Human Services

Physical Activity Definition : any bodily movement produced by skeletal muscles that results in energy expenditure

- Occupational physical activity
- Transportation physical activity
- Household physical activity
- **Leisure-time physical activity**

Figure F11-1. Social Ecological Framework

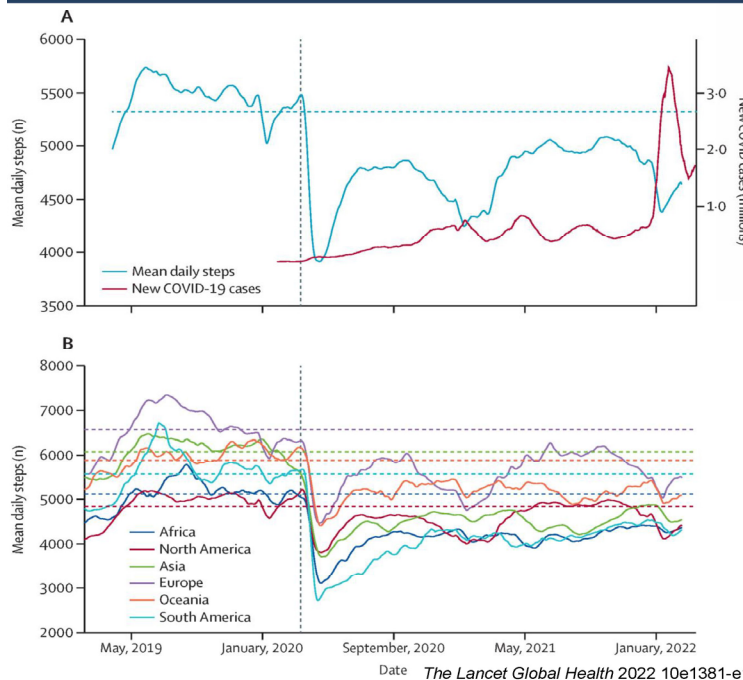


Source: Adapted from data found in Napolitano et al., 2013.<sup>3</sup>

**ICT can be employed in interventions emanating from the other levels impact**

2018 Physical Activity Guidelines Advisory Committee Scientific Report

## Physical Activity since COVID-19 Onset



**Figure: Worldwide physical activity in the 2 years since COVID-19 onset**

(A) Global mean daily step count.  
(B) Mean daily step counts by continent. Dotted lines indicate mean baseline step count by region, calculated from Jan 1, 2019–Dec 31, 2019. Vertical black line denotes March 11, 2020, when COVID-19 was declared a global pandemic. All values are plotted by region over a rolling 10-day averaged window for smoothness. Mean pre-pandemic steps per day by continent: Africa=5111, North America=4838, Asia=6072, Europe=6565, Oceania=5881, and South America=5563



# 2022 Fitness 트렌드

ACSM's  
HEALTH & FITNESS JOURNAL



## 1. Wearable technology

Wearable technology has been the no. 1 trend since it was first introduced on the survey in 2016, except for 2018 (no. 3) and 2021 (no. 2). This trend includes fitness or activity trackers, smart watches, heart rate monitors, and GPS tracking devices. Examples include fitness and activity trackers like those manufactured by Polar®, Fitbit®, Wyze®, Whoop®, Samsung®, Jawbone®, Misfit®, Garmin®, Coros®, and Apple®. These devices can be used as a step counter and can track heart rate, body temperature, calories, sitting time, sleep time, and much more. Initially, there was some question of wearable technology accuracy, but these issues have seemed to be resolved well enough that it has been estimated to be about a US \$100 billion industry. New innovations include blood pressure, oxygen saturation, body temperature, respiratory rate, and electrocardiogram.

(Thompson, 2022)

TABLE 2: Top 20 Worldwide Fitness Trends for 2022

Rank	Top 20 Worldwide Fitness Trends for 2022
1	Wearable technology
2	Home exercise gyms
3	Outdoor activities
4	Strength training with free weights
5	Exercise for weight loss
6	Personal training
7	High Intensity Interval Training
8	Body weight training
9	Online live and on-demand exercise classes
10	Health/wellness coaching
11	Fitness programs for older adults
12	Exercise is Medicine
13	Employing certified fitness professionals
14	Functional fitness training
15	Yoga
16	Mobile exercise apps
17	Online personal training
18	Licensure for fitness professionals
19	Lifestyle medicine
20	Group exercise training

The response rate was 3.5% with a total of 4,546 responses.

## 웨어러블 기기로 인한 다양한 스포츠 인식 기능 확대



Our top picks feature a user-friendly design and reliable tracking. Photography by Jeff Westbrook for Buy Side from WSJ. Styling by Miki Kato for Buy Side from WSJ.

<https://www.wsj.com/buyside/wellness/best-fitness-trackers-01653427911>

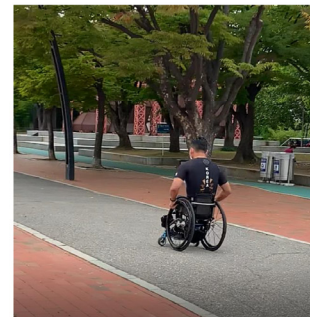


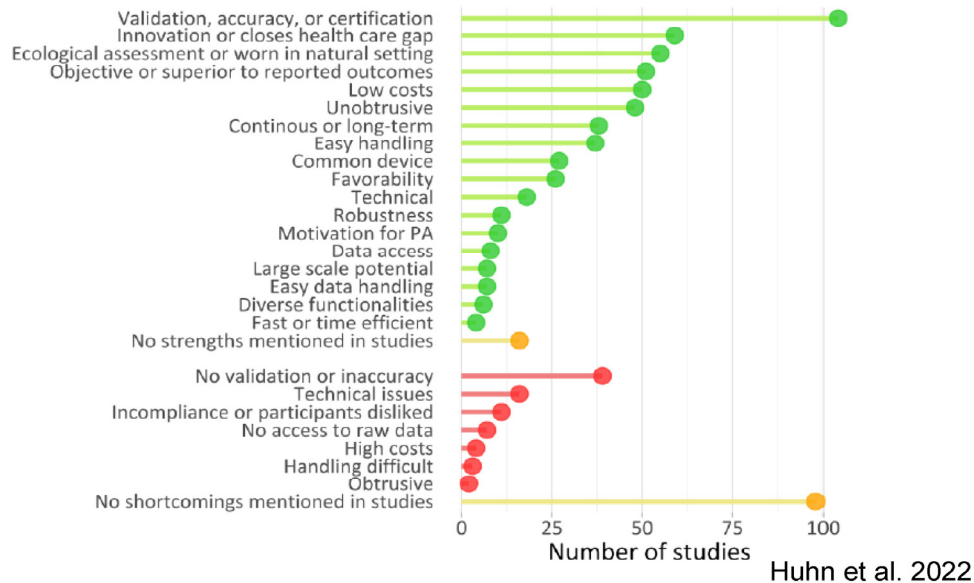
Table 1. Characteristics of studies.

Study characteristics	Studies (N=179), n (%)	Participants (N=10,835,733), n (%)
Year of publication		

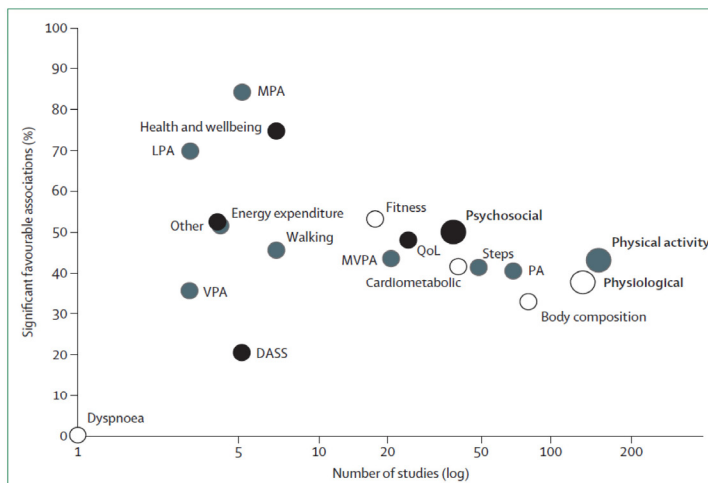
Table 2. Characteristics of wearable devices.

Wearable characteristics	Studies (N=189), n (%)	Participants (N=11,244,872), n (%)
--------------------------	------------------------	------------------------------------

Figure 7. Chart of reported strengths and weaknesses of wearables as mentioned by authors. PA: physical activity.



## Effectiveness of wearable activity trackers to increase physical activity and improve health: a systematic review of systematic reviews and meta-analyses



ward O'Connor,



systematic review of  
f activity trackers for  
cal and non-clinical  
ie Cochrane Library,  
vs of primary studies  
ychosocial outcomes  
ed, reporting results  
i. Taken together, the  
n difference [SMD]  
tely 1800 extra steps  
ht. Effects for other  
l (quality of life and  
ffective at increasing  
enefit is clinically  
lence to recommend  
potential to improve

Lancet Digit Health 2022;  
4: e615-26  
Alliance for Research in  
Exercise, Nutrition, and  
Activity, University of South  
Australia, Adelaide, SA,  
Australia  
(T Ferguson BPhysio Hons,  
Prof T Olds PhD, R Curtis PhD,  
H Blake BHealthSc Hons,  
A J Crozier PhD, K Dankiw MRes,  
D Dumuid PhD, D Kacai MResch,  
E O'Connor BPsych Hons,  
R Virgara PhD, Prof C Maher PhD)  
Correspondence to:  
Prof Carol Maher, Alliance for  
Research in Exercise, Nutrition,  
and Activity, University of South  
Australia, Adelaide 5000, SA,  
Australia  
carol.maher@unisa.edu.au

Figure 4: Relationship between the percentage of studies showing significant favourable associations and the total number of included studies, for reviews that did not use meta-analysis  
The larger dots indicate lumped values for the overall categories of physical activity outcomes, physiological outcomes, and psychosocial outcomes. DASS=Depression, Anxiety and Stress Scale. LPA=light physical activity. MPA=moderate physical activity. MVPA=moderate-to-vigorous physical activity. PA=physical activity. QoL=quality of life. VPA=vigorous physical activity.

## Circulation

## AHA SCIENTIFIC STATEMENT

## Supporting Physical Activity in Patients and Populations During Life Events and Transitions: A Scientific Statement From the American Heart Association

Table 1. Physical Activity Guidelines for Americans and Corresponding Steps per Day Estimates

Activity guidelines	Preschool-aged children (3–5 y)	Children and adolescents (6–17 y)	Adults (18–65 y)	Older adults (65+ y)*
2018 Physical Activity Guidelines	Should be physically active throughout the day to enhance growth and development. Adult caregivers of preschool-aged children should encourage active play that includes a variety of activity types.	60 min (1 h) or more of moderate-to-vigorous physical activity daily. This should include muscle strengthening 3 d/wk and bone strengthening activities 3 d/wk	At least 150–300 min/wk of moderate-intensity, or 75–150 min/wk of vigorous-intensity aerobic physical activity, or an equivalent combination. Plus, muscle-strengthening exercise 2 d/wk.†	At least 150–300 min/wk of moderate-intensity, or 75–150 min/wk of vigorous-intensity aerobic physical activity, or an equivalent combination. Should include multicomponent physical activity that includes balance, aerobic, and muscle-strengthening activities
Estimated minimal number of steps per day from wearable activity monitors‡	≥10 000 steps/d	≥10 000 steps/d	≥7000 steps/d	≥7000 steps/d

\*Adults with chronic health conditions or disabilities, who are able, should follow the same recommendations as adults/older adults. When adults with chronic conditions or disabilities are not able to meet these guidelines, they should engage in regular physical activity according to their abilities and should avoid inactivity.<sup>3</sup>

†Pregnant and postpartum women should do at least 150 minutes of moderate-intensity aerobic activity. Vigorous-intensity activity can be performed if habitually engaged in pre-pregnancy.<sup>4</sup>

‡Steps per day estimations are based on preliminary research findings based on norm-referenced assessment of how many steps would be equivalent to the recommended amounts of moderate-vigorous physical activity and are not a part of the 2018 Physical Activity Guidelines.<sup>5–7</sup>

## 요 약

- 신체활동량 증가를 위한 웨어러블 기기 활용
  - 최근 다수의 과학적 근거 제시
- 신체활동 증가를 위한 웨어러블 기기 활용 시 고려사항
  - 제품 및 변인의 정확도(걸음수, 심박수 등)
  - 결과 지표 선정(신체활동량, 운동시간 등)
  - 혈압, 체중, 혈중 지질 등 건강 변인
  - 추가 사항 : 목표설정 및 행동전략 접목 등