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Weekend warrior physical activity engagement and the risk of mental health conditions: A systematic review and narrative synthesis

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Citation:

Characteristics	Hamer et al., 2017	Chen et al., 2023	Liang et al., 2023	Li et al., 2024	Min et al., 2024	Seol et al., 2024	Yang et al., 2024	Andersen et al., 2025	Chen et al., 2025	de Victo et al., 2025	Liu et al., 2025	Xu et al., 2025
Years of the study	1994-2004	2007-2018	2007-2020	2007-2018	2013-2022	2018	2013-2022	2013-2022	2007- 2012	2008-2022	2013-2022	2011–2014
Country	UK	US	US	US	UK	Japan	UK	UK	US	Brazil	UK	US
Study design	Cross-sectional	Cross-sectional	Cross-sectional	Cross-sectional	Prospective Cohort	Cross-sectional	Prospective Cohort	Prospective Cohort	Cross-sectional	Cross-sectional	Prospective Cohort	Cross-sectional
Name of cohort/survey	HSE & SHS survey	NHANES	NHANES	NHANES	UK Biobank	Original survey	UK Biobank	UK Biobank	NHANES	Preventive Medicine Center of the Hospital Israelita Albert Einstein	UK Biobank	NHANES
No. of participants	108,011	21,125	23,258	1,803	75,629	8,247	79,243	74,715	13,740	29,907	84,570	6,080
Age range	NA	>20	>20	>20	43-79	20-64	NA	40-69	20-80	≥18	37-73	18-80
Mean age (years)	47±17	NA	45.49 ± 0.27	NA	61.8 ± 7.9	NA	62.0 ± 7.9	55.2 ± 7.8	47.04 ± 16.75	44.48 ± 9.52	56.2 ± 7.8	49.13 ± 18.26
Males (%)	46.50%	51.23%	52.30%	43%	44.60%	55.40%	45.30%	42%	48.84%	71.2%	44.50%	48%
Method for measuring PA levels	Original questionnaire	NHANES-PA questionnaire	NHANES-PA questionnaire	NHANES-PA questionnaire	Wrist-worn accelerometer	WLAQ questionnaire	Wrist-worn accelerometer	Wrist-worn accelerometer	GPAQ questionnaire	IPAQ-LF questionnaire	Wrist-worn accelerometer	Wrist-worn accelerometer
PA Quantification	Moderate PA: 3.0–5.9 METs; Vigorous PA: ≥6.0 METs	Total PA duration (minutes per week): 2 × vigorous + moderate	A questionnaire with four questions to determine the frequency, duration, and intensity of leisure-time PA.	Calculate weekly activity volume by multiplying MET values (4 for moderate OPA/RPA and TPA, 8 for high OPA/RPA) by total PA minutes. Total PA is the sum of OPA, TPA, and RPA.	Accelerometers recorded acceleration at 100 Hz (±8 g) in 5-s epochs; Daily MVPA proportion converted to minutes using a machine learning-based classification.	A questionnaire with three questions to determine the frequency, duration, and intensity of PA on workdays or free days	Accelerometers recorded acceleration at 100 Hz (±8 g) in 5-s epochs; Daily MVPA proportion converted to minutes using a machine learning-based classification	Accelerometers recorded continuous acceleration at 100 Hz, ±8 g dynamic range, segmented into 5-s epochs; MVPA measured as minutes/week at ≥100 milligravities	Total PA duration (minutes per week): 2 × vigorous + moderate	The questionnaire investigates volume of leisure-time PA (time spent) and the intensity (light, moderate, and vigorous)	Accelerometers recorded continuous acceleration at 100 Hz, ±8 g dynamic range, segmented into 5-s epochs; MVPA measured as minutes/week at ≥100 milligravities	Physical activity was measured using the ActiGraph GT3X+ wristworn triaxial accelerometer (ActiGraph Corp., Pensacola, FL; 80 Hz sampling frequency)

Definition of WW	≥150 min/wk moderate PA or 75 min/wk vigorous PA or combination of both	<3 sessions/wk & ≥150 min/wk moderate or ≥75 min/wk vigorous or combination of both	At least 150 min MPA or 75 min VPA, 1-2 sessions/wk or combination of both	1-2 times/wk, RPA ≥600 MET min/wk	At least 150 min/wk (Moderate) or 75 min/wk (Vigorous); 1-2 d/w or or combination of both	Met or surpassed MVPA threshold (150min/wk), ≥ 50% of total MVPA on any or consecutive 1–2 days	MVPA ≥150 min/wk; ≥50% total MVPA on 1-2 days	MVPA ≥150 min/wk; ≥50% total MVPA on 1-2 days	≥150 min/wk moderate PA or 75 min/wk vigorous PA or combination of both	MVPA ≥150 min/week concentrated on 1–2 days	MVPA ≥150 min/wk and ≥50 % of total MVPA over 1–2 days	MVPA ≥150 min/wk and ≥50 % of total MVPA over 1–2 days
Type of physical activity exposure	MVPA	MVPA	MVPA	MVPA	MVPA	MVPA	MVPA	MVPA	MVPA	MVPA	MVPA	MVPA
Subgroups classification	IA, ISA, WW, RA	IA, ISA, WW, RA	IA, ISA, WW, RA	IA, ISA, WW, RA	IA, WW, RA	IA, ISA, WW, RA	IA, WW, RA	ISA, WW, RA	IA, ISA, WW, RA	Not meeting PA Recommendation, WW, RA	IA, WW, RA	IA, ISA, WW, RA
No. of participants with WW pattern (%)	8,921 (8.25%)	397 (1.91%)	1,042 (4.5%)	54 (2.9%)	29,973 (39.6%)	220 (2.6%)	34,955 (44.1%)	29,994 (40.1%)	607 (4.41%)	729 (2.4%)	36,625 (43.3 %)	1814 (29.84%)
Outcome	Common mental disorder	Depression	Depression	Depression	Depressive & anxiety disorders, bipolar disorder	Depression	Depression and anxiety	Depression	Anxiety	Depressive symptoms	Depression and anxiety	Depression
MHI assessment	GHQ-12 > 3	PHQ-9 ≥10	PHQ-9 ≥10	PHQ-9 ≥10	ICD 10 codes: F32, F33	CES-D >16 points	ICD 10 codes: F32–F33 F40-48	ICD 10 codes: F32.0, F32.1, F32.2, F32.3, F32.4, F32.5, F32.89, F32.9, and F32.A	NHANES-related questionnaire	BDI-II ≥14	Depression: ICD-10 F32-F33/ Anxiety: ICD-10 F40-F48	PHQ-9 ≥10

Main findings on the relation of WW and MHI	WW and RA: Comparable associations with lower risk of psychological distress compared to IA	WW and RA: Comparable associations with lower depression risk compared to IA	WW and RA: Comparable associations with lower depression risk compared to IA	Only RA had a significant relationship with lower reduced risk of depression	WW and RA: Comparable associations with lower depression and anxiety risk compared to IA	WW and RA: Comparable associations with lower depression risk compared to IA	WW and RA: Comparable associations with lower depression and anxiety risk compared to IA	WW and RA: Comparable associations with lower depression risk compared to IA	WW and RA: Comparable associations with lower anxiety risk compared to IA	WW was not associated with depressive symptoms, while RA was associated with lower odds	WW and RA: Comparable associations with lower depression and anxiety risk compared to IA	WW and RA: Comparable associations with lower depression risk compared to IA
Covariates adjusted	Age, sex, smoking, class, BMI, illness	Gender, age, race, education, income, BMI, smoking, CVD, diabetes, hypertension	Age, gender, race, education, marital status, BMI, PIR, smoking, alcohol, SB, sleep	Age, gender, race, marital status, education, poverty, smoking, alcohol, BMI, chronic diseases	Age, sex, ethnicity, TDI, education, smoking, alcohol, diet, sleep, BMI, health history	Age, sex, BMI, marital status, smoking, drinking, medication, sleep, occupation	Age, sex, ethnicity, tobacco, TDI, alcohol, education, employment, health, diet, BMI	Age, sex, race, tobacco, TDI, alcohol, employment, health, diet, BMI	Gender, age, race/ethnicity, education level, marital status, PIR, BMI, smoking status, alcohol status, sleep duration, hypertension, depression and diabetes	Sex, age, sedentary behavior, BMI, smoking status, drinking status, perceived stress, HbA1c, total cholesterol, hypertension, diabetes mellitus, dyslipidemia, lower urinary tract symptoms	Age, sex, ethnicity, educational level, BMI, socioeconomic status, smoking status, alcohol consumption frequency, diet, sleep, type 2 diabetes history, and CVD history	Age, sex, race/ethnicity, education level, marital status, income level, BMI, smoking status, alcoholism, and sedentary time.

Notes: BDI-II: Beck Depression Inventory-II, BMI: Body Mass Index, CES-D: Center for Epidemiologic Studies Depression Scale, CVD: Cardiovascular Disease, GHQ-12: General Health Questionnaire-12, HSE: Health Survey for England, IA: Inactive, ICD 10: International Classification of Diseases, 10th Revision, ISA: Insufficiently Active, MET: Metabolic Equivalent of Task, MHI: Mental Health Issues, MVPA: Moderate to Vigorous Physical Activity, NHANES: National Health and Nutrition Examination Survey, OPA: Occupational Physical Activity, PA: Physical Activity, PHQ-9: Patient Health Questionnaire-9, PIR: Poverty Income Ratio, RA: Regularly Active, RPA: Recreational Physical Activity, SB: Sedentary Behavior, SHS: Scottish Health Survey, TDI: Townsend Deprivation Index, TPA: Transportation-related Physical Activity, WLAQ: Work and Leisure Activity Questionnaire, WW: Weekend Warrior