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**MODELO EXPLICATIVO DE LA ACTIVIDAD FÍSICA INCIDENTAL EN
ESTUDIANTES UNIVERSITARIOS DESDE LA PSICOLOGÍA DEL EJERCICIO**

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PUBLICACIONES

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RESUMEN

Introducción: La promoción de la actividad física incidental puede ayudar a reducir los estilos de vida sedentarios y la inactividad física. Aunque la Psicología del Ejercicio propone variables explicativas para la actividad física, se desconocen modelos explicativos de la actividad física incidental en estudiantes universitarios que integre rasgos de personalidad, motivación y actitudes implícitas. **Objetivo:** Evaluar un modelo explicativo hipotético de la actividad física incidental en estudiantes universitarios basado en rasgos de la personalidad, motivación y actitudes implícitas hacia la actividad física incidental. **Metodología:** La tesis doctoral se articula en tres estudios. Estudio I, una revisión de alcance que sintetizó el concepto de actividad física incidental. Estudio II, una adaptación y análisis psicométrico del Cuestionario de Regulación de la Conducta hacia el Ejercicio Físico (BREQ-3) para medir la motivación hacia la actividad física incidental. Estudio III, un diseño explicativo transversal con variables latentes, analizadas mediante modelo de ecuaciones estructurales, en 223 estudiantes ($21,13 \pm 2,03$ años; 63,67 % mujeres). Donde se midieron rasgos de personalidad (Cuestionario de los Cinco Grandes), motivación (BREQ-3 adaptado), actitudes implícitas (Tarea de Asociación Implícita), y actividad física incidental mediante acelerómetros. **Resultados:** El Estudio I sintetizó la evidencia disponible sobre la actividad física incidental y se propuso una conceptualización. El Estudio II informó adecuadas propiedades psicométricas de la adaptación del BREQ-3 para medir la motivación hacia la actividad física incidental. El Estudio III informó efectos directos positivos de la extroversión ($\beta = 4,89, p < ,001$) y la motivación autónoma ($\beta = 3,11, p = ,002$), y un efecto directo negativo de la apertura a la experiencia ($\beta = -3,51, p < ,001$). La amabilidad y la responsabilidad tuvieron un efecto indirecto positivo a través de la motivación autónoma ($\beta = 2,72, p = ,006$; $\beta = 2,96, p = ,003$), y el neuroticismo tuvo un efecto indirecto negativo ($\beta = -2,65, p = ,008$). **Conclusión:** La extroversión, apertura a la experiencia, amabilidad y responsabilidad junto con la motivación autónoma explican la actividad física incidental. Una promoción eficaz de esta actividad debe considerar rasgos de la personalidad y la motivación autónoma. Futuras investigaciones deberán replicar este modelo para evaluar su causalidad.

Palabras clave: actividad física incidental; universitarios; personalidad; teoría de la autodeterminación; actitudes implícitas; SEM.

ABSTRACT

Introduction: Promoting incidental physical activity can help reduce sedentary lifestyles and physical inactivity. Although exercise psychology proposes explanatory variables for physical activity, there are no known explanatory models of incidental physical activity in university students that integrate personality traits, motivation, and implicit attitudes. **Objective:** To evaluate a hypothetical explanatory model of incidental physical activity in university students based on personality traits, motivation, and implicit attitudes toward incidental physical activity. **Methodology:** This doctoral thesis is structured into three studies. Study I, a scoping review that synthesised the concept of incidental physical activity. Study II, an adaptation and psychometric analysis of the Behavior Regulation Toward Physical Exercise Questionnaire (BREQ-3) to measure motivation for incidental physical activity. Study III, a cross-sectional explanatory design with latent variables, was analysed using structural equation modelling in 223 students (21.13 ± 2.03 years; 63.67% women). Personality traits (Big Five Questionnaire), motivation (adapted BREQ-3), implicit attitudes (Implicit Association Task), and incidental physical activity were measured using accelerometers. **Results:** Study I synthesised the available evidence on incidental physical activity and proposed a conceptualisation. Study II reported adequate psychometric properties of the adapted BREQ-3 to measure motivation towards incidental physical activity. Study III reported positive direct effects of extraversion ($\beta = 4.89, p < 0.001$) and autonomous motivation ($\beta = 3.11, p = 0.002$), as well as a negative direct effect of openness to experience ($\beta = -3.51, p < 0.001$). Agreeableness and conscientiousness had a positive indirect effect through autonomous motivation ($\beta = 2.72, p = 0.006$; $\beta = 2.96, p = 0.003$), and neuroticism had a negative indirect effect ($\beta = -2.65, p = 0.008$). **Conclusion:** Extraversion, openness to experience, agreeableness, and conscientiousness, along with autonomous motivation, explain incidental physical activity. Effective promotion of this activity should consider personality traits and autonomous motivation. Future research should replicate this model to assess its causality.

Keywords: Incidental physical activity; university students; personality; self-determination theory; implicit attitudes; SEM.

INTRODUCCION

La presente tesis doctoral adopta el formato de tesis por artículos, conformada por tres estudios complementarios que, articulados entre sí, aportan evidencia empírica y teórica sobre los determinantes psicológicos de la actividad física incidental en estudiantes universitarios. El Estudio I consistió en una revisión de alcance que sintetiza el concepto y los comportamientos de la actividad física incidental en la literatura existente. Dada la heterogeneidad de su definición, resultó fundamental proponer una definición derivada de una revisión sistemática de la literatura, para orientar el proceso de medición objetiva de la actividad física incidental propuesto en el Estudio III. El Estudio II es una adaptación y análisis de las propiedades psicométricas del instrumento de motivación hacia el ejercicio físico adaptado para la actividad física incidental que se utilizó en el Estudio III. El Estudio III, un diseño explicativo transversal con variables latentes de actividad física incidental en estudiantes universitarios, diseñado para dar cumplimiento al objetivo general y específicos, y probar las hipótesis de la presente tesis.

La tesis doctoral se organiza en seis secciones. Primero, El Planteamiento del Problema, donde se presentan los antecedentes sobre la actividad física incidental y sus variables explicativas desde la perspectiva de la Psicología del Ejercicio que argumentan la pregunta de investigación de la presente tesis doctoral. Segundo, los Antecedentes Teórico-Empíricos, donde se proporcionan antecedentes y describe las Teorías de Autodeterminación, de la Personalidad y Modelo de Procesamiento Dual Reflexivo-Impulsivo, al tiempo que revisa la literatura clave sobre actividad física incidental para fundamentar el modelo hipotético propuesto. Tercero, la Pregunta de Investigación, Objetivos e Hipótesis, donde se describe en detalle cada uno de estos elementos de la tesis doctoral. Cuarto, el Método General, que describe el diseño de investigación aplicado en los tres estudios que conforman la tesis. Quinto, los Resultados, incluye los tres estudios que compone la tesis, en su formato original en que fueron publicados o enviados. Y sexto, la Discusión y Conclusiones, donde se articulan los resultados de los tres estudios, y los contrasta con la evidencia existente y profundiza en los hallazgos del Estudio III que respaldan las hipótesis planteadas, para luego proponer las implicaciones y líneas de investigación futuras.

1. PLANTEAMIENTO DEL PROBLEMA

La prevalencia mundial de inactividad física en adultos es del 31,30 %, es decir, casi un tercio de la población no cumple la recomendación de la Organización Mundial de la Salud (OMS) de 150 - 300 minutos semanales de actividad moderada o 75–150 minutos de actividad vigorosa (Bull et al., 2020; Strain et al., 2024). Los beneficios de aumentar la actividad física están ampliamente documentados tanto en la salud como en el bienestar (Dempsey et al., 2021; Díaz-Martínez et al., 2018; Kraus et al., 2019; Lacombe et al., 2019; Zhao et al., 2020). Sin embargo, el periodo de transición a la adultez ha sido caracterizado por estilos de vida poco saludables. Por ejemplo, en estudiantes universitarios se informa entre 7 a 14 horas diarias en conductas sedentarias, como estar sentados o recostados (Castro et al., 2020; Kwan et al., 2012; Moulin et al., 2021; Pengpid et al., 2015). En este sentido, presentar elevados niveles de sedentarismo resulta perjudicial incluso en quienes alcanzan las recomendaciones mínimas de actividad física semanal (Ekelund et al., 2016, 2019; Panahi & Tremblay, 2018; Thakkar et al., 2018; Thorp et al., 2011). Por ello, la OMS recomienda reducir el tiempo sedentario sustituyéndolo por actividad de cualquier intensidad (Bull et al., 2020) y, en su Plan de Acción Mundial sobre Actividad Física 2018–2030, propone la actividad física incidental como estrategia clave para disminuir el sedentarismo y aumentar la actividad física (Organización Mundial de la Salud, 2019).

La actividad física incidental comprende actividades no estructuradas y planificadas, cuyo objetivo no es el acondicionamiento físico, el deporte o la recreación, tales como subir escaleras, cortar el césped, pasear al perro o desplazarse activamente (Reynolds et al., 2014; Stamatakis et al., 2019, 2021). A diferencia del ejercicio estructurado, la actividad física incidental requiere menos equipamiento y supera muchas de sus barreras reportadas (Delahanty et al., 2019; Farah et al., 2021; Thøgersen-Ntoumani et al., 2023). Estudios con dispositivos portátiles muestran que más del 90 % de la actividad física diaria se acumula en ráfagas de menos de tres minutos de actividad física incidental (Ahmadi et al., 2023; Stamatakis et al., 2022). Asimismo, se ha observado que estudiantes universitarios pueden acumular cantidades significativas de actividad física incidental durante sus horas de vigilia (Wallmann-Sperlich et al., 2022). Un estudio reciente en 22.368 adultos del Reino Unido informó que breves periodos de actividad incidental moderada a vigorosa compensaron los riesgos cardiovasculares asociados al sedentarismo (Koemel et al., 2025). De forma

consistente, estudios en cohortes representativas que utilizan medición objetiva de la actividad incidental han mostrado que periodos breves de actividad física incidental se asocian con un menor riesgo de mortalidad por todas las causas, cáncer, accidente cerebrovascular y enfermedades cardiovasculares (Stamatakis et al., 2022, 2025).

Aunque la literatura ha explorado principalmente factores ambientales y contextuales de la actividad física incidental (Thøgersen-Ntoumani et al., 2023), existen menos estudios sobre las variables individuales y psicológicas que la expliquen (Levine, 2007; Reynolds et al., 2014; Tudor-Locke et al., 2007). Una rama de la psicología, la Psicología del Ejercicio, emerge para explicar los diversos fenómenos psicológicos relacionados con la actividad física, incluido el por qué y cómo las personas se involucran en comportamientos relacionados con la actividad física (Zenko et al., 2021) atendiendo a enfoques teóricos de los dominios biológico, cognitivo, afectivo, social, y de personalidad (Zenko et al., 2021).

Un estudio realizado por Oliver y Kemps (2018), en el que combinaron la Teoría de la Autodeterminación (Deci & Ryan, 1985) y el Modelo de Procesamiento Dual Reflexivo-Impulsivo (Strack & Deutsch, 2004) informó que las actitudes implícitas se relacionaron negativamente, mientras que la motivación autónoma y la motivación controlada tuvieron asociaciones positivas e independientes con la actividad física incidental, medida a través del conteo de pasos (Oliver & Kemps, 2018). Sin embargo, este estudio no consideró la Teoría de la Personalidad, que tiene una de las tradiciones más largas y ricas de la psicología y con amplia evidencia en la actividad física (McCrae & Costa Jr., 2008; Rhodes & Smith, 2006; Sutin et al., 2016; Wilson & Dishman, 2015; Wilson & Rhodes, 2021). La evidencia actual respalda la relación entre rasgos de personalidad y actividad física, mediada tanto por constructos sociocognitivos (por ejemplo, el disfrute), como por determinantes más directos del comportamiento como las actitudes implícitas (Wilson & Rhodes, 2021).

La Teoría de los Cinco Grandes Rasgos o Modelo de los Cinco Factores, desarrollado por Costa y McCrae (1992), divide la personalidad humana en cinco dimensiones principales: Amabilidad, Extroversión, Neuroticismo, Responsabilidad y Apertura a la experiencia. Los rasgos de personalidad son relativamente estables durante la edad adulta, y reflejan características individuales duraderas y coherentes que determinan cómo las personas responden a los estímulos ambientales y autorregulan su comportamiento (Costa & McCrae, 1992; McCrae et al., 2000; McCrae & Costa Jr., 2008; Wilson & Rhodes, 2021). Este modelo

resulta especialmente útil para comprender cómo la personalidad interactúa con la actividad física (Costa & McCrae, 1992; McCrae et al., 2000; McCrae & Costa Jr., 2008) y cómo patrones de personalidad ya consolidados pueden influir en la adopción de estilos de sedentarios.

Revisiones sistemáticas y metaanálisis indican que un perfil de alta extroversión y responsabilidad, y bajo neuroticismo se asocia de manera consistente con una mayor probabilidad de participación en actividad física (Rhodes & Smith, 2006; Sutin et al., 2016; Wilson & Dishman, 2015). Sin embargo, los hallazgos sobre la apertura a la experiencia son inconsistentes y, en general, la amabilidad no parece influir significativamente en el nivel de actividad física (Rhodes & Smith, 2006; Sutin et al., 2016; Wilson & Dishman, 2015). Un estudio de Kekäläinen et al. (2022) desarrollado en mujeres adultas mostró que la motivación autónoma se asoció positivamente con la actividad física de tiempo libre, mientras que el neuroticismo ejerció un efecto indirecto negativo a través de la motivación autónoma (Kekäläinen et al., 2022).

No obstante, la evidencia de modelos explicativos integradores que incluyan aspectos de motivación y actitudes implícitas hacia la actividad física incidental, y rasgos de personalidad, sigue siendo limitada. Considerar variables psicológicas como la personalidad, la motivación y las actitudes implícitas en la comprensión de la actividad física incidental ofrece una oportunidad concreta para orientar acciones en contextos universitarios. En este sentido, el desarrollo de un modelo explicativo no solo contribuye al avance del conocimiento científico en esta línea de investigación, sino que también permite diseñar intervenciones focalizadas y estrategias de promoción ajustadas a las características individuales de los estudiantes. A nivel institucional, estos hallazgos pueden ser utilizados para fomentar entornos que favorezcan la actividad física incidental durante la jornada académica, mediante campañas educativas, rediseño de espacios y programas de bienestar psicológico. Asimismo, los resultados pueden contribuir a políticas públicas orientadas a la reducción del sedentarismo en este grupo de la población desde un enfoque preventivo, integrando la promoción de la actividad física incidental como una estrategia accesible, costo-efectiva y basada en evidencia.

2. ANTECEDENTES TEÓRICO-EMPÍRICOS

2.1 Actividad física, tiempo sedentario y salud

La Organización Mundial de la Salud (OMS) define la actividad física como cualquier forma de movimiento corporal realizado por los músculos esqueléticos, que provoca un aumento del gasto energético (OMS, 2010; Siscovick et al., 1985). Estas actividades pueden ser realizadas por elección, placer, necesidad, o de manera obligatoria (Organización Panamericana de la Salud [OPS], 2019).

La actividad física se refiere a numerosos tipos de actividades, entre ellas las actividades físicas de la vida diaria o no planificadas, como: 1) actividad física en el hogar (por ejemplo, pasar la aspiradora, lavar el automóvil, lavar la ropa); 2) las actividades físicas en el tiempo libre y recreativas (por ejemplo, caminar por senderos, andar en kayak); 3) los desplazamientos activos (por ejemplo, caminar o ir en bicicleta a la escuela/trabajo); y 4) las actividades físicas ocupacionales (por ejemplo, levantar objetos pesados, transportar objetos) (OMS, 2010; OPS, 2019). Por otro lado, están las actividades físicas planificadas como: 1) ejercicio físico (por ejemplo, correr, levantamiento de pesas), y 2) deportes (por ejemplo, baloncesto, fútbol, boxeo) (OMS, 2010; OPS, 2019). De tal modo, el ejercicio físico es definido como una variedad de la actividad física, que es planificado, estructurado, repetitivo, y realizado con un objetivo de mejora o mantenimiento de uno o más componentes de la aptitud física (Caspersen et al., 1985; Ferguson, 2014).

2.1.1 Actividad física y salud

La evidencia sobre los beneficios para la salud física, mental y bienestar de la actividad física/ejercicio físico regular se encuentra ampliamente documentada (Biddle & Asare, 2011; Bull et al., 2020; Hillman & Biggan, 2017; Kraus et al., 2019; Lee et al., 2012; Marquez et al., 2020; Pearce et al., 2022; Posadzki et al., 2020; Reiner et al., 2013). La evidencia plantea la reducción significativa del riesgo de diversos tipos de cáncer, diabetes, cardiopatía isquémica y accidente cerebrovascular isquémico, entre otras enfermedades (Kyu et al., 2016; Lopez et al., 2020). También se ha informado numerosos beneficios como prevención, del deterioro cognitivo y físico (Anderson et al., 2014; Barlow et al., 2014; Erickson et al., 2019; Hillman & Biggan, 2017), control de la glucemia (Aljawarneh et al., 2019; Chastin et al., 2019) y mortalidad por todas las causas (Abell et al., 2017; Lopez et al., 2020; Posadzki et al., 2020). Así también, efectos como mejor salud mental, bienestar,

calidad de vida, y reducción de síntomas depresivos y de ansiedad (Bailey et al., 2018; Buecker et al., 2021; Erickson et al., 2019; Marquez et al., 2020; Maruf et al., 2013; Schuch et al., 2016; Wu et al., 2017).

Sin embargo, los beneficios destacados anteriormente varían considerablemente según los niveles de condición física individuales, los tipos de población, los grupos de edad y la intensidad de la actividad física/ejercicio (Vina et al., 2012). En esta línea, se han desarrollado guías de actividad física para la salud por grupos de expertos en el mundo, de Estados Unidos (US Department of Health and Human Services, 2018), Reino Unido (Gibson-Moore, 2019), Australia (Department of Health, 2021), y de la OMS (Bull et al., 2020; OMS, 2020), en las cuales se recomienda que los adultos acumulen al menos 150 min de actividad de intensidad moderada (3–5,9 equivalentes metabólicos o [MET]) o 75 min de actividad de intensidad vigorosa (≥ 6 MET) por semana o una combinación de ambas intensidades. Las personas que no cumplen con estas recomendaciones son consideradas físicamente inactivas (Guthold et al., 2018).

2.1.2 Tiempo sedentario y salud

Personas que están más de ocho horas al día en actividades sedentes, como conducir, estar sentado o recostado, o expuestos a tiempos de pantalla, pueden clasificarse como personas sedentarias (Ekelund et al., 2016, 2019; Tremblay et al., 2017). Un meta-análisis mostró que el comportamiento sedentario es un factor de riesgo asociado a mortalidad por todas las causas (Ekelund et al., 2019). En esa misma línea, otro meta-análisis, en esta misma línea, señala que la mortalidad por enfermedades cardiovasculares, cáncer, y la incidencia de diabetes tipo 2 aumenta en personas con más de ocho horas por día de comportamiento sedentario, independiente del nivel de actividad física (Patterson et al., 2018).

Permanecer más de ocho horas diarias en conducta sedentaria puede tener efectos perjudiciales para la salud, incluso si se cumplen las recomendaciones mínimas de actividad física (Ekelund et al., 2016, 2019; Thakkar et al., 2018; Thorp et al., 2011). Esto demuestra que ser físicamente activo y sedentario no son conductas excluyentes. De hecho, es frecuente observar personas que cumplen con la actividad física recomendada, pero que también acumulan tiempos sedentarios excesivos. A este fenómeno se le conoce como la paradoja del “activo pero sedentario” (Cristi-Montero & Rodríguez, 2014; Thakkar et al., 2018).

2.2 Nuevo enfoque en las pautas de actividad física “cada movimiento cuenta”

En 2018, las Pautas de Actividad Física para Los Estados Unidos introdujo una serie de nuevos elementos que cambiaron la forma en que se piensa y promueve la actividad física (Piercy et al., 2018). En comparación con las antiguas pautas de actividad física entregadas por la OMS en 2010, las nuevas pautas abandonaron la idea de que la actividad física debe acumularse en al menos 10 minutos continuos para mejorar la salud (Bull et al., 2020; Piercy et al., 2018). Lo anterior, dada la creciente evidencia sobre la relación entre actividad física de cualquier duración, y mejores resultados de salud, incluida la mortalidad por todas las causas (Jakicic et al., 2019; Murphy et al., 2019).

De esta manera, este nuevo enfoque propuso un cambio hacia paradigmas de actividad física integrados y multidimensionales (Thompson et al., 2015; Thompson & Batterham, 2013), en los que la actividad física esporádica e incidental cobra relevancia en la mejora de la salud de la población (Stamatakis et al., 2019).

En consecuencia, la última actualización de la directrices de la OMS sobre actividad física y sedentarismo, pone un nuevo énfasis en que “*cada movimiento cuenta*”, destacando que la interrupción del tiempo sedente con todo tipo de actividad física (independientemente de su intensidad) posee la capacidad de contrarrestar sus efectos negativos para la salud (Bull et al., 2020).

2.3 Actividad Física Incidental

La primera definición del concepto de actividad física incidental puede ser atribuida al *Instituto Australiano de Salud y Bienestar* en el año 1999, el cual señaló que la actividad física incidental incluye formas de actividad física realizadas en el trabajo, en el hogar, y en la vida cotidiana, generalmente utilizando grandes grupos de músculos esqueléticos (Australian Institute of Health and Welfare, 1999).

A comienzos de siglo, los primeros estudios que se refieren al término de actividad física incidental (Marshall et al., 2002; McCormack et al., 2003), se basaron en la importancia que se le dio en la década de los 90 a la “*actividad física en el estilo de vida*”, concepto definido para ese entonces como “*la acumulación diaria de al menos 30 minutos de actividades autoseleccionadas, que incluye todas las actividades de ocio, ocupacionales o domésticas que son al menos moderadas a vigorosas en su intensidad y pueden ser actividades planificadas o no planificadas y que forman parte de la vida cotidiana*” (Dunn

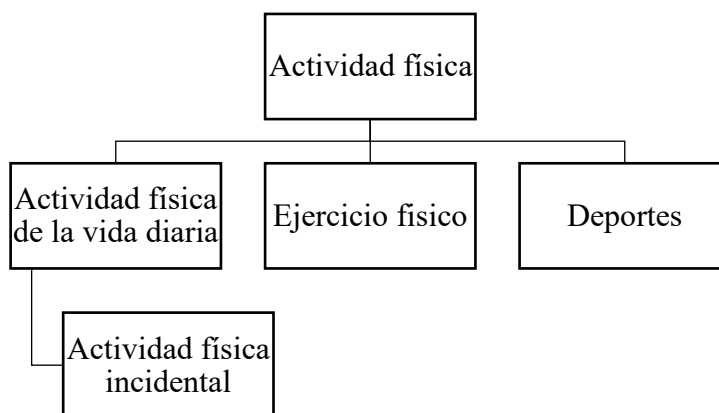
et al., 1998). En este ámbito, la actividad física de estilo de vida, podría considerarse como un concepto más amplio y antecesor al de actividad física incidental, que permitió delimitar algunas de las actividades que forman parte de la actividad física incidental, como caminatas a comprar, a la escuela o al transporte público (McCormack et al., 2003).

Estudios posteriores y más recientes, con el propósito de delimitar teórica y metodológicamente la actividad física incidental, han desarrollado una definición más elaborada del concepto (Alzahrani et al., 2019; Koch et al., 2020; Oliver & Kemps, 2018; Reynolds et al., 2014; Stamatakis et al., 2019, 2021; Wallmann-Sperlich et al., 2022). Estos coinciden en que la actividad física incidental corresponde a cualquier actividad física de la vida diaria, realizada en el hogar, trabajo/estudio y tiempo libre, que no requiere emplear tiempo opcional, y que no tiene fines de salud/fitness o recreativos.

De esta manera, la actividad física incidental por definición sería parte de las actividades físicas de la vida diaria, pero sin considerar las actividades de tipo recreativas (ver Figura 2.1) ni a todas aquellas actividades que no están orientadas al trabajo doméstico, ocupacional o de rendimiento deportivo, que incluyen tareas repetitivas y rápidas dentro de un ambiente controlado, y que muchas veces no cuentan con suficiente descanso o tiempo de recuperación, como ejercicios derivados del deporte, fitness o actividades de relajación como Tai Chi, yoga, danza, o mindfulness, entre otros (Pazmino et al., 2021).

Figura 2.1

Clasificación de la actividad física incidental a partir de la definición de actividad física. Elaboración propia



En este ámbito, existe gran cantidad de comportamientos de la actividad física que poseen un carácter incidental (Levine, 2007; Tremblay et al., 2007; Tudor-Locke et al., 2007). A la fecha dos estudios teóricos y uno de carácter empírico han identificado comportamientos que corresponderían a actividad física incidental. El primero de ellos y con el objetivo de delimitar la búsqueda de una revisión sistemática sobre intervenciones comunitarias de actividad física incidental, creó una nómina que incluía comportamientos como uso de escaleras, desplazamiento activo, estar de pie o caminando durante la mayor parte del día, trabajos de jardinería o tareas domésticas, actividad física ocupacional, pasear al perro o mascotas, y actividades de juego para niños, entre otras (para más detalle ver, Reynolds et al. 2014).

Un artículo de editorial realizado por Stamatakis et al. (2019), enumeró una lista de formas comunes de actividad física incidental basada en el compendio de actividades físicas (Ainsworth et al., 2011), organizadas en dimensiones de actividades en el hogar, reparaciones en el hogar, jardinería, caminar, y andar en bicicleta, entre otras (para más detalle ver, Stamatakis et al. 2019). En esta misma línea, un estudio en población universitaria, utilizó un registro escrito de 24 horas basado en una versión modificada del diario de actividad de Bouchard (Bouchard et al., 1983), con el propósito de identificar el tipo de comportamiento relacionado con la actividad física incidental que realizaban los estudiantes (Wallmann-Sperlich et al., 2022). En este estudio se identificaron actividades en las dimensiones descritas anteriormente: actividades en el hogar como cocinar, reparar cosas, limpiar el hogar, higiene personal, ir de compras, tender la ropa, lavar los platos; desplazamiento activo como caminar o andar en bicicleta a la universidad, o caminar al autobús; actividades en el trabajo, como mesero en un restaurante; y de otro tipo como, pasear mascotas, o hacer voluntariado que implique jugar con niños (para más detalle ver, Wallmann-Sperlich et al., 2022).

Sin embargo, para avanzar en la investigación y respaldar futuros estudios sobre actividad física incidental, es necesario contar con una definición empírica y operacional del constructo, además de delimitar los comportamientos que la componen (Stamatakis et al., 2021).

2.3.1 Actividad física incidental y salud

Los estudios sobre actividad física incidental cuentan con una evidencia incipiente, pero en auge, sobre su relación con la salud física y el bienestar. En particular, estudios en cohortes representativas que utilizan medición objetiva de la actividad incidental han mostrado que periodos breves de actividad física incidental se asocian con un menor riesgo de mortalidad por todas las causas, accidente cerebrovascular y enfermedades cardiovasculares (Koemel et al., 2025; Stamatakis et al., 2022, 2025).

Un estudio de cohorte prospectivo reciente, que incluyó a 22.368 adultos (edad media 62,9 años; 41,8 % hombres) del Biobanco de datos del Reino Unido (UK Biobank), registró datos de acelerometría y realizó un seguimiento medio de 8,0 años, durante el cual se documentaron 819 accidentes cerebrovasculares. Los principales hallazgos informaron que los participantes con elevada conducta sedentaria (> 11,4 h/día) y bajos niveles de actividad incidental presentaron el mayor riesgo de accidentes cerebrovasculares. En cambio, elevados niveles de cualquiera de las modalidades de actividad incidental eliminaron esa asociación entre sedentarismo y accidente cerebrovascular. En conjunto, estos resultados ofrecen la primera evidencia de que pequeñas dosis de actividad física incidental, especialmente breves episodios de intensidad vigorosa, pueden mitigar el riesgo de eventos cardiovasculares mayores asociado a prolongados periodos de conductas sedentarias (Koemel et al., 2025).

En la misma línea, un estudio prospectivo de cohorte con 24.139 adultos (edad media $61,9 \pm 7,6$ años; 56,2 % mujeres) también del Biobanco de datos del Reino Unido (UK Biobank), realizó un seguimiento medio de 7,9 años, durante el cual se registraron 908 accidentes cerebrovasculares, 223 muertes por causas cardiovasculares y 1.071 muertes por todas las causas. Los resultados mostraron que incluso cantidades muy pequeñas de actividad física incidental se vinculan con una reducción notable del riesgo de sufrir eventos cardiovasculares, accidentes cerebrovasculares o mortalidad por todas las causas. En concreto, pasar de no realizar ningún ejercicio a acumular el equivalente a unos 24 minutos diarios de actividad moderada se asoció con una disminución del 46 % en el riesgo de eventos cardiovasculares y de casi el 50 % en la mortalidad por todas las causas. Al desglosar por intensidad, los beneficios aparecieron muy pronto, con 4 a 5 min diarios de actividad física vigorosa incidental ya ofrecieron una reducción de riesgo significativa. Incorporar ráfagas breves de movimiento más intenso, subir escaleras a buen ritmo, caminar con paso ligero

entre distintas salas o cargar bolsas con mayor rapidez, puede “compensar” el impacto negativo de un estilo de vida muy sedentario (Stamatakis et al., 2025).

Un estudio prospectivo de cohorte a siete años en 25.241 adultos de 40 a 69 años pertenecientes al Biobanco de datos del Reino Unido (UK Biobank). Informó que realizar actividad física incidental vigorosa durante uno o dos minutos, tres veces al día, se asocia con una reducción del riesgo de mortalidad por todas las causas y enfermedades cardiovasculares. Incluso 3 a 5 minutos diarios de actividad vigorosa incidental como subir escaleras rápidamente o caminar a paso muy ligero, se vinculan con disminuciones sustanciales de la mortalidad. En particular de un 22 a 28% menos de mortalidad por todas las causas y un 27 % menos de mortalidad por enfermedades cardiovasculares. Estos hallazgos respaldan que “*todo movimiento cuenta*”, y sugieren que breves ráfagas de esfuerzo incorporadas en la rutina diaria pueden ser una estrategia accesible y efectiva para proteger la salud y prolongar la vida (Stamatakis et al., 2022).

Por otro lado, existe amplia evidencia que respalda los efectos positivos sobre la salud y el bienestar de comportamientos que son parte de la actividad física incidental, como los desplazamientos activos y subir escaleras (Amagasa et al., 2018). Al respecto, un estudio de seguimiento de 46 años realizado en la ciudad de Copenhague, donde más del 50% de todos los viajes que se realizan en dicha ciudad implican caminar o andar en bicicleta (Schnohr et al., 2012), encontró asociación entre alto nivel de desplazamiento activo, mayor esperanza de vida y menor riesgo de mortalidad por enfermedad cardiovascular (Clausen et al., 2018). De igual manera, el uso de escaleras y desplazamientos a pie o en bicicleta, en población infantil, adolescente, adulta y anciana, han indicado una relación positiva con un mejor nivel de aptitud cardiorrespiratoria, y un mejor estado de ánimo (Allison et al., 2017; Hulley et al., 2008; Reichert et al., 2017; Stamatakis et al., 2019).

2.3.2 Medición de la actividad física incidental

Dado que la actividad física es un comportamiento complejo y, por tanto, difícil de medir, existe una diversidad de métodos para su medición (Skender et al., 2016). Estos incluyen observaciones de comportamiento, cuestionarios, diarios de actividad física, calorimetría directa/indirecta, monitores de frecuencia cardíaca, y sensores de movimiento, como acelerómetros y podómetros (Skender et al., 2016). Los estudios con medidas de

actividad física basadas en cuestionarios representan la mayor parte de la evidencia utilizada a nivel mundial (Ainsworth et al., 2012; Ara et al., 2015).

En particular, para la medición de actividad física incidental estudios han utilizado cuestionarios de autoinforme (D'Alonzo & Cortese, 2007; Marshall et al., 2002; Sanchez-Lopez et al., 2018), como el Past Year Leisure-Time Physical Activity Questionnaire (Aaron et al., 1995), Incidental and Planned Exercise Questionnaire (IPEQ) (Merom et al., 2014), Yale Physical Activity Survey (YPAS) (De Abajo et al., 2001), Brunel Lifestyle Physical Activity Questionnaire (Vencato et al., 2017), y Godin-Shephard Leisure-Time Physical Activity Questionnaire (LTPAQ) (Amireault & Godin, 2015). Sin embargo, los cuestionarios de actividad física presentan limitaciones como dificultad para capturar episodios breves e intermitentes de actividad física, además de ser propensos al sesgo de recuerdo (Ainsworth et al., 2012; Martorell et al., 2020; Strath et al., 2013).

En consecuencia, con el avance de las tecnologías portátiles, las herramientas objetivas, como los monitores de frecuencia cardíaca, los podómetros y los acelerómetros, se han utilizado cada vez más para registrar niveles de actividad física y la actividad física incidental (Hansen et al., 2012; Stamatakis et al., 2021). Como ejemplo, los estudios de Tonello et al. (2016) y Wallmann-Sperlich et al. (2022) utilizaron monitor de frecuencia cardíaca y registro diario para evaluar la actividades física incidental.

Las tecnologías portátiles basadas en acelerómetros son el método más utilizado para la evaluación objetiva de la actividad física en estudios poblacionales (Strath et al., 2013; Wijndaele et al., 2015). Al respecto, los acelerómetros poseen la capacidad de registrar continuamente el movimiento a alta resolución durante las 24 horas del día durante una semana, permitiendo la captura detallada y la intensidad con la que se realizan breves patrones de comportamiento, como los de actividad física incidental (Skotte et al., 2014; Stamatakis et al., 2021).

Los primeros acelerómetros datan de la década de 1920 y se usaban para medir vibraciones en aeronaves y estructuras civiles. En la década de 1950 comenzaron a aplicarse a la marcha humana, midiendo la velocidad del paso mediante sensores uniaxiales. A partir de la década de 1980, investigadores incorporaron acelerómetros a estudios de actividad física, y desde mediados de la década de 1990 se emplearon en grandes cohortes epidemiológicas para cuantificar el gasto energético y el tiempo de actividad versus tiempo

sedentario. Del 2000 en adelante la miniaturización gracias al avance de la tecnología permitió dispositivos triaxiales, con mayores capacidades de almacenamiento y autonomía. Hoy en día, los acelerómetros de alta frecuencia (hasta 100 Hz o más) recogen datos que pueden procesarse con algoritmos avanzados para discriminar intensidades de actividad, postura y patrones de movimiento (Evenson et al., 2022).

En la actualidad, existe una amplia oferta de acelerómetros triaxiales validados para su uso en distintas poblaciones, como los de ActiGraph®, ActivInsights®, y Axivity Ltd. En ActiGraph todos sus modelos han sido validados en estudios de conteo de pasos, gasto energético y patrones de actividad. En particular, el modelo wGT3X-BT de la marca ActiGraph® (ver Figura 2.2) es un acelerómetro triaxial de alta resolución, gran capacidad de memoria y larga autonomía, ideal para monitorizar de forma continua actividad física y sueño en estudios epidemiológicos y clínicos (para más información ver <https://theactigraph.com/>).

Figura 2.2

Acelerómetro triaxial marca ActiGraph® wGT3X-BT



Si bien, los acelerómetros se usan con mayor frecuencia en la cadera (Evenson et al., 2022), y en tiempo de vigilia (Troiano et al., 2014), su capacidad de medición varía según su ubicación. Por ejemplo, los acelerómetros montados en la cintura pueden recopilar información de frecuencia, duración y tipo de actividad física, así como la velocidad de los indicadores de intensidad basados en el ritmo (Stamatakis et al., 2021), pero no pueden

capturar la modulación de la intensidad debido a cambios en la pendiente de la superficie, como caminar cuesta arriba o subir escaleras (Stamatakis et al., 2021). A su vez, los acelerómetros montados en el muslo son capaces de diferenciar entre posturas y modos de actividad física, como subir escaleras o andar en bicicleta (Skotte et al., 2014; Stamatakis et al., 2020; Stevens et al., 2020), pero no tienen estándares específicos para capturar episodios de intensidad vigorosa, y no pueden capturar la intensidad de caminar sobre una pendiente o al llevar cargas (Skotte et al., 2014; Stamatakis et al., 2020; Stevens et al., 2020).

Los acelerómetros que se llevan en la muñeca se utilizan cada vez más como una medida objetiva de la actividad física (da Silva et al., 2014; Doherty et al., 2017; Ramakrishnan et al., 2021; Sabia et al., 2014; Troiano et al., 2014) y de la actividad física incidental (Stamatakis et al., 2022). El uso del acelerómetro en la muñeca permite el registro continuo día y noche, lo que da como resultado niveles más altos de cumplimiento por parte de los participantes (Sabia et al., 2014; Troiano et al., 2014). Asimismo, se han establecido medidas validadas del gasto energético de la actividad física para el uso de un acelerómetro de muñeca (Doherty et al., 2017; van Hees et al., 2011).

Una revisión sistemática sobre el uso del acelerómetro ActiGraph GT3X en adultos recomienda su uso en la muñeca no dominante, lo que facilita su uso durante el sueño y evita interferencias de actividades estáticas donde hay uso de la mano dominante (por ejemplo, al cepillarse los dientes). Además, se sugiere un periodo de registro de 7 a 9 días, con al menos 4 días válidos (incluido un fin de semana), definiendo un día válido como aquel con ≥ 10 h de datos de actividad. Estos criterios equilibran la calidad de la información (captura de patrones diarios) con la comodidad del participante y la comparabilidad entre estudios (Migueles et al., 2017).

Para el procesamiento de datos de acelerometría, el paquete GGIR para R Studio, ofrece un conjunto robusto de herramientas y evidencia sólida, compatible con dispositivos ActiGraph® y otras marcas. Al ser un software libre, facilita la comparación y fusión de datos entre estudios y grandes cohortes, superando las limitaciones del software de pago. Desde su lanzamiento en 2013, GGIR ha sido citado en más de 90 artículos revisados por pares, con aplicaciones clínicas, epidemiológicas y en biobancos como el UK Biobank. Su arquitectura modular se compone en cinco componentes (g.part1–g.part5), que permite realizar en bloque el procesamiento de datos (parte 1) y, a continuación, explorar parámetros

de interés de forma interactiva (partes 2–5). Además, la función “shell” única (g.shell.GGIR) facilita el intercambio exacto de los comandos utilizados, garantizando la plena reproducibilidad del análisis (Migueles et al., 2019).

En síntesis, aunque los cuestionarios han sido ampliamente utilizados para medir la actividad física incidental, presentan limitaciones importantes. En cambio, los acelerómetros, especialmente los triaxiales usados en la muñeca no dominante, ofrecen una alternativa válida, precisa y continua para registrar patrones de movimiento espontáneo en contextos cotidianos.

2.3.3 Beneficios de la promoción de la actividad física incidental

Aunque la actividad física planificada de intensidad moderada a vigorosa basada en el ejercicio físico tiene efectos positivos indiscutibles sobre la salud general (Gebel et al., 2015; Lopez et al., 2019, 2020; Reiner et al., 2013; Wang et al., 2021). Su práctica regular puede ser exigente o poco atractiva para la mayoría de la población debido a razones distintas a la falta de tiempo (Hoare et al., 2017). Se han reportado como principales barreras para el ejercicio físico, la distancia o el costo de acceso a las instalaciones, la falta de habilidades y confianza para hacer ejercicio, y las molestias asociadas al esfuerzo físico intenso (Delahanty et al., 2019; Farah et al., 2021; Rech et al., 2018).

En el caso de la actividad física incidental es menos probable que estén presentes la mayoría de las barreras antes mencionadas (Stamatakis et al., 2021), ya que es parte de la actividad física de la vida diaria, y requiere poco o ningún compromiso de tiempo (Stamatakis et al., 2019). Tales ventajas de viabilidad puede favorecer que más personas puedan estar o pasar a ser activas incidentalmente (Stamatakis et al., 2019). Al respecto, Wallmann-Sperlich et al. (2022) en un estudio de actividad física incidental en estudiantes universitarios y oficinistas, reportó que los participantes pasaron una media de 31,9 minutos al día (3,2% de su tiempo de vigilia) realizando actividad física estructurada como ejercicio físico, mientras que para la actividad física incidental el tiempo fue de 76,9 minutos al día (22,5% de su tiempo de vigilia) (Wallmann-Sperlich et al., 2022).

En este ámbito, el *Plan de Acción Mundial Sobre Actividad Física 2018-2030* señala que reducir el comportamiento sedentario mediante la promoción de la actividad física incidental puede ayudar a las personas a aumentar gradualmente sus niveles de actividad física hacia los niveles recomendados para una salud óptima (OPS, 2019).

2.4 La Psicología del Ejercicio

La Psicología del Ejercicio es la disciplina que estudia los procesos psicológicos, cognitivos, afectivos y conductuales, relacionados con la práctica de la actividad física y el ejercicio (Zenko et al., 2021). En el libro *Fundamentos de la Psicología del Ejercicio y el Deporte*, un texto de acceso abierto elaborado por Zenko et al. (2021), se señala que la Psicología del Ejercicio se centra en tres grandes áreas de investigación. La primera es la promoción del comportamiento de ejercicio, que estudia los factores internos (como la motivación y la autoeficacia) y externos (como el apoyo social y el entorno) que facilitan o dificultan el inicio y la adherencia a la actividad física. La segunda es la psicología dinámica del ejercicio, que analiza los procesos mentales y afectivos que ocurren durante la práctica (estado de ánimo, percepción del esfuerzo), es decir, el estado mental mientras nos movemos. Finalmente, la tercera área es la Psicología del Ejercicio y la salud, que investiga cómo el ejercicio físico influye en el desarrollo psicológico y el bienestar a lo largo de la vida, incluyendo la reducción de la ansiedad y la depresión, la mejora cognitiva y la regulación emocional (Zenko et al., 2021).

Además, Zenko et al. (2021) señalan que la Psicología del Ejercicio utiliza varios enfoques para comprender los diversos fenómenos psicológicos involucrados en la actividad física. Estos enfoques son afectivos, biológicos, cognitivos, sociales y de la personalidad, los que, si bien utilizan diferentes metodologías e instrumentos de medición, en última instancia brindan una comprensión más inclusiva y completa, sobre por qué y cómo nos involucramos en la actividad física. De igual manera, estos enfoques poseen el potencial para explicar por qué y cómo la actividad física influye en pensamientos, sentimientos, interacciones sociales y comportamiento (Zenko et al., 2021).

Específicamente, el *enfoque afectivo* investiga los estados de ánimo y emociones como motivadores y como resultados del ejercicio. Parte de la idea hedonista de buscar placer y evitar displacer, y ha documentado que la actividad física aguda y crónica reduce ansiedad y depresión (Zenko et al., 2021).

El *enfoque biológico* considera muchas áreas de estudio, que incluyen, pero no se limitan, a la bioquímica, la endocrinología, la neurociencia y la electrofisiología, para comprender cómo se relacionan los estados físicos con los estados mentales. Este enfoque investiga los estados físicos como habilitadores y barreras para el comportamiento, y explora

las complejidades de una amplia gama de fenómenos psicológicos, incluidos los trastornos/enfermedades mentales (Zenko et al., 2021).

El *enfoque cognitivo* investiga el procesamiento psicológico de orden superior que ocurre entre algún estímulo y la respuesta a un comportamiento dado. Este enfoque investiga cómo la actividad física puede influir y ser influenciada por los procesos cognitivos como la atención, la memoria, el lenguaje, la percepción y el funcionamiento ejecutivo. Además, examina como determinantes de la conducta física (mejor autocontrol → más ejercicio) como efectos beneficiosos del ejercicio en el envejecimiento cognitivo y la prevención de demencia (Zenko et al., 2021).

El *enfoque social*, explora cómo las redes, el apoyo, la cohesión y las normas sociales promueven o inhiben el ejercicio, así como el impacto del ejercicio en la integración, el sentido de pertenencia y la calidad de vida, reconociendo el efecto de la soledad en la salud (Zenko et al., 2021).

El *enfoque de la personalidad* estudia los rasgos de personalidad como facilitadores e inhibidores de la cognición, la emoción y el comportamiento, y también explora los trastornos de la personalidad, como por ejemplo, trastorno bipolar, trastorno obsesivo-compulsivo de la personalidad. El enfoque de la personalidad de la Psicología del Ejercicio busca comprender si los rasgos de personalidad están comúnmente relacionados con la participación en actividades físicas, ya sea facilitando o inhibiendo la participación en actividades físicas, o la medida en que la actividad física podría influir en dichos rasgos (Zenko et al., 2021).

Zenko et al. (2021) señalan que una suposición general dentro de la Psicología del Ejercicio es que los sentimientos y pensamientos de una persona están íntimamente entrelazados con su estado físico. Donde, al igual que un solo engranaje que puede influir en todo un tren de engranajes, también un solo componente mental o físico puede influir en todo el individuo. Sin embargo, independientemente de lo que ocurra primero, o si ocurrieran simultáneamente, una conclusión importante es que la mente y el cuerpo están tan íntimamente entrelazados, y que un cambio en el estado psicológico ocurrirá con un cambio en el estado físico, y viceversa (Zenko et al., 2021). En este sentido, Zenko et al. (2021) mencionan la importancia de poder integrar los enfoques de la Psicología del Ejercicio en las

investigaciones que busquen explicar comportamientos relacionados con la actividad física (Zenko et al., 2021).

2.5 Enfoque cognitivo de la Psicología del Ejercicio en el estudio de la actividad física: Teoría de la Autodeterminación y Teoría de Procesamiento Dual Reflexivo-Impulsivo

2.5.1 Teoría de la Autodeterminación (Deci & Ryan, 2000, 2008; Ryan & Deci, 2020).

Desde un enfoque cognitivo de la Psicología del Ejercicio, una teoría de la motivación humana que ha sido aplicada en diferentes contextos como el educativo, laboral y de salud, y en el estudio de una variedad de comportamientos, siendo un referente en el área de la actividad física, es la Teoría de la Autodeterminación. Esta teoría busca explicar cómo los factores internos, externos y sociales median los procesos de internalización del comportamiento y conducen a un mejor compromiso, aprendizaje y bienestar.

Para los autores Deci y Ryan, estar motivado significa estar impulsado por hacer algo (Deci & Ryan, 2000). Una persona que no siente ímpetu o inspiración para actuar se caracteriza así como desmotivada, mientras que alguien que está energizado o activado hacia un fin se considera motivado (Deci & Ryan, 2000). La mayoría de las teorías de la motivación ven a la motivación como un fenómeno unitario, que varía desde muy poca motivación para actuar hasta una alta motivación (Deci & Ryan, 2000).

Sin embargo, Deci y Ryan (2000) plantean que la motivación difícilmente es un fenómeno unitario. Las personas no solo tienen diferentes niveles de motivación, sino también diferentes tipos de motivación (Deci & Ryan, 2000). Es decir, varían no solo en el nivel de motivación (es decir, cuánta motivación), sino también en la orientación de esa motivación (es decir, qué tipo de motivación) (Deci & Ryan, 2000). La orientación de la motivación se refiere a las actitudes y objetivos subyacentes que dan lugar a la acción, es decir, se refiere al por qué de las acciones (Deci & Ryan, 2000).

A la Teoría de Autodeterminación subyacen otras teorías, una de ellas es la *Teoría de la Integración Organísmica*, que se enfoca específicamente en las razones que tiene un individuo para involucrarse en un comportamiento en particular. Esta teoría postula que la motivación es vista como un *continuo de autodeterminación*. En el extremo izquierdo de este continuo se ubica la *desmotivación* o *amotivación*, entendida como la ausencia de motivación

para realizar un comportamiento. En el extremo derecho está la *motivación intrínseca*, donde una actividad es realizada porque es placentera en sí misma, porque su interés y disfrute son inherentes. El juego, la exploración y las actividades generadas por la curiosidad ejemplifican comportamientos intrínsecamente motivados, ya que no dependen de incentivos o presiones externas, sino que proporcionan sus propias satisfacciones y alegrías (ver Figura 2.3).

Una tercera forma general de motivación, la *motivación extrínseca*, se encuentra entre los dos extremos del continuo. La motivación extrínseca implica participar en una actividad para obtener algún resultado que esté separado de la actividad en sí. La Teoría de la Autodeterminación especifica cuatro subtipos de motivación extrínseca: *regulación externa*, *regulación introyectada*, *regulación identificada*, y la *regulación integrada* (ver Figura 2.3).

La *regulación externa* es la forma de motivación extrínseca experimentada como más controlada. Se refiere a comportamientos impulsados por recompensas y castigos impuestos externamente. Luego la *regulación introyectada*, que se refiere a la motivación extrínseca que ha sido parcialmente interiorizada en el que los comportamientos están regulados por las recompensas internas de la autoestima, por el éxito, y por evitar la ansiedad, la vergüenza o la culpa por el fracaso; aquí se considera la participación del ego. En la *regulación identificada*, las personas se identifican conscientemente con el valor de una actividad o lo respaldan personalmente y, por lo tanto, experimentan un grado relativamente alto de deseo, voluntad, o disposición para actuar. Sin embargo, la forma más autónoma de motivación extrínseca es la *regulación integrada* en la que la persona no solo reconoce y se identifica con el valor de la actividad, sino que también encuentra que es congruente con sus intereses y valores fundamentales (ver Figura 2.3).

Figura 2.3

Continuo de autodeterminación Ryan y Deci (2020)

Taxonomía de la motivación de la Teoría de la Autodeterminación						
Motivación	Amotivación	Motivación Extrínseca				Motivación Intrínseca
Tipo de regulación		Regulación Externa	Regulación Introyectada	Regulación Identificada	Regulación Integrada	
Atributos	<ul style="list-style-type: none"> Falta de competencia percibida. Falta de valor o irrelevante. 	<ul style="list-style-type: none"> Premios o castigos externos. Cumplimiento Resistencia reactiva 	<ul style="list-style-type: none"> Participación del ego Centrado en la aprobación de uno mismo y de los demás. 	<ul style="list-style-type: none"> Importancia personal. Valoración consciente de la actividad Autoaprobación de la meta. 	<ul style="list-style-type: none"> Congruencia. Síntesis y consistencia de identificaciones 	<ul style="list-style-type: none"> Interés. Disfrute Satisfacción inherente
Locus de Causalidad Percibido	Impersonal	Externa	Un poco externa	Un poco interna	Interna	Interna

Nota. Tipos de motivación, estilos de regulación, locus de causalidad y procesos correspondientes a la Teoría de Autodeterminación. Extraído de Ryan y Deci (2020)

Aunque la taxonomía clásica de seis dimensiones de la motivación es ampliamente utilizada, se ha propuesto una clasificación alternativa que agrupa el continuo de la autodeterminación en tres categorías: amotivación, *motivación controlada* (que incluye regulación introyectada y externa) y *motivación autónoma* (que incluye motivación intrínseca y regulación integrada e identificada) (Vansteenkiste et al., 2010).

2.5.1.1 Teoría de la Autodeterminación y actividad física

Existen factores motivacionales que influyen y predicen el comportamiento de actividad física (Owen et al., 2014; Howard et al., 2021; Manninen et al., 2022; Teixeira et al., 2012) que pueden ser explicados a partir de la Teoría de la Autodeterminación (Teixeira et al., 2012). De acuerdo con los principios de esta teoría, es más probable que

ocurra una participación sostenida en la actividad física cuando las personas actúan con motivaciones de tipo más autónomas e intrínsecas (Ryan et al., 2009).

En esta línea, hallazgos de revisiones sistemáticas y metaanálisis indican que la motivación intrínseca, la regulación identificada y la regulación introyectada tienen una relación positiva con mayor nivel de actividad física (Owen et al., 2014; Hagger & Chatzisarantis, 2009; Howard et al., 2021; Ng et al., 2012; Vasconcellos et al., 2020). Por el contrario, se ha demostrado que la motivación controlada, principalmente regulación externa, se asocia negativamente con la actividad física y se vincula positivamente con menor compromiso con la actividad física (Owen et al., 2014; Howard et al., 2021; Vasconcellos et al., 2020).

Una revisión sistemática reciente realizada por Gómez-Mazorra et al. (2022) sobre actividad física en el tiempo libre de estudiantes universitarios, señala que la motivación intrínseca y la regulación identificada son predictores positivos y significativos para la práctica y nivel de actividad física en tiempo libre (Gómez-Mazorra et al., 2022). Además, en esta revisión se reconoce la importancia del abordaje desde la perspectiva de género, ya que las mujeres evidencian razones introyectadas (culpa y vergüenza), y refieren mayores barreras para la práctica de actividad física en tiempo libre (Gómez-Mazorra et al., 2022). En línea con estos hallazgos, un estudio longitudinal en universitarios españoles encontró que la motivación intrínseca fue el predictor más consistente para la actividad física (Corella et al., 2021).

Al respecto, investigaciones ha demostrado que las personas pueden identificarse con diversos niveles de razones autónomas y controladas para actuar, así como respaldar más de una forma de motivación al mismo tiempo (Lindwall et al., 2017; O'Dougherty et al., 2010). Teniendo en cuenta que la actividad física incidental consta de varios subcomportamientos diferentes, algunos de los cuales simplemente deben realizarse (actividades en el trabajo), y otros que pueden proporcionar una sensación de satisfacción al realizarlos (cuidado del jardín o jugar con niños), es posible que diferentes tipos de motivación estén asociados tanto con la actividad física incidental total como con cada uno de sus subcomportamientos.

Al respecto, un estudio sobre motivación y el comportamiento de caminar, observó relaciones negativas significativas consistentes de caminar con amotivación y regulación externa, ninguna relación con introyección, y relaciones positivas con regulación identificada

e intrínseca (Niven & Markland, 2016). El patrón fue diferente para la regulación integrada, que se relacionó positivamente con el transporte a pie, pero no con el paseo por ocio (Niven & Markland, 2016).

En resumen, la motivación autónoma, particularmente la motivación intrínseca y la regulación identificada, se ha identificado como un predictor positivo clave de la actividad física, mientras que la regulación externa y la amotivación se asocian a menor participación. Estas evidencias respaldan la aplicación de la Teoría de la Autodeterminación para explicar el comportamiento físico en contextos como la actividad incidental.

2.5.2 Modelo de Procesamiento Dual Reflexivo-Impulsivo (Strack & Deutsch, 2004).

Las teorías que comúnmente se han aplicado para explicar el comportamiento de la actividad física, como la Teoría del Comportamiento Planificado y la Teoría de la Autodeterminación, se han centrado casi exclusivamente en los procesos de regulación consciente (Rebar et al., 2016). Sin embargo, particularmente con respecto a algunas actividades físicas incidentales de la vida diaria, donde las personas se enfrentan frecuentemente a decisiones tales como tomar el ascensor o las escaleras, o tomar el primer estacionamiento disponible o encontrar el más cercano a su destino (Conroy & Berry, 2017), parece poco probable que estas decisiones estén influenciadas por expectativas, valores, objetivos explícitos, o por procesos psicológicos reflexivos y conscientes (Conroy & Berry, 2017). Así, los Modelos de Procesamiento Dual proponen que los comportamientos se ven afectados, al menos en parte, por deseos y sesgos automáticos (Rebar et al., 2021).

La Teoría de Modelos de Procesamiento Dual plantea que los procesos reflexivos y conscientes son más lentos en comparación con los procesos automáticos, dado que los procesos reflexivos involucran cogniciones esforzadas (como intención, autorregulación, resolución de problemas, entre otras) (Rebar et al., 2021). Plantea, a su vez que los recursos limitados de autorregulación consciente se agotarían rápidamente si uno intentara tomar todas estas decisiones (por ejemplo, ascensor v/s escaleras) basadas en procesos motivacionales explícitos (Rebar et al., 2021). Igualmente, esta teoría de Modelo de Procesamiento Dual menciona que las expectativas de las personas, por defecto, están influenciadas por procesos automáticos o inconscientes, a menos que tengan suficiente motivación, oportunidad, y capacidad de autorregulación para inhibirlos (Rebar et al., 2021).

La característica general de los Modelos de Procesamiento Dual es la presencia de dos sistemas que operan en paralelo para regular pensamientos, sentimientos y acciones (Conroy & Berry, 2017). El *Sistema 1* se basa en asociaciones aprendidas a lo largo del tiempo, es relativamente rápido, sin esfuerzo y automático, e involucra constructos tales como hábitos, y evaluaciones automáticas (Conroy & Berry, 2017). Incluye procesos como el *sesgo atencional*, las *actitudes implícitas* y las tendencias impulsivas de *acercamiento-avoidancia* (Sheeran et al., 2013, 2016). Entre estos procesos implícitos, las *actitudes implícitas* ha recibido más atención teórica y empírica que los demás (Conroy & Berry, 2017; Rebar et al., 2016). Las actitudes implícitas se definen como acciones o juicios que están bajo el control de una evaluación activada automáticamente, sin que el ejecutante sea consciente de esa causalidad (Greenwald et al., 1998).

Por el contrario, el *Sistema 2* implica un procesamiento basado en reglas, es relativamente lento, esforzado y volitivo (Conroy & Berry, 2017). Los procesos del Sistema 2 se ejemplifican mediante teorías sociocognitivas que invocan constructos tales como intenciones, creencias de eficacia, expectativas de resultados y planes (por ejemplo, Teoría del comportamiento planificado) (Conroy & Berry, 2017).

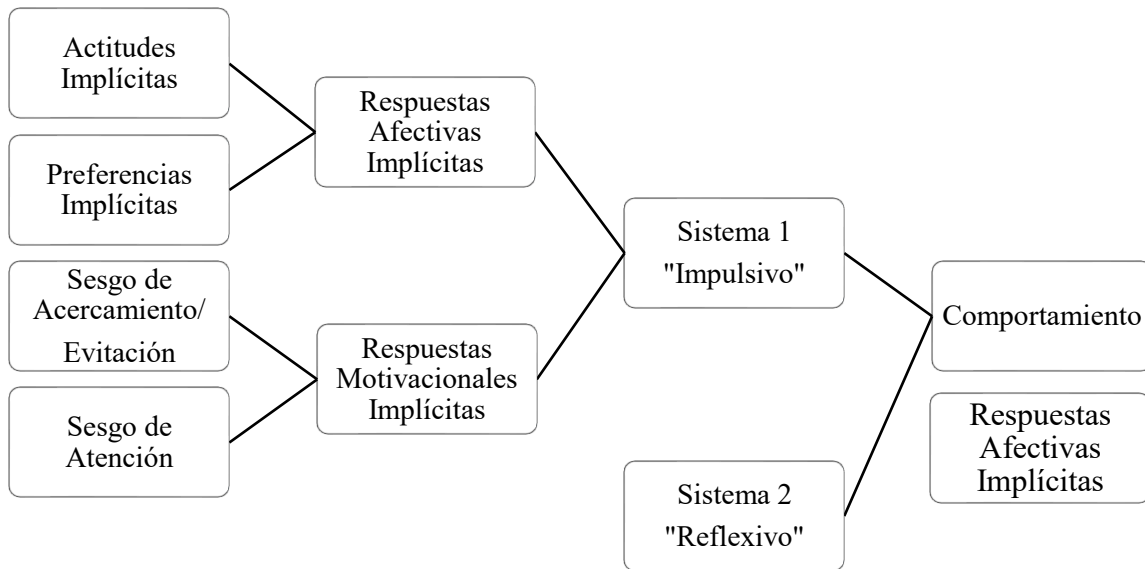
El *Modelo de Procesamiento Dual Reflexivo-Impulsivo*, se centra en las asociaciones evaluativas y semánticas que se activan mediante una señal o un estímulo. Estas asociaciones son la base del *Sistema Impulsivo* (Sistema 1) el cual incluye respuestas a estímulos relevantes que son tanto afectivas como motivacionales. Las *respuestas afectivas* incluyen actitudes y preferencias implícitas de las que los individuos pueden no ser conscientes (o no están dispuestos a informar), que ocurren debido a asociaciones mentales previas entre un objeto o un comportamiento y una evaluación (positiva o negativa) (Fazio & Olson, 2003). Las *respuestas motivacionales* incluyen sesgos atencionales y de acercamiento-avoidancia. Los *sesgos atencionales* ocurren cuando ciertos estímulos en el ambiente capturan y retienen automáticamente la atención de los individuos (Kemps & Tiggemann, 2009). Los *sesgos de acercamiento-avoidancia* guían automáticamente a un individuo a acercarse o evitar ciertos estímulos (Hofmann et al., 2008) (ver Figura 2.4).

Por otro lado, el *Sistema Reflexivo* (Sistema 2) que implica decisiones conductuales conscientes, lo que resulta en respuestas lentas y esforzadas, elabora esas asociaciones automáticas en proposiciones (en las que se asigna un valor de "verdad" a la asociación

después de la deliberación). Este sistema es importante para las intenciones y el logro de objetivos. El *sistema reflexivo* también puede superar las respuestas habituales o elaborar planes de acción en situaciones nuevas cuando los hábitos fallan (ver Figura 2.4).

Figura 2.4

*Modelo de Procesamiento Dual Reflexivo-Impulsivo adaptado de Strack y Deutsch (2004).
Elaboración propia*



De acuerdo con el *Modelo de Procesamiento Dual Reflexivo-Impulsivo* ningún proceso es completamente reflexivo o impulsivo, y estos dos sistemas interactúan para influir en el comportamiento. En general, este modelo traza cómo se clasifican las entradas iniciales, lo que conduce a decisiones efectivas y evaluativas y, en última instancia, a una decisión de comportamiento e intenciones de actuar en consecuencia. Los esquemas son una construcción importante dentro de este modelo, y se activan mediante la difusión de la activación en redes asociativas.

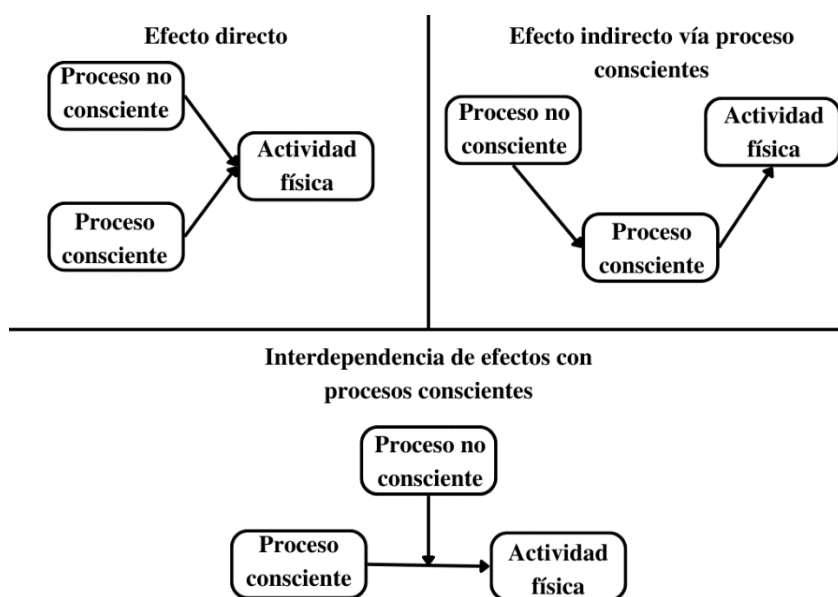
Se han descrito tres maneras en que interactúan los sistemas de los Modelos de Procesamiento Dual (ver Figura 2.5) (Rebar et al., 2016). Por un lado está el *patrón aditivo o efecto directo*, donde ambos sistemas explican la variación única en un comportamiento (Perugini, 2005; Rebar et al., 2016), por otro está el *patrón de doble disociación*, donde puede existir un efecto indirecto a través de procesos conscientes, un efecto independiente con procesos conscientes (Perugini, 2005; Rebar et al., 2016). De manera consistente, el patrón aditivo o de efecto directo se ha reportado para explicar exitosamente el comportamiento de la actividad física, dado que los procesos implícitos/impulsivos pueden estar asociados con la actividad física más allá de los procesos conscientes (Rebar et al., 2016). De igual manera,

se ha reportado que es probable que exista una interdependencia entre el vínculo de la actividad física con los procesos implícitos y reflexivos/conscientes (Rebar et al., 2016).

En síntesis, el Modelo de Procesamiento Dual plantea que la actividad física, especialmente la incidental, puede estar influida tanto por procesos conscientes y reflexivos como por respuestas automáticas e implícitas. Las actitudes implícitas emergen así como un componente relevante para explicar conductas físicas que no siempre son racionales o planificadas, como las propias de la vida diaria.

Figura 2.5

Modelos de interacción de los sistemas en Modelo de Procesamiento Dual adaptado de Rebar et al. (2016)



2.5.2.1 Modelo de Procesamiento Dual Reflexivo-Impulsivo y actividad física

La evidencia indica que las personas con niveles más altos de actividad física intencional (es decir, ejercicio físico) tienden a dirigir automáticamente su atención hacia señales relacionadas con la actividad física, en mayor medida que aquellas con niveles más bajos (Berry et al., 2011; Bluemke et al., 2010; Calitri et al., 2009; Conroy et al., 2010). Esto respalda la existencia de un sesgo atencional hacia estímulos vinculados al ejercicio (Berry et al., 2011; Bluemke et al., 2010; Calitri et al., 2009; Conroy et al., 2010). En particular, se

ha demostrado que los sesgos de atención para las señales de actividad física pueden predecir prospectivamente la actividad física de moderada a vigorosa (Cheval et al., 2015).

Respecto a la actividad física incidental, un estudio reportó que las actitudes implícitas predijeron prospectivamente los niveles de actividad física incidental e intencional, de modo que las personas con actitudes implícitas más positivas hacia la actividad física tenían un recuento de pasos diarios más alto (Conroy et al., 2010). También, estudios han reportado que las actitudes implícitas complementan la motivación al guiar la participación en la actividad física de los asistentes al gimnasio (Caudwell & Keatley, 2016). Además, la investigación también sugiere asociaciones positivas del comportamiento de actividad física con motivación autónoma (Williams et al., 2018), y tendencias de aproximación-evitación (Cheval et al., 2016).

En línea con lo anterior, un estudio transversal realizado en población universitaria examinó si la motivación autónoma y controlada en interacción con procesos implícitos (actitudes implícitas, sesgos atencionales y de acercamiento/evitación) contribuía a la actividad física incidental (Oliver & Kemps, 2018). Los resultados mostraron que las actitudes implícitas y la motivación autónoma y controlada se asociaron de forma independiente con la actividad física incidental. Se observó también que, tanto la motivación autónoma como la controlada (cuando se controla por el otro tipo de motivación) en interacción con el sesgo de acercamiento, contribuyeron a los niveles de actividad física incidental. De igual manera, la motivación se asoció positivamente con el conteo de pasos en participantes con puntajes altos de sesgo de evitación (Oliver & Kemps, 2018).

Cabe señalar que, hasta donde se tiene conocimiento, las investigaciones que han abordado explícitamente el estudio de la actividad física incidental y que han tenido como objetivo explicar este tipo de comportamiento, se han desarrollado exclusivamente desde un enfoque cognitivo de la Psicología del Ejercicio. Específicamente, a partir de la Teoría de Autodeterminación (Deci & Ryan, 2000, 2008), y el Modelo de Procesamiento Dual Reflexivo/Impulsivo (Strack & Deutsch, 2004).

2.6 Enfoque de la personalidad desde la Psicología del Ejercicio en el estudio de la actividad física: Modelo de personalidad de “Los Cinco Grandes”

Durante las últimas tres décadas, las investigaciones orientadas a explicar el comportamiento relacionado con la actividad física han estado dominadas por un enfoque

cognitivo dentro de la Psicología del Ejercicio (Rhodes et al., 2019). Este enfoque se ha expresado principalmente a través del uso de marcos teóricos como la Teoría Cognitivo-Social (Bandura, 1986), la Teoría del Comportamiento Planificado (Ajzen, 1991), la Teoría de la Autodeterminación (Deci & Ryan, 2000), el Modelo Transteórico (Prochaska & Velicer, 1997) y los Modelos de Procesamiento Dual (Strack & Deutsch, 2004).

Sin embargo, una variable individual que ha recibido considerable atención en la Psicología del Ejercicio es la personalidad (McCrae & Costa Jr., 2008; Wilson & Rhodes, 2021). La Teoría de la Personalidad constituye una de las tradiciones más extensas y consolidadas dentro de la psicología (McCrae & Costa, 2008; Wilson & Rhodes, 2021), y actualmente existe evidencia que respalda una relación significativa entre los rasgos de personalidad y la actividad física (Rhodes & Smith, 2006; Sutin et al., 2016; Wilson & Dishman, 2015). Asimismo, se ha observado que los rasgos de personalidad pueden influir en constructos cognitivos-sociales, como las actitudes, el disfrute, y la autoeficacia (Wilson & Rhodes, 2021). Además, estos rasgos pueden moderar la respuesta afectiva ante la actividad física, afectando así determinantes más automáticos o impulsivos del comportamiento, más allá de los procesos puramente cognitivos-sociales (Wilson & Rhodes, 2021).

La personalidad o rasgos de personalidad es definida como “diferencias individuales en patrones característicos de pensamiento, sentimiento y comportamiento” (American Psychological Association, 2020). En general, los rasgos de personalidad representan diferencias individuales duraderas y consistentes a lo largo de la vida (McCrae et al., 2000; Roberts et al., 2006). Estas disposiciones fundamentales influyen en la forma en que las personas responden a los estímulos ambientales (Wilson, 2019; Wilson & Rhodes, 2021). Si bien las expresiones individuales de personalidad generalmente se consideran manifestaciones culturalmente condicionadas por varios factores (Eysenck & Eysenck, 1987; McCrae et al., 2000), la personalidad es de moderada a altamente hereditaria (Bouchard & Loehlin, 2001; de Moor et al., 2012), sugiriendo una base evolutiva y biológica (Gray, 1991; Zuckerman, 2005).

En la actualidad, el estudio de la personalidad se basa en una taxonomía común de rasgos, a partir de la Teoría de la Personalidad de los Cinco Grandes: Apertura a la Experiencia, Extroversión, Amabilidad, Responsabilidad y Neuroticismo (ver Figura 2.6). Si

bien cada uno de estos términos representa un extremo dentro de su respectiva dimensión bipolar, son los más utilizados en la literatura para describir dichas dimensiones. No obstante, es importante reconocer que estas dimensiones tienen una naturaleza continua, y que todas las personas pueden ubicarse en algún punto de cada una de ellas, según sus respectivos puntajes (Wilson, 2019; Wilson & Rhodes, 2021).

Figura 2.6

Rasgos de personalidad según la Teoría de la Personalidad de los Cinco Grandes (McCrae & Costa Jr., 2008). Elaboración propia.



Las personas con mayores grados de apertura a la experiencia son reflexivos, creativos, intelectuales, originales, imaginativos, independientes y de amplios intereses (McCrae & Costa, 2008). Las personas con mayores grados de responsabilidad son ordenadas, orientadas al objetivo, autodisciplinadas, confiables, puntuales, perseverantes y

organizados (McCrae & Costa, 2008). Los extrovertidos, a diferencia de los introvertidos, son habladores, asertivos, enérgicos y prefieren (o no les importa) ser el centro de atención (McCrae & Costa, 2008). Aquellos que exhiben mayores grados de amabilidad son afables, alegres, generosos, confiables, cooperativos, optimistas y de trato fácil (McCrae & Costa, 2008). Por último, el neuroticismo es la tendencia a ser emocionalmente reactivo, son personas que presentan menor estabilidad emocional, son ansiosos, nerviosos, e inseguros, y son propensos a molestarse fácilmente o ser “malhumorado” (McCrae & Costa, 2008).

2.6.1 Modelo de personalidad de “Los Cinco Grandes” y actividad física

Revisiones sistemáticas y metaanálisis han encontrado que la tríada de mayor extroversión, mayor responsabilidad y menor neuroticismo (o más estabilidad emocional) se ha relacionado de manera más consistente con una mayor probabilidad de participación en actividades físicas (Rhodes & Smith, 2006; Sutin et al., 2016; Wilson & Dishman, 2015). mientras que, para el rasgo apertura a la experiencia se han reportado hallazgos más inconsistentes y para amabilidad generalmente no se ha relacionado con la actividad física (Rhodes & Smith, 2006; Sutin et al., 2016; Wilson & Dishman, 2015).

Rhodes y Smith (2006) en unos de los primeros metaanálisis sobre personalidad y actividad física, informaron correlaciones heterogéneas entre actividad física y los rasgos de personalidad de extroversión ($r = 0,23$), responsabilidad ($r = 0,20$), y neuroticismo ($r = -0,11$). Más recientemente, un metaanálisis de 64 estudios realizado por Wilson y Dishman (2015) indicó que los efectos de la personalidad sobre el comportamiento de la actividad física son moderadamente heterogéneos, variando según las características de la muestra (edad, sexo o estado clínico) y/o características del estudio (calidad de la medida o formato de ítem). este metaanálisis reportó una r media significativa para extroversión ($r = 0.107$), neuroticismo ($r = -0.071$), responsabilidad ($r = 0.103$), otorgando un nuevo respaldo para una relación entre la actividad física y el rasgo de apertura a la experiencia ($r = 0.034$), pero no así para amabilidad ($r = 0.002$).

De igual manera, Sutin et al. (2016), en un metaanálisis, examinaron la relación entre los rasgos de personalidad y la frecuencia de la actividad física, respaldando la evidencia previa que indica que un menor nivel de neuroticismo, junto con niveles más altos de extroversión y responsabilidad, se asocian con una mayor participación en actividad física. En línea con lo reportado por Wilson y Dishman (2015), también encontraron que la apertura

a la experiencia se relaciona positivamente con mayores niveles de actividad física (Sutin et al., 2016; Wilson & Dishman, 2015).

Estudios recientes corroboran la información proporcionada por los metaanálisis descritos anteriormente. Un metaanálisis basado en múltiples estudios de cohortes a gran escala en población adulta examinó las asociaciones transversales y prospectivas entre los rasgos de personalidad y la actividad física de la vida diaria (Canada et al., 2021). Reportó que un mayor neuroticismo se relacionó con una menor actividad física de la vida diaria ($\beta = -0,007$), por el contrario, mayor responsabilidad ($\beta = 0,013$), extroversión ($\beta = 0,014$) y apertura a la experiencia ($\beta = 0,013$), se asociaron con mayor actividad física de la vida diaria (Canada et al., 2021).

Courneya y Hellsten (1998) fueron pioneros en profundizar sobre la relación entre los rasgos primarios de personalidad y una amplia gama de preferencias de actividad física. A través de un estudio realizado en una muestra de estudiantes universitarios, informaron que la extroversión se relaciona con preferencias por hacer actividad física en grupo o supervisado. La responsabilidad, también se relacionó con una preferencia por la actividad programada, pero particularmente a través de ejercicios de alta intensidad, en lugar del ejercicio de intensidad moderada. De igual manera, aquellos que prefirieron actividad física de intensidad alta a moderada puntuaron bajo en neuroticismo. También observaron que el rasgo de apertura experiencia estaba relacionado con preferencias por actividad física en el exterior (en lugar del hogar o gimnasio), ejercicio recreativo (en lugar de competitivo), sin supervisión y espontáneo (en lugar de programado), además de presentar una preferencia por caminar. Finalmente, aquellos que puntuaron más alto en amabilidad prefirieron los ejercicios aeróbicos al entrenamiento con pesas.

Estudios posteriores han corroborado estos hallazgos, señalando que personas con puntajes altos en extroversión y responsabilidad comparten una preferencia por el ejercicio en grupo, estructurado, y el entrenamiento en el gimnasio (Hagan & Hausenblas, 2005). Mientras que las personas con alto nivel de neuroticismo prefieren hacer ejercicio solos sin supervisión, preferiblemente en casa (Hagan & Hausenblas, 2005). Asimismo, puntuaciones altas en extroversión, responsabilidad, y apertura a la experiencia se han asociado con preferencia por el ejercicio de intensidad moderada y vigorosa (Hagan & Hausenblas, 2005). Por el contrario, las puntuaciones altas en neuroticismo se han asociado con menor frecuencia

de actividad física (Rhodes & Smith, 2006; Wilson & Dishman, 2015), y preferencia por el ejercicio físico de menor intensidad (Hagan & Hausenblas, 2005), así como una mayor inactividad física y un estilo de vida más sedentario (Allen et al., 2017; Sutin et al., 2016).

En síntesis, el modelo de los Cinco Grandes proporciona una base sólida y empíricamente validada para comprender cómo características de personalidad relativamente estables pueden influir en la conducta física. La evidencia respalda asociaciones consistentes entre ciertos rasgos, como la extroversión o la responsabilidad, y mayores niveles de actividad física.

2.6.2 Rasgos de personalidad y teorías desde un enfoque cognitivo de la Psicología del Ejercicio

La evidencia indica que la influencia de la personalidad sobre la actividad física es predominantemente indirecta, mediada por constructos psicológicos, como percepciones, actitudes, normas y autoeficacia, por hábitos o por el acceso social y ambiental a recursos conductuales (Ajzen, 1991; Rhodes & Pfaeffli, 2012; Wilson & Rhodes, 2021).

Asimismo, la evidencia que respalda esta mediación sugiere que la personalidad podría influir en el comportamiento a través de vías distintas a los procesos psicológicos reflexivos y conscientes, como la motivación (Wilson & Rhodes, 2021). En este sentido, teorías como el Modelo de Procesamiento Dual Reflexivo-Impulsivo proponen dos rutas: una reflexiva y otra impulsiva, esta última asociada a procesos automáticos e inconscientes (Rhodes & de Bruijn, 2013).

En consecuencia, es plausible que la relación entre ciertos rasgos de personalidad, por ejemplo, la Extroversión, y el comportamiento en actividad física esté mediada, al menos en parte, por procesos menos conscientes e impulsivos. No obstante, aún se requiere mayor investigación que integre una gama más amplia de teorías con enfoque cognitivo, para comprender en mayor profundidad cómo la personalidad incide en la conducta relacionada con la actividad física (Wilson & Rhodes, 2021).

2.7 Integración de teorías explicativas para la actividad física incidental desde un enfoque de la personalidad y cognitivo de la Psicología del Ejercicio

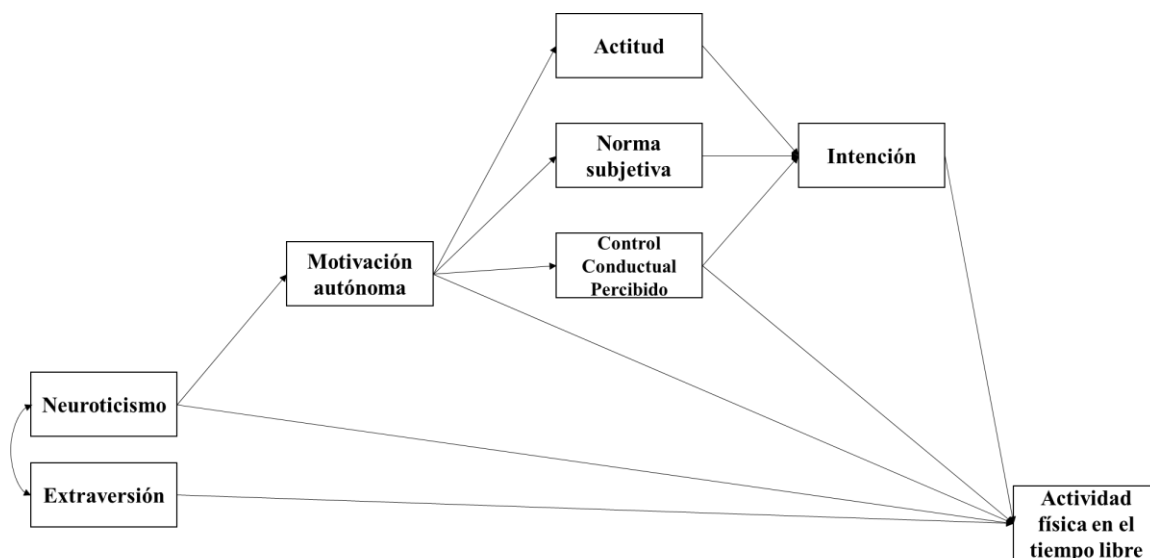
Como se ha señalado anteriormente, existen intentos en la literatura por desarrollar modelos explicativos de la actividad física y sus subcomportamientos, como la actividad física en el tiempo libre o los desplazamientos activos, que integren enfoques cognitivos y de

personalidad provenientes de la Psicología del Ejercicio. En esta línea, un estudio reciente que buscó explicar la actividad física en el tiempo libre en mujeres, utilizando mediciones con acelerometría, propuso un modelo teórico integrado basado en los rasgos de personalidad de extroversión y neuroticismo, y la motivación autónoma (Kekäläinen et al., 2022).

Como se muestra en la Figura 2.7, el modelo plantea una relación directa positiva entre la extroversión y la actividad física en el tiempo libre, y una relación directa negativa entre el neuroticismo y dicha conducta. Además, se observaron relaciones directas y positivas entre la motivación autónoma con la actividad física en el tiempo libre. La motivación autónoma también actúa como mediadora en la relación entre la extroversión, el neuroticismo y la actividad física en el tiempo libre. Finalmente, se identificó que tanto la extroversión como el neuroticismo moderan las asociaciones hipotéticas entre la motivación autónoma y la actividad física en el tiempo libre (ver Figura 2.7) (Kekäläinen et al., 2022).

Figura 2.7

Modelo propuesto de la relación entre rasgos de personalidad y motivación hacia la actividad física en el tiempo libre. Adaptado de Kekäläinen et al. (2022).



Al aplicar el modelo, se obtuvo que la motivación autónoma se asoció positivamente con la actividad física en el tiempo libre ($\beta = 0,21, p = ,001$). El neuroticismo se asoció

negativamente con la motivación autónoma ($\beta = -0,25, p < ,001$) y tuvo una asociación indirecta negativa con la actividad física en el tiempo libre a través de la motivación autónoma (efecto indirecto específico, $\beta = -0,05 p = ,007$). En consecuencia, no hubo una asociación indirecta entre la extroversión y la actividad física en el tiempo libre mediada por ninguna de las otras variables del modelo. El modelo explicó el 12% de la varianza en actividad física en el tiempo libre.

Este estudio aplicó un modelo basado en teorías que buscan explicar el comportamiento de la actividad física a través de procesos conscientes y reflexivos, dejando de lado las actitudes implícitas hacia la actividad física. Como se mencionó anteriormente, el sistema impulsivo (inconsciente) de los Modelos de Procesamiento Dual, cuentan con evidencia que respalda su interacción con constructos psicológicos de las Teorías de Autodeterminación, para explicar la actividad física. Además, dado que los rasgos de personalidad no presentaron una asociación directa con la actividad física, se plantea la relevancia potencial de las actitudes implícitas descritas dentro de los sistemas impulsivos de los Modelos de Procesamiento Dual, para explicar la actividad física, y la relación indirecta entre personalidad y actividad física.

Hasta la fecha, se desconoce un modelo explicativo de la actividad física incidental basado en un enfoque de personalidad, que integre una vía reflexiva y consciente a través de la incorporación de constructos de la Teoría de la Autodeterminación. Junto con una vía más inconsciente a través de actitudes implícitas como los propuestos en el Modelo de Procesamiento Dual Reflexivo/Impulsivo (*sistema I* de los modelos de procesamiento dual).

2.8 Propuesta de modelo integrado de teorías explicativas para la actividad física incidental desde un enfoque de la personalidad y cognitivo de la Psicología del Ejercicio

Este modelo explicativo integrado tiene como propósito comprender el comportamiento de la actividad física incidental, a partir de la integración teórica de enfoques de personalidad y cognitivos de la Psicología del Ejercicio. Se trata de una propuesta innovadora, ya que, por primera vez, se incorporan en un único modelo explicativo constructos provenientes de tres marcos teóricos: la Teoría de la Personalidad de los Cinco Grandes, la Teoría de la Autodeterminación y el Modelo de Procesamiento Dual Reflexivo/Impulsivo. En particular, este modelo se enfoca en explicar la actividad física

incidental, un tipo de comportamiento que ha recibido escasa atención científica y para el cual existen pocos modelos teóricos disponibles (ver Figura 3.1).

Concretamente, el modelo plantea que los rasgos de personalidad (apertura a la experiencia, responsabilidad, extroversión, amabilidad y neuroticismo) se asocian de forma directa e indirecta con el nivel de actividad física incidental. Siguiendo los postulados del Modelo de Procesamiento Dual, se propone que esta relación indirecta opera a través de dos sistemas o vías: una reflexiva y consciente, y otra impulsiva e inconsciente (ver Figura 3.1).

La vía reflexiva del modelo explica aquellas decisiones conscientes que forman parte de la vida diaria al involucrarse en comportamientos relacionados con la actividad física incidental. Esta vía está compuesta por los tipos de motivación hacia dicha actividad, es decir, amotivación, motivación controlada y motivación autónoma, de acuerdo con la Teoría de la Autodeterminación. Estos constructos actuarían como mediadores en la relación entre los rasgos de personalidad y el nivel de actividad física incidental. Y también como variables explicativas directas (ver Figura 3.1).

Por su parte, la vía impulsiva del modelo representa decisiones frecuentes, automáticas y no conscientes que ocurren en la vida cotidiana al realizar este tipo de actividad. Está conformada por las actitudes implícitas hacia la actividad física incidental, un constructo central del Modelo de Procesamiento Dual Reflexivo/Impulsivo. Dichas actitudes implícitas refuerzan y otorgan una explicación plausible a la relación indirecta entre los rasgos de personalidad y el comportamiento de actividad física incidental. Y también actuarían como variables explicativas directas (ver Figura 3.1).

2.9. Síntesis crítica y vacíos en la literatura

A pesar de los avances recientes en la conceptualización y medición de la actividad física incidental, persiste una heterogeneidad en su definición operacional, lo que dificulta la comparación entre estudios y el diseño de intervenciones basadas en evidencia. Además, la mayoría de las investigaciones se han centrado en factores contextuales o ambientales, mientras que las variables individuales, especialmente aquellas de carácter psicológico, han recibido menor atención. Finalmente, aunque existen estudios que han abordado la motivación o las actitudes implícitas de manera aislada, son escasos los modelos explicativos integradores que incorporen simultáneamente rasgos de personalidad, motivación y actitudes implícitas como predictores de la actividad física incidental.

La presente tesis busca abordar dichos vacíos existentes en la literatura mediante la integración de las perspectivas teóricas de la Psicología del Ejercicio como, la Teoría de la Autodeterminación, los modelos de procesamiento dual, y el modelo de los Cinco Grandes rasgos de personalidad, en un modelo explicativo integrado. Al hacerlo, se espera avanzar en la comprensión de los determinantes psicológicos de la actividad física incidental y contribuir con evidencia aplicable al diseño de intervenciones personalizadas y efectivas.

3. PREGUNTA DE INVESTIGACIÓN, OBJETIVOS E HIPÓTESIS

3.1 Preguntas de Investigación

En un modelo explicativo hipotético ¿Cuál es el rol de los rasgos de personalidad, la motivación hacia la actividad física incidental y actitudes implícitas hacia la actividad física incidental en el nivel de actividad física incidental en estudiantes universitarios?

3.2 Objetivos de Investigación

3.2.1 Objetivo general

Evaluar un modelo explicativo hipotético de la actividad física incidental en estudiantes de la Universidad de Concepción basado en variables de la personalidad, motivación hacia la actividad física, y actitudes implícitas hacia la actividad física incidental.

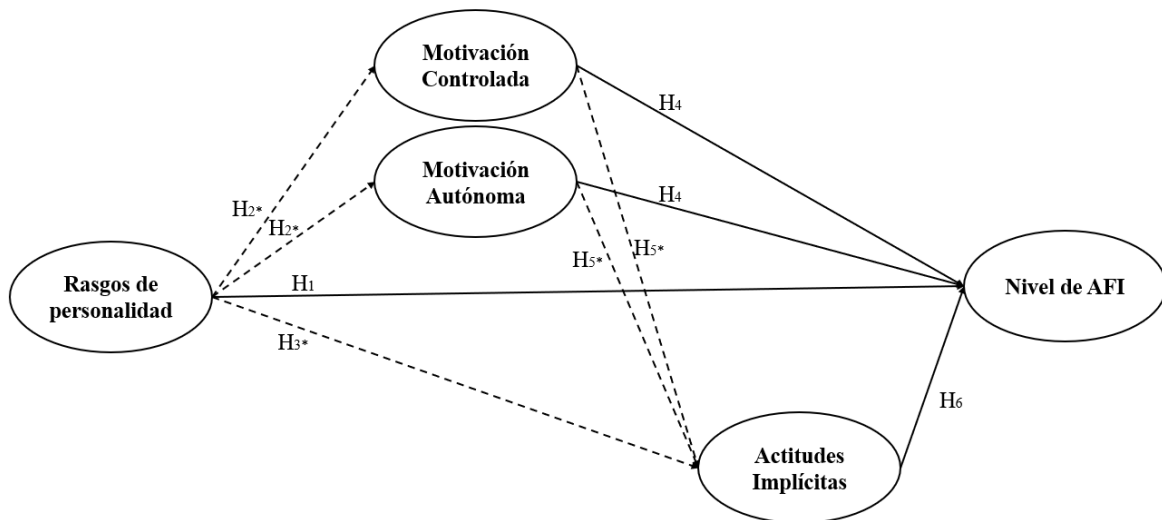
3.2.2 Objetivos específicos

- Establecer la relación entre los rasgos de personalidad, la motivación hacia la actividad física, actitudes implícitas hacia la actividad física incidental, y el nivel de actividad física incidental en estudiantes de la Universidad de Concepción.
- Estimar el efecto directo de los rasgos de personalidad, motivación hacia la actividad física, y actitudes implícitas hacia la actividad física incidental sobre el nivel de actividad física incidental de estudiantes de la Universidad de Concepción.
- Estimar el efecto indirecto de los rasgos de personalidad sobre el nivel de actividad física incidental de estudiantes de la Universidad de Concepción mediado por la motivación hacia la actividad física y actitudes implícitas hacia la actividad física incidental.

3.3 Hipótesis de Investigación

Figura 3.1

Modelo hipotético integrado explicativo de la actividad física incidental desde un enfoque de personalidad y cognitivo de la Psicología del Ejercicio



*: Hipótesis de efectos indirectos. AFI: Actividad física incidental

Hipótesis 1: Los rasgos de personalidad extroversión, amabilidad, responsabilidad y apertura a la experiencia tienen un efecto directo positivo, y neuroticismo tiene un efecto directo negativo en el nivel de actividad física incidental.

Hipótesis 2: Los rasgos de personalidad extroversión, amabilidad, responsabilidad y apertura a la experiencia tienen un efecto indirecto positivo, y neuroticismo tiene un efecto indirecto negativo en el nivel de actividad física incidental a través de la motivación controlada y autónoma.

Hipótesis 3: Los rasgos de personalidad extroversión, amabilidad, responsabilidad y apertura a la experiencia tienen un efecto indirecto positivo, y neuroticismo tiene un efecto indirecto negativo en el nivel de actividad física incidental a través de las actitudes implícitas.

Hipótesis 4: La motivación controlada y autónoma tienen un efecto directo positivo en la actividad física incidental.

Hipótesis 5: La motivación controlada y autónoma tienen un efecto indirecto positivo en la actividad física incidental a través de las actitudes implícitas.

Hipótesis 6: Actitudes implícitas positivas hacia la actividad física incidental se asociarán con mayores niveles de actividad física incidental.

4. MÉTODO GENERAL, ESTUDIOS Y CONSIDERACIONES ÉTICAS

4.1 Método

A continuación, se describen las características metodológicas de los diseños utilizados en los tres estudios que conforman y estructuran la presente tesis doctoral, así como las consideraciones éticas contempladas en su desarrollo.

4.2 Estudios

Estudio I

El Estudio I de la presente tesis doctoral consistió en una revisión sistemática de alcance, realizada de acuerdo con los estándares de la declaración PRISMA-ScR (Tricco et al., 2018). El estudio se registró el 22 de julio de 2023 en la Plataforma Internacional de Protocolos Registrados para la Revisión Sistemática y el Metaanálisis (INPLASY202370089).

Estudio II

El Estudio II de la presente tesis doctoral consistió en un diseño de estudio instrumental (Ato et al., 2013) desarrollado a partir del método de encuesta transversal (Creswell, 2012) a través de la recopilación de información en un solo punto en el tiempo. Este estudio siguió las recomendaciones para la validación de instrumentos psicométricos en ciencias sociales y de la salud (López-Pina & Veas, 2024).

Estudio III

El Estudio III de la presente tesis doctoral consistió en un diseño explicativo transversal con variables latentes (Ato et al., 2013). Este tipo de diseño se sugiere para explicar comportamientos complejos como la actividad física, en los que concurren múltiples variables explicativas (Migueles et al., 2022). Además, se siguieron las recomendaciones de la guía STROBE para el reporte de estudios observacionales (Cuschieri, 2019).

4.3 Consideraciones éticas

El presente proyecto de tesis doctoral fue aprobado por el Comité de Ética y Bioética del Departamento de Psicología (ver anexo 5), y por el Comité de Ética, Bioética y Bioseguridad de la Universidad de Concepción (ver anexo 6), lo que garantiza su adecuación a los principios éticos establecidos para la investigación con personas.

Los procedimientos y métodos llevados a cabo en la presente tesis doctoral se ajustan a los lineamientos éticos para la investigación en seres humanos definidos por la Declaración

de Helsinki de 1964 y sus enmiendas posteriores (World Medical Association, 2013), y por el Código de Ética del Colegio de Psicólogos de Chile. En cuanto al principio de autonomía, todos los participantes fueron informados de forma clara sobre los objetivos del estudio, los procedimientos, los beneficios y posibles riesgos, y se obtuvo su consentimiento informado por escrito, con la opción de retirarse en cualquier momento sin consecuencias. El principio de beneficencia fue resguardado asegurando que la participación en el estudio no implicara daño alguno, sino potenciales beneficios asociados a la toma de conciencia sobre sus propios niveles de actividad física y hábitos de vida. El principio de no maleficencia se garantizó mediante la aplicación de instrumentos validados, no invasivos y la ausencia de procedimientos que implicaran riesgo físico, psicológico o emocional para los participantes. Finalmente, el principio de justicia se consideró en la selección voluntaria de los participantes, asegurando un trato equitativo, sin discriminación por sexo, edad, nivel socioeconómico u otros criterios.

En lo relativo a la custodia y protección de los datos, se establecieron procedimientos específicos para garantizar la confidencialidad y seguridad de la información recolectada. Todos los datos fueron anonimizados mediante codificación única antes de su análisis. Los archivos digitales fueron almacenados en un disco duro externo bajo custodia y responsabilidad exclusiva del investigador principal. Solo los coinvestigadores autorizados tuvieron acceso a las bases de datos. Los datos serán conservados por un período mínimo de cinco años y luego eliminados, conforme a las normativas institucionales y los lineamientos de buenas prácticas científicas. Estos resguardos fueron también informados explícitamente en el documento de consentimiento informado entregado a los participantes (ver Anexos 4), el cual fue revisado y aprobado por los comités de ética correspondientes.

5. RESULTADOS

A continuación, se presentan íntegramente los Estudios I, II y III que articulan la presente tesis doctoral. Los estudios se incluyen en el formato original de la revista en la que fueron publicados los Estudios I y II, y en el formato en que fue enviado para su evaluación el Estudio III.

El Estudio I consistió en una revisión de alcance que sintetiza el concepto y los comportamientos asociados a la actividad física incidental en la literatura científica existente. El Estudio II corresponde a la adaptación y análisis de las propiedades psicométricas del Cuestionario de Regulación Conductual en el Ejercicio (BREQ-3), adaptado específicamente para evaluar la motivación hacia la actividad física incidental. Este instrumento fue utilizado en el Estudio III. Finalmente, el Estudio III corresponde a un diseño explicativo de tipo transversal, que incluye variables latentes de actividad física incidental y fue desarrollado para dar cumplimiento al objetivo general y los objetivos específicos, así como para contrastar las hipótesis de la presente tesis doctoral.

5.1 Estudio I



REVIEW OPEN ACCESS

Conceptual and Evidence Update on Incidental Physical Activity: A Scoping Review of Experimental and Observational Studies

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ABSTRACT

Promoting incidental physical activity (IPA) can help reduce sedentary lifestyles and physical inactivity levels in the population. However, there is heterogeneity in the definition of IPA, and studies have yet to synthesize the empirical findings on this topic. This review aimed to (1) Synthesize the definitions of the IPA used in the scientific literature, (2) Identify the behaviors part of the IPA, and (3) Synthesize the main findings on IPA. The review followed PRISMA guidelines. A systematic search was performed in July 2023, and an update was made in February 2024 in the CINAHL databases by EBSCOhost, Cochrane Library, Pubmed, ScienceDirect, Scopus, and Web of Science. The search phrase was (“incidental physical activity” OR “incidental physical activity of daily living” OR “incidental movement” OR “vigorous intermittent lifestyle physical activity” OR “VILPA” OR “physical activity of daily living”). Fifty-five studies were included, with non-experimental (40), experimental (12), qualitative studies (2), and mixed design (1). Ten different terms for IPA were identified, and a conceptual definition was included in 33 articles. Behaviors measured as part of the IPA were reported in 41 articles. These definitions describe unstructured, unplanned, and unintentional physical activities of daily living that are performed as a by-product of an activity with a different primary purpose during free or occupational time and without specific fitness, sport, or recreation goals. Include light and vigorous intensities ranging from short sessions of < 1 min to prolonged ones. They include home activities, self-care, gardening, occupation, active transportation, and walking. Furthermore, evidence on IPA suggests an association with a lower risk of all-cause mortality. The findings of this review contribute to the updated study of IPA. Advances in data processing methods are needed to capture the diversity of behaviors and deepen the understanding of IPA.

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1 | Introduction

The latest update of the World Health Organization (WHO) guidelines on physical activity and sedentary lifestyle emphasizes that “every movement counts” and recommends that limiting sedentary time with physical activity of any intensity translates into health benefits [1]. In addition, there is growing evidence of the association between physical activity of any duration and improved health outcomes, including reduced all-cause mortality [2, 3]. Thus, the recommendation that physical activity should be accumulated in segments of at least 10 continuous minutes has been modified by the message “Any amount of physical activity is better than none, and the more, the better” [1, 4].

In this sense, incidental physical activity (IPA) might be important in population health. This is because many everyday activities involve IPA, such as using stairs, walking for transportation, standing, shopping, gardening, housework, work-related physical activity, playing with children, and walking pets, among others [5–7]. Furthermore, research indicates that IPA tends to have a higher adherence rate over time and appears to be easier to incorporate than structured physical exercises (e.g., going to the gym or attending guided classes), regardless of age or gender [5, 8, 9].

The Global Action Plan on Physical Activity 2018–2030 highlights the potential of reducing sedentary behaviors through promoting IPA [10]. This approach can gradually elevate physical activity levels, improving health [1]. Numerous population groups have reported a positive association between IPA and physical health and well-being [11–13]. A recent 7-year prospective study of 25 241 adults in the United Kingdom revealed that even 3–4 min bursts of vigorous IPA could significantly reduce the risk of all-cause, cancer, and cardiovascular disease mortality [14].

While the body of evidence on IPA is expanding, there is still a need for more empirical studies. One potential challenge in this area is accurately conceptualizing and identifying IPA behaviors [15, 16]. Over the past decade, researchers have been refining the concept of IPA to provide methodological support to their studies. They generally agree that IPA encompasses any physical activity of daily life, whether at home, work/study, or during free time, that does not require additional time and does not have health/fitness or recreational purposes [11, 17–22].

Although there is currently a delimited construct about what IPA is, it has limitations, such as a lack of agreement regarding the specific behaviors that IPA encompasses and whether the degree of intention with which the behaviors are performed determines if they are considered IPA. To the best of our knowledge, two theoretical studies [19, 20] and one of an empirical nature [22] have identified behaviors corresponding to IPA. Reynolds et al. developed a list based on the definition of IPA provided by the Australian Institute of Health and Welfare [19]. More recently, Stamatakis et al. suggested a preliminary list of common forms of IPA based on the compendium of physical activities [23], encompassing dimensions such as home activities, home repairs, gardening, walking,

and biking, among others [20]. Finally, a recent study using a 24-h written record in the university population [22] documented activities that responded to the dimensions described by Stamatakis et al. [20].

Advancing IPA research can inform public health policies and interventions aimed at increasing physical activity levels across different demographics, ultimately fostering healthier communities [10, 21]. IPA is inherently more accessible to diverse populations, including those who may not have the time, resources, or inclination to engage in formal exercise routines [5, 8, 9]. Integrating IPA into daily life through activities such as walking, taking stairs, and household chores can encourage a more active lifestyle to reduce the risk of chronic diseases, enhance mental health, and improve overall well-being [14, 21, 24]. Consequently, in order to advance in this line of research, it is necessary to have a theoretical definition of the concept of IPA [15, 21] as well as to know the main empirical findings in IPA research. Therefore, the objectives of this review are: (1) To synthesize the definitions of the IPA used in the scientific literature; (2) To identify the behaviors that are part of the IPA; and (3) To synthesize the main empirical findings on IPA.

2 | Method

2.1 | Design

The reporting of this scoping review was conducted following the standards established by the PRISMA-ScR statement [25]. The PRISMA checklist can be found in the Data S1. The study was registered on July 22, 2023 on the International Platform of Registered Protocols for Systematic Review and Meta-analysis (INPLASY202370089).

2.2 | Search Strategy

The search strategy followed the guidelines established by the Peer Review of Electronic Search Strategies (PRESS) [26]. EBSCOhost, Cochrane Library, Pubmed, ScienceDirect, Scopus, and Web of Science systematically searched the CINAHL databases.

The general search syntax was limited by title, abstract, and keywords. It was: (“incidental physical activity” OR “incidental physical activity of daily living” OR “incidental movement” OR “vigorous intermittent lifestyle physical activity” OR “VILPA” OR “physical activity of daily living”). In this way, the scope of the search was extended to all articles that explicitly dealt with IPA and studies that investigated this IPA under terms such as “incidental movement” or as part of the physical activity of daily living. The search looked at studies in English published up to July 2023 and then conducted a second update search up to February 29, 2024. The review was not limited by publication date, as the interest was to capture the evolution of the IPA concept. Gray literature was not included, as the focus was on published definitions, behaviors, and findings on IPA that have been peer-reviewed.

2.3 | Study Selection and Inclusion Criteria

All articles that met the search phrase were considered. Then, only those articles that met the following inclusion criteria were selected: (1) *Population*: children and adolescents, adults, older people, with or without health conditions; (2) *Study objectives*: articles whose main objective was the study of IPA or those that reported the measurement of such activity. In addition, we considered studies that investigated IPA by using the term “incidental movement” to refer to behaviors such as walking, stair climbing, active transport, home, occupational, and leisure-time activities. Also, studies were incorporated under the term “physical activity of daily living” that included a set of behaviors that are part of the IPA, such as walking, climbing stairs, active transportation, home, occupational, and leisure activities; (3) *Variables*: IPA level, incidental movement, or physical activities of daily living; and (4) *Study design*: studies classified as instrumental research, empirical research (i.e., experimental, quasi-experimental, single-case, non-experimental, qualitative, and mixed studies), and methodological research [27].

Articles were excluded when: (1) the study objective or outcome measure was physical exercise or structured physical activity (e.g., trekking or group classes such as yoga, dance, or fitness); (2) the study objective or outcome measure was incidental movements not identified as behaviors that are part of the IPA, such as eye movements or muscle spasms; (3) the study objective or outcome measure included physical activities of daily living without specifying the type of activities or behaviors performed, or recreational physical activities, such as recreational sports, hiking, dancing, and outdoor games, or was considered a categorical indicator of functional ability or disability; (4) were published as conference abstracts, posters, dissertations, theses, commentaries, study protocols, in non-scientific journals, or systematic or literature reviews; and (5) the language was different from English or Spanish.

2.4 | Data Extraction

After eliminating the duplicate records obtained from the databases through the Zotero bibliographic manager, the selection process was carried out using the Rayyan platform [28, 29]. The identified articles were independently reviewed by two reviewers (DR-M and RZ-L), and any discrepancies were discussed with a third reviewer (IC) until agreement was reached.

Data extraction in this scoping review was performed in two stages. First, two review authors (DR-M and RZ-L) selected records that met the inclusion criteria by reading the title and abstract of the articles. Second, when decisions could not be made solely based on the title and abstract, full-text documents (DR-M and RZ-L) were retrieved. The inter-reviewer agreement was analyzed using Cohen of the Kappa index during the study selection process [30]. The level of agreement among reviewers during study selection in the first stage was 82.0% ($\kappa=0.62$; 95% CI: 0.52–0.72), indicating substantial agreement according to the classification of Cohen [30]. In the second stage, it was 88.6% ($\kappa=0.75$; 95% CI: 0.66–0.84), indicating substantial to excellent agreement.

2.5 | Data Synthesis Strategy

We summarized the evidence from the included studies and presented relevant information in tables and figures. The PRISMA flowchart represents the stratification of the selected studies (Figure 1). Table 1 provides a summary of the general characteristics of the included studies. Table 2 presents the conceptual definition of IPA used by the authors. To do this, the FITT principle (Frequency, Intensity, Time or Duration, and Type or Mode of Physical Exercise) established by the American College of Sports Medicine was used [89]. Given the characteristics of the IPA, the frequency domain of the FITT principle was not considered in this context. Table 3 summarizes the behaviors and instruments used to measure IPA. Figure 2 shows the frequency of behaviors reported in the IPA measurement by item. Behaviors reported in the IPA measurement were classified according to the 2024 Adult Compendium of Physical Activities [90]. Table 4 summarizes the main findings on IPA reported in the included articles.

3 | Results

3.1 | Literature Review

Figure 1 presents the flowchart for systematic reviews proposed by the PRISMA statement [31]. A total of 588 potential items were identified. Subsequently, after the exclusion of duplicates in the databases, selection and eligibility criteria were applied, and 48 articles were included. In addition, seven articles that met the selection and eligibility criteria were included. Of these, five articles were identified in February following an update to the systematic search [24, 32, 64, 67, 78], and two were identified from findings in the citation of included articles [51, 73]. Thus, a total of 55 articles for narrative synthesis were included in this review (Figure 1).

3.2 | General Characteristics of the Included Articles

The 55 articles reviewed were published between 1999 and 2024, and 37 were published in the last 10 years. Most of the studies were conducted in the Americas, with a total of 22 articles, and in Oceania, with 18 articles. Within the Americas, most of the research focused on North America, specifically the United States (13 articles), Canada (three articles), and Mexico (two articles). In South America, the research was limited to Brazil, with a total of four articles. All the studies conducted in Oceania were conducted exclusively in Australia, with 18 articles.

Most of the studies had non-experimental designs ($n=40$), with cross-sectional designs being the most frequent (34 articles). There were 12 articles with experimental designs, two with a qualitative approach and one with a mixed-method design. Participants were from all age ranges. Eight articles did not provide information on the age of participants. In 33 articles, the majority of the sample was composed of women, and in four studies, the research was conducted exclusively with women.

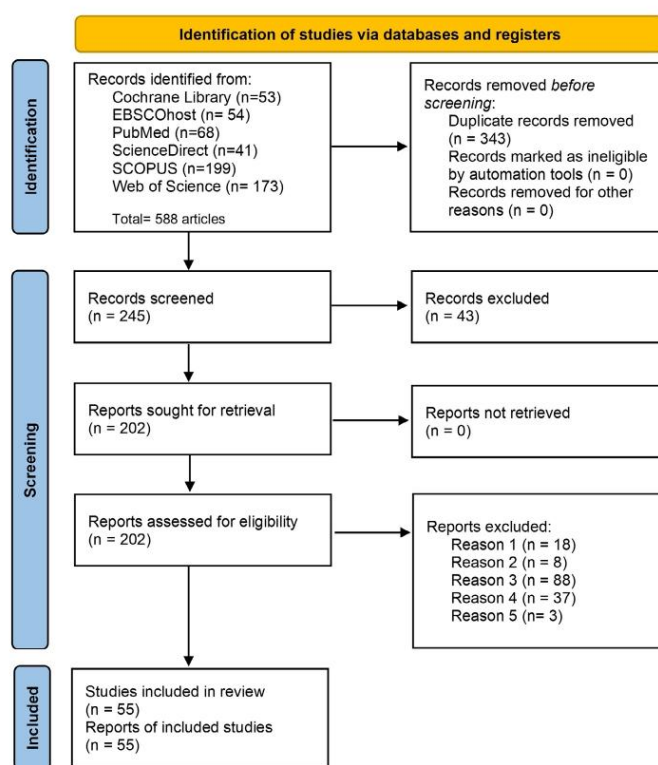


FIGURE 1 | PRISMA statement study selection flowchart [31].

3.3 | Incidental Physical Activity Definition

The term IPA was used in 38 of the 55 articles included. Then, the included articles identified more terms to refer to IPA. These terms were: incidental activity or activities, incidental movement, incidental walking, incidental breaks, incidental exercise, habitual incidental physical activity, incidental lifestyle or incidental lifestyle physical activity, vigorous intermittent lifestyle physical activity (VILPA), moderate-to-vigorous intermittent lifestyle physical activity (MV-ILPA), and physical activity of daily life (PDLA). Of the 10 terms identified to refer to incidental physical activity, the most frequently used were “incidental activity or activities” (nine articles), followed by “incidental movement” (eight articles). The term “incidental movement” was used as a substitute for “incidental physical activity” in seven of the eight articles. In contrast, one article used it with the term “incidental physical activity”. On the other hand, in the nine articles in which “incidental activity or activities” was used, this term was used in conjunction with “incidental physical activity”.

In 33 articles, the concept addressed was defined (Table 2). Of those, 20 provided definitions for “incidental physical activity”, seven for “incidental movement”, six for “incidental activity or

activities”, three for “VILPA”, two for “incidental lifestyle or incidental lifestyle physical activity”, one for “incidental walking”, one for “habitual incidental physical activity”, one for “PADL” and one for “MV-ILPA”. Following the FITT principle of the ACSM, 11 articles incorporated *Activity Intensity* into the definitions of IPA and the related concepts. Intensity measures included step cadence, METs, or the Borg scale, which reported intensities from light to vigorous as part of IPA. Step cadence was the most frequently reported measure of intensity (in five studies), where the intensity of IPA ranged from 1 to <40 steps/min.

The time or duration of the activity was incorporated into the IPA definitions of five articles, and although they all used minutes, all the descriptions were heterogeneous. The *Type of activity* was incorporated into the definitions of 32 articles, reporting most frequently that IPA is activities that are part of daily life (13 articles), performed in free time (two articles), without structure or planning (six articles), unintentional (four articles), that are performed as a by-product of activity with a different primary purpose (three articles), and that do not have as their purpose the performance of exercise, sport, or physical activity (six articles) or recreational or health purposes (two articles). In addition, according to the definitions provided and following the

TABLE 1 | General characteristics of the included articles.

Reference	Country	Design	Population	Final sample	Mean age	Male/female/other %
Ahmadi et al. [32]**	United Kingdom	Prospective cohort	Non-athletic population or population that performs physical exercise without cardiovascular diseases	23 292	61.8 ± 7.6	61/39
Alatorre-Cruz et al. [33]	Mexico	Cross-sectional	Older adults aged 60 years and older	36	60–77	—
Andrews et al. [34]	Australia	Cross-sectional	People 65 years and older without neurodegenerative disease or severe psychiatric or neurological conditions	127	65–88	33/67
Assemi et al. [35]	Australia	Descriptive	Undergraduate engineering students at the University of Queensland	142	—	62/38
Beavis & Moodie [36]	Australia	Cross-sectional	General population	29 840	0–80+	—
Bellefriere et al. [37]	United States	Quasi-experimental	Pedestrians use stairs/escalators at the airport	1091	18–66+	33/77
Benitez-Flores et al. [38]	Brazil	Randomized controlled	College students	30	19–35	50/50
Benitez-Flores et al. [39]	Brazil	Randomized crossover	Healthy adults are physically active but not athletic	10	20–40	70/30
Bull et al. [40]	United States	Randomized controlled trial	Adult primary care patients	203	49.0 ± 6.4	26/74
Candido et al. [41]	Australia	Cross-sectional	Office workers	20	—	—
Chudyk et al. [42]	Canada	Cross-sectional	Older adults 65 years and older	151	70–79	34/66
Conroy et al. [43]	United States	Cross-sectional	Undergraduate students	201	19.2	38/72
Coronini-Cronberg et al. [44]	England	Cross-sectional	Older adults 60 years and older	16 911	60–70+	46/54
D'Alonzo & Cortese [45]	Costa Rican/ United States	Cross-sectional	Healthy Costa Rican Women	19	12–19	—/100
D'Alonzo & Sharma [46]	United States	Photovoice	Women	8	35–55	—/100
Engelen et al. [47]	Australia	Cross-sectional	University of Sydney students and staff	—	—	—
Eves et al. [48]	United Kingdom	Quasi-experimental	Passengers at the train station	—	—	—
Gilson et al. [49]	United Kingdom/Australia/Spain	Quasi-experimental	White-collar university employees	179	41.3 ± 10.1	21/79

(Continues)

TABLE 1 | (Continued)

Reference	Country	Design	Population	Final sample	Mean age	Male/female/other %
Harding et al. [50]	United States	Quasi-experimental	Persons aged 60 or older diagnosed with cancer	41	70.1 ± 4.4	44/56
Khalil et al. [51]*	Jordan	Cross-sectional	People with multiple sclerosis	50	36.7 ± 10.0	22/78
Kim et al. [52]	South Korea	Descriptive	Korean adult general population	1703	19–64	38/62
Koch et al. [11]	Germany	Cross-sectional	Adolescents from a mental health institute without mental disorders, cardiovascular disorders, or chronic endocrine or immunological diseases	113	12–17	—
Macdonald et al. [53]	Australia	Cross-sectional	Schoolchildren	34	—	59/41
Mark & Janssen [54]	United States	Cross-sectional	General population	1165	8–17	—
Marshall et al. [55]	Australia	Quasi-experimental	Hospital staff	40	—	22/78
McCormack et al. [56]	Australia	Cross-sectional	General population	84	18–65	54/46
McGann et al. [57]	Australia	Mixed methods	Employees working in the government sector	90	—	—
McGuire & Ross [58]	Canada	Cross-sectional	Inactive men and women with abdominal obesity	126	35–69	33/67
Merom et al. [59]	Australia	Randomized controlled trial	Inactive older adults	126	65–74	33/67
Munari et al. [60]	Brazil	Cross-sectional	Subjects with a clinical diagnosis of chronic obstructive pulmonary disease who are clinically stable	131	40–80	28/72
Norrish et al. [61]	Australia	Cross-sectional	Primary school children	64	10.5 ± 0.5	56/44
Oliver & Kemps [18]	Australia	Cross-sectional	University student population and the community in general	103	17–68	31/69
Osborne et al. [62]	Australia	Randomized controlled	Recreationally trained males	8	26.5 ± 1.8	100/—
Pan et al. [63]	United States	Cross-sectional	Patients needed to undergo a bilateral nephrectomy	9	33–71	66/34
Panisset & Galea [64]**	Australia	Retrospective cohort	People with multiple sclerosis	151	48.2 ± 11.3	87/11/1
Perry et al. [65]	Australia	Cross-sectional	Older adults with osteoarthritis knee	19	55–81	47/53

(Continues)

TABLE 1 | (Continued)

Reference	Country	Design	Population	Final sample	Mean age	Male/ female/ other %
Puig-Ribera et al. [66]	Spain	Quasi-experimental	University employees	190	42	35/65
Raisi et al. [67]**	United Kingdom	Prospective cohort	People who used stairs	442027	37-73	46/54
Ross & McGuire [68]	Canada	Cross-sectional	Inactive men and women with abdominal obesity	135	35-65	32/68
Ruff et al. [69]	United States	Cross-sectional	Employees	1348	18-65+	45/55
Sanchez-Lopez et al. [12]	Mexico	Cross-sectional	Healthy older people	97	66.8±4.3	34/66
Scharff et al. [70]	United States	Cross-sectional	Women	611	18-75	—/100
Stamatakis et al. [14]	United Kingdom	Prospective cohort	Nonexercising adults	25241	40-69	44/56
Stamatakis et al. [24]**	United Kingdom	Prospective cohort	Nonexercising adults	22 398	62.0 ± 7.6	45/55
Straiton et al. [71]	Australia	Cross-sectional	Older adults with severe aortic stenosis	10	82.3 ± 7.0	47/53
Thøgersen-Ntoumani et al. [72]	Australia	Focus group interview	Physically inactive middle-aged and older adult	78	35-76	76/23/1
Tonello et al. [13]	Brazil	Cross-sectional	Young, non-menopausal, overweight but healthy women, free of pathological conditions and medications, full-time service workers	21	34.5 ± 6.4	—/100
Tudor-Locke et al. [73]*	United States	Cross-sectional	General population	3744	20+	48/52
Tudor-Locke et al. [74]	United States	Cross-sectional	General young population	54	20-36	37/63
Vancampfort et al. [75]	Uganda	Cross-sectional	Outpatients with psychosis	50	33.5 ± 14.3	56/44
Vancampfort et al. [76]	Uganda	Cross-sectional	Patients with depression	50	29.0 ± 14.2	70/30
Wallmann-Sperlich et al. [22]	Germany	Cross-sectional	University students and office workers	23	—	—
Wu et al. [77]	United Kingdom	Cross-sectional	Healthy people who used stairs	451 699	40-69	45/55
Zheng et al. [78]**	United States	Cross-sectional	Persons with multiple sclerosis	201	22-77	22/78
Ziviani et al. [79]	Australia	Cross-sectional	Primary school children	164	9.1 ± 2.0	46/54

Note: ±, II, represented the mean age's standard deviation (SD), +, The "plus" symbol after an age, such as 80+, indicates that the sample includes people aged 80 and older. *Articles were added to the systematic review because they were cited in the included articles. **Articles added in the update.

TABLE 2 | Incidental physical activity definition.

Reference	Concept used	Definition	Intensity	Time	Type	Definition based on
Ahmadi et al. [32]**	MV-ILPA	Short sessions of less than 10 min are carried out as part of activities of daily living, not related to participation in exercise or sport during leisure time or recreational walking more than once a week		✓	✓	—
Alatorre-Cruz et al. [33]	IPA	Unstructured daily activities, such as housekeeping, working, transportation, etc.			✓	Strath et al. [80]
Andrews et al. [34]	IPA/Incidental activity	—				—
Assemi et al. [35]	IPA	Physical activity accumulated through normal daily activities unassociated with exercise goals, such as walking for transport purposes			✓	Reynolds et al. [16] Ross & McGuire [68]
Beavis & Moodie [36]	IPA	—				—
Belletiere et al. [37]	IPA	Activities that are incidental to the routine, everyday living tasks, such as stair use			✓	Lavizzo-Mourey & McGinnis [81]
Benitez-Flores et al. [38]	IPA/Incidental lifestyle	Work, hours of sleep, etc.			✓	—
Benitez-Flores et al. [39]	IPA	—				—
Bull et al. [40]	PADL	—				—
Candido et al. [41]	IPA	—				—
Chudyk et al. [42]	IPA	—				—
Conroy et al. [43]	IPA	Unintentional physical activity			✓	—
Coronini-Cronberg et al. [44]	IPA	Physical activity is a byproduct of an activity with a different primary purpose (i.e., active transport, such as walking, cycling, and use of public transport)			✓	—

(Continues)

TABLE 2 | (Continued)

Reference	Concept used	Definition	Intensity	Time	Type	Definition based on
D'Alonzo & Cortese [45]	IPA	Household chores, walking to and from school or work, and spontaneous physical activity			✓	—
D'Alonzo & Sharma [46]	IPA/Incidental activity	Household, family care, and occupational pursuits			✓	—
Engelen et al. [47]	IPA	—				—
Eves et al. [48]	PADL	—				—
Gilson et al. [49]	Incidental walking	Step during the working task			✓	—
Harding et al. [50]	Incidental movement	<40 steps/min	✓		✓	Tudor-Locke et al. [82]
Khalil et al. [51]*	IPA/Incidental exercise	—				—
Kim et al. [52]	Incidental movement	1–19 steps/min	✓		✓	Tudor-Locke et al. [82]
Koch et al. [11]	IPA/Incidental activity	Cleaning, climbing stairs, or running to the train			✓	Kanning et al. [83]
Macdonald et al. [53]	IPA Incidental movement	The child moved without being instructed; this was recorded as an incidental transition (e.g., collecting learning materials and moving to speak to the teacher/peers)			✓	—
Mark & Janssen [54]	Incidental movement	A movement that falls below an intensity is usually considered physical activity (e.g., fidgeting or walking around the home)	✓		✓	—
Marshall et al. [55]	IPA	—				—
McCormack et al. [56]	IPA/habitual IPA/incidental activity	Incidental activity is considered physical activity undertaken while performing other functions (usually a byproduct of the function rather than specifically planned physical activity). Examples include short walks to the shop, walks to school, or even to public transport			✓	Dunn et al. [84] Bauman et al. [85]
McGann et al. [57]	IPA	—				—

(Continues)

TABLE 2 | (Continued)

Reference	Concept used	Definition	Intensity	Time	Type	Definition based on
McGuire & Ross [58]	IPA	Physical activity that fails to meet the guidelines is characterized as IPA, which consists primarily of light physical activity and sporadic (e.g., bouts lasting <10 min) moderate-to-vigorous physical activity that is accrued through activities of daily living. This includes, but is not limited to, activities such as dusting, vacuuming, and raking the lawn	✓	✓	✓	Tremblay et al. [6] Crouter et al. [86] Kozey et al. [87]
Merom et al. [59]	IPA	—	—	—	—	—
Munari et al. [60]	PADL	—	—	—	—	—
Norrish et al. [61]	IPA/Incidental breaks	—	—	—	—	—
Oliver & Kemps [18]	IPA	It consists of different sub-behaviors, including domestic work (e.g., household chores, gardening), workplace activity (e.g., physical labour), transport (e.g., cycling to get from A to B), and leisure-time activity (e.g., walking the dog)	—	—	✓	Tudor-Locke et al. [7], Levine [5]
Osborne et al. [62]	IPA/Incidental activity	—	—	—	—	—
Pan et al. [63]	IPA	—	—	—	—	—
Panisset & Galea [64]**	IPA/Incidental activity	Purposeful activities include active transportation, dog walking, taking the kids to the park, gardening, and household maintenance	—	—	✓	—
Perry et al. [65]	IPA/Incidental activity	Casual day-to-day activities	—	—	—	—
Puig-Ribera et al. [66]	Incidental movement	—	—	—	—	—
Raisi et al. [67]**	IPA	—	—	—	—	—
Ross & McGuire [68]	IPA	Non-purposeful physical activity accrued through activities of daily living	—	—	✓	—
Ruff et al. [69]	IPA	—	—	—	—	—

(Continues)

TABLE 2 | (Continued)

Reference	Concept used	Definition	Intensity	Time	Type	Definition based on
Sanchez-Lopez et al. [12]	IPA	Unlike structured physical activity, it results from unstructured daily activities, such as working, housekeeping, transportation, leisure, etc.			✓	Strath et al. [80]
Scharff et al. [70]	PADL	Activities such as house and yard work and occupational-related physical activities			✓	—
Stamatakis et al. [14]	VILPA	Brief and sporadic (up to 1 or 2 min long) bouts of vigorous-intensity physical activity are part of daily life, such as bursts of very fast walking while commuting to work, moving from place to place, or climbing stairs	✓	✓	✓	Rey-Lopez et al. [88]
Stamatakis et al. [24]**	VILPA	Brief and sporadic (up to 1–2 min) bouts of vigorous physical activity during daily living, e.g., bursts of swift walking or stair climbing	✓	✓	✓	—
Stratton et al. [71]	IPA	Part of everyday living includes active transportation (e.g., walking), domestic chores, and non-specific ambulation in domestic settings			✓	Alzahrani et al. [17]
Thøgersen-Niouxmani et al. [72]	VILPA	Brief, vigorous bouts of IPA lasting 1 or 2 min that are done during activities of daily living, such as carrying shopping bags, carrying children, or walking uphill	✓	✓	✓	Stamatakis et al. [21]
Tonello et al. [13]	IPA	Non-purposeful physical activity accrued through activities of daily living			✓	Ross & McGuire [68]
Tudor-Locke et al. [73]*	Incidental movement	Cadence of 1–19 steps/min	✓		✓	—
Tudor-Locke et al. [74]	Incidental movement	Cadence of 1–19 steps/min	✓		✓	Tudor-Locke et al. [73]
Vancampfort et al. [75]	IPA/Incidental activity	—				—
Vancampfort et al. [76]	IPA	—				—

(Continues)

TABLE 2 | (Continued)

Reference	Concept used	Definition	Intensity	Time	Type	Definition based on
Wallmann-Sperlich et al. [22]	Incidental lifestyle physical activity	Activities are part of daily life and are not intended for recreational or health purposes without requiring optional time. Physical activities carried out at work, home, transportation, and leisure are distributed throughout waking hours. IPA represents the opposite of structured physical activity or exercise characterized by programmed, pre-planned, and intentionally directed activities, e.g., visiting a gym, jogging, or other recreational activities, improving or maintaining physical fitness, performance, or health. Incidental lifestyle physical activities have an intensity greater than 6 MET or ≥ 14 on the Borg scale of 6–20	✓		✓	Stamatakis et al. [20]
Wu et al. [77]	IPA	—				—
Zheng et al. [78]**	Incidental movement	Cadence of 1–19 steps/min	✓		✓	Tudor-Locke et al. [73]
Ziviani et al. [79]	IPA/Incidental activities	Walking to shops, the school or the park, climbing stairs in buildings, opening garage doors by hand, and getting up to change the television channel			✓	—

Note: Intensity: Activity intensity of the FITT principle of the ACSM. Time: The time or duration of the activity of the FITT principle of the ACSM. Type: Type of activity of the FITT principle of the ACSM. *Articles were added to the systematic review because they were cited in the included articles. **Articles added in the update.

Abbreviations: ACSM, American College of Sports Medicine; IPA, Incidental Physical Activity; MV-LIPA, Moderate-to-Vigorous Intermittent Lifestyle Physical Activity; N/A, not applicable; PADL, physical activity in daily life; VILIPA, vigorous intermittent lifestyle physical activity.

TABLE 3 | Behaviors and instruments of incidental physical activity measurement.

Reference	Behaviors assessed	Compendium activity	Type instruments	Instrument names	Time of use	Device location
Ahmedi et al. [32]**	Household chores include utilitarian standing movements to iron a shirt, washing dishes, kitchen activities, cleaning rooms, ambulation, and heavy household outdoor chores (such as gardening). Walking to go to the supermarket or walking for occupational work. Active travel and high energy activities like actively playing with children	(5) Home activities (8) Lawn & garden (11) Occupation (16) Transportation (17) Walking	Accelerometer	Activity AX3 triaxial accelerometer	7 days	Dominant wrist
Alatorre-Cruz et al. [33]	Housework, yard work, caretaking and leisure activities, leisurely walking, standing, and moving	(5) Home activities (8) Lawn & garden (17) Walking	Questionnaire	Yale physical activity survey (YPAS, Spanish version)	N/A	N/A
Andrews et al. [34]	Walks for running errands (such as visiting the general practitioner or store), outdoor chores (such as house maintenance and gardening), and indoor chores (including housework and self-care tasks)	(5) Home activities (6) Home repair (8) Lawn & garden (13) Self-care (17) Walking	Questionnaire	Incidental and planned exercise questionnaire (IPEQ)	N/A	N/A
Assemi et al. [35]	Transport-related walking	(16) Transportation	Cell phone	Mobil app ATLAS II	2 days	—
Beavis & Moodie [36]	Active transport (sum of travel-related walking and cycling)	(16) Transportation	Survey	Victorian Integrated Survey of Travel and Activity 2007–08 (VISTA07–08)	N/A	N/A
Bellefriere et al. [37]	Stair use	(17) Walking	Interviews	—	N/A	N/A
Benítez-Flores et al. [38]	—	—	Accelerometer	GT1M, Actigraph, Pensacola, FL, USA	7 days	Right hip
Benítez-Flores et al. [39]	—	—	Accelerometer	GT3X, Actigraph, Pensacola, FL, USA	3 days	Non-dominant wrist
Bull et al. [40]	Childcare, work in the home, home repair, and yard work	(5) Home activities (6) Home repair (8) Lawn & garden	Survey	—	N/A	N/A
Candido et al. [41]	Steps	(17) Walking	Accelerometer	Fitbit Charge 2	—	Wrist
Chudyk et al. [42]	Walk	(17) Walking	Travel diary	—	N/A	N/A

(Continues)

TABLE 3 | (Continued)

Reference	Behaviors assessed	Compendium activity	Type instruments	Instrument names	Time of use	Device location
Conroy et al. [43]	Step	(17) Walking	Pedometer	OMRON HJ-720ITC, Bannockburn, IL	—	—
Coronini-Cronberg et al. [44]	Active transport, use of buses, and walking 3 or more times per week	(16) Transportation	Travel diary	—	N/A	N/A
D'Alonzo & Cortese [45]	Steps	(17) Walking	Pedometer	Digiwalker pedometer	3 days	Waist
D'Alonzo & Sharma [46]	(1) a typical day's activities, including household tasks, family/childcare, and occupational responsibilities; (2) examples of both habitual and IPA accrued throughout the day, including walking to work, to a neighbor's home, or grocery store	(5) Home activities (11) Occupation (16) Transportation (17) Walking	Photovoice	—	—	N/A
Engelen et al. [47]	Stair use	(17) Walking	Observations	—	N/A	N/A
Eves et al. [48]	Stair use	(17) Walking	Observations	—	N/A	N/A
Gilson et al. [49]	Step	(17) Walking	Pedometer	Yamax SW-200	5 days	—
Harding et al. [50]	Step or walk at different intensities	(17) Walking	Accelerometer	ActivPAL3 micro monitor, PAL Technologies Ltd., Glasgow, UK	7 days	On to the midline of the mid-right thigh.
Khalil et al. [51]*	Walks to get to places, and average daily time spent doing outdoor and indoor activities such as gardening and house cleaning	(5) Home activities (8) Lawn & garden (17) Walking	Questionnaire/ accelerometer	Incidental and Planned Exercise Questionnaire (IPEQ)/ActiGraph; Pensacola, FL, USA	7 days	Waist
Kim et al. [52]	Step or walk at different intensities	(17) Walking	Accelerometer	GT3X, Actigraph, (Pensacola, FL, USA) for 7 days on the hip.	7 days	Hip
Koch et al. [11]	When the participants did not do physical exercise	—	Accelerometer/e-diaries	Movisens Move-II or Move-III, movies GmbH/Motorola Moto G	7 days	Right hip

(Continues)

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TABLE 3 | (Continued)

Reference	Behaviors assessed	Compendium activity	Type instruments	Instrument names	Time of use	Device location
Macdonald et al. [53]	Collecting learning materials and moving to speak to the teacher/peers	(17) Walking	Observation	A modified version of the Observational System for Recording Physical Activity in Children-Elementary School (OSRAC-E)	—	—
Mark & Janssen [54]	Light activities performed while not participating in physical activity of at least a low intensity	—	Accelerometer	Actigraph 7124 uniaxial monitor, Ft. Walton Beach, FL, USA	7 days	Right hip
Marshall et al. [55]	Stair use	(17) Walking	Observational/ device infrared motion-sensing	—	1 day	—
McCormack et al. [56]	You are walking or bicycling on continuous trips that last 10 min or less and may have been taken, such as short trips that include errands such as walking to the stores to buy lunch or a newspaper, to public transportation, to school, to work, or to recreation—also, activities like climbing stairs or parking your vehicle far from your destination	(16) Transportation (17) Walking	Questionnaire	Western Australian Incidental Physical Activity Questionnaire (WAIPAQ)	N/A	N/A
McGann et al. [57]	Stair use, walking, standing	(17) Walking	Photographic/ observations	—	N/A	N/A
McGuire & Ross [58]	—	—	Accelerometer	Actigraph GT3X, Pensacola, FL	7 days	Right hip
Merom et al. [59]	For the accelerometer, a low cut-off point was considered that covered moderate-intensity daily activities, such as grocery shopping, mopping, and vacuuming, as well as free-time activities, such as playing with children and gardening. The questionnaire included activities such as walks, house maintenance and gardening, housework and activities inside the house, hours on your feet for housework, personal care, or caring for another person	(5) Home activities (6) Home repair (8) Lawn & garden (13) Self-care (17) Walking	Accelerometer/ Questionnaire	Actigraph, Pensacola, FL, USA/ Incidental and Planned Exercise Questionnaire (IPEQ)	7 days	Right hip

(Continues)

TABLE 3 | (Continued)

Reference	Behaviors assessed	Compendium activity	Type instruments	Instrument names	Time of use	Device location
Munari et al. [60]	Steps: time spent seated, lying down, standing, walking; and in PADL with the metabolic equivalent of task (MET) ≥ 3	(17) Walking	Accelerometer	DynaPort MiniMod triaxial accelerometers (McRoberts BV, The Hague, the Netherlands)	2 days	—
Norriah et al. [61]	Steps were taken during recess and lunchtime each day	(17) Walking	Pedometer	Yamax Digi-Walker SW200	10 days	—
Oliver & Kemps [18]	They removed the pedometer when working out at the gym, participating in a team sport, running, and walking to exercise. However, they were instructed to keep the pedometer on when walking to the shops, riding a bike to work, or engaging in activity for other transport-related reasons	(16) Transportation (17) Walking	Pedometer	G-Sensor Accelerometer Pedometer	7 days	—
Osborne et al. [62]	—	—	Accelerometer	GT9X ActiGraph, Pensacola, FL, USA	5 days	Non-dominant wrist
Pan et al. [63]	—	—	Survey	—	—	—
Panisset & Galea [64]**	Active transportation, dog walking, taking the kids to the park, gardening, and household maintenance	(5) Home activities (6) Home repair (8) Lawn & garden (16) Transportation (17) Walking	Survey	—	N/A	N/A
Perry et al. [65]	—	—	Questionnaire	Incidental and Planned Activity Questionnaire	N/A	N/A
Puig-Ribera et al. [66]	Step	(17) Walking	Pedometer	Yamax-200	5 days	—
Raisi et al. [67]**	Stair use	(17) Walking	Survey	—	N/A	N/A
Ross & McGuire [68]	Duration and intensity of behaviors with counts/min equal to or greater than 100	—	Accelerometer	ActiGraph GT3X, Pensacola, FL.	7 days	Right hip
Ruff et al. [69]	Stair use	(17) Walking	Survey web	—	N/A	N/A

(Continues)

TABLE 3 | (Continued)

Reference	Behaviors assessed	Compedium activity	Type instruments	Instrument names	Time of use	Device location
Sanchez-Lopez et al. [12]	Housework, working, yard work, caretaking and leisure activities, leisurely walking, standing, and moving	(5) Home activities (8) Lawn & garden (11) Occupation (17) Walking	Questionnaire	Yale Physical Activity Survey (YPAS, Spanish version)	N/A	N/A
Scharff et al. [70]	Childcare, housework, home repairs, and yard work	(5) Home activities (6) Home repair (8) Lawn & garden	—	—	N/A	N/A
Stamatakis et al. [14]	Standing utilitarian movements (e.g., ironing a shirt, washing dishes), walking activities (e.g., gardening, active commuting, mopping floors), running/high energetic activities (e.g., active playing with children)	(5) Home activities (8) Lawn & garden (16) Transportation (17) Walking	Accelerometer/ Action cameras	Activiy AX3 triaxial accelerometer	7 days	Dominant wrist
Stamatakis et al. [24]**	—	—	Accelerometer	Activiy AX3 triaxial accelerometer	7 days	Dominant wrist
Straiton et al. [71]	Steps	(17) Walking	Accelerometer	Fitbit-Flex (Fitbit Inc., San Francisco, CA, USA)	—	Wrist
Thogersen-Niouxmani et al. [72]	—	—	—	—	—	—
Tonello et al. [13]	—	—	Accelerometer	GTIM, Actigraph, EE, UU	7 days	Right hip
Tudor-Locke et al. [73]*	Steps	(17) Walking	Accelerometer	Actigraph	7 days	—
Tudor-Locke et al. [74]	Steps	(17) Walking	Accelerometer	ActiGraph GTIM Ft. (Walton Beach, Florida)	7 days	Hip
Vancampfort et al. [75]	Household chores	(5) Home Activities	Questionnaire	Luganda (or English) version of the Simple Physical Activity Questionnaire (SIMPAQ)	N/A	N/A

(Continues)

TABLE 3 | (Continued)

Reference	Behaviors assessed	Compendium activity	Type instruments	Instrument names	Time of use	Device location
Vancampfort et al. [76]	—	—	Questionnaire	Luganda (or English) version of the Simple Physical Activity Questionnaire (SIMPAQ)	N/A	N/A
Wallmann-Sperlich et al. [22]	All activities that were not structured physical activity as reported in the Bouchard activity diary and that recorded a heart rate reserve of 50% or more significant (Structured or performing sports, (ii) all activities in the categories conditioning exercise, running, and sports, (iii) for the activities mountain biking, dance workout/dance, aerobic, dancing, Nordic walking, swimming)	—	Optical heart rate sensor/questionnaire	Polar M600, Polar Electro Oy, Kempele, Finland/Modified version of Bouchard's activity diary.	—	Wrist
Wu et al. [77]	Frequency of stair climbing	(17) Walking	Questionnaire	—	N/A	N/A
Zheng et al. [78]**	Steps	(17) Walking	Accelerometer	ActiGraph GT3X+, Pensacola, FL, USA.	7 days	Non-dominant hip
Ziviani et al. [79]	Walking to and from school	(16) Transportation	Questionnaire	—	N/A	N/A

Note: IPA: Incidental Physical Activity, Compendium activity: Main activities in the Compendium of Physical Activity. The numbers in parentheses correspond to the order within the 22 categories in the Compendium. N/A: Not applicable. *Articles were added to the systematic review because they were cited in the included articles. **Articles added in the update.

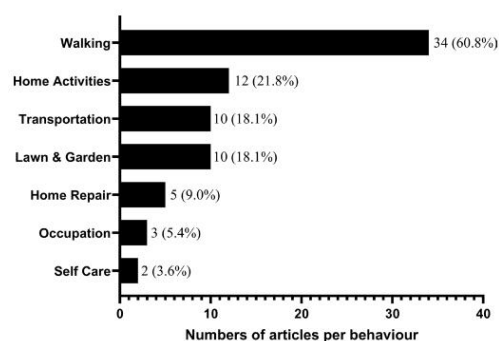


FIGURE 2 | Frequency of articles by behavior categories according to main activities in the compendium of physical activities.

Compendium of Physical Activities classification of activities [90], the IPA was comprised of Home Activities (13 articles), Lawn & Gardening (five articles), Occupation (seven articles), Transportation (13 articles), and Walking (10 articles).

In 17 articles, the definitions were based on previous publications, mainly by Ross and McGuire (2011), Strath et al. (2013), Tudor-Locke et al. (2011), and Tudor-Locke et al. (2017), being cited in two papers each.

3.4 | Behaviors and Instruments of Incidental Physical Activity Measurement

From the 55 articles reviewed, 45 informed the behaviors measured as part of the IPA. In 41 of these 45 articles, the behaviors described were classified within the 22 main physical activities of the Compendium of Physical Activities for Adults [90]. In four of the 45 articles [11, 22, 54, 68], the details on the type of behavior considered for the measurement of the IPA were excessively broad or general, which prevented its classification according to the Compendium of Physical Activities. The behaviors described in the 41 articles fell into seven of the 22 possible Compendium categories, which were Home Activities, Home Repair, Occupation, Lawn & Garden, Self Care, Transportation, and Walking (see Figure 2 for the frequency of articles by behavior categories according to main activities in the Compendium of Physical Activities).

Various instruments and methods were used to measure IPA, including accelerometers, pedometers, cell phones, heart rate monitors, observation, interviews, photography, questionnaires, surveys, and diaries. Two articles did not provide information on the measuring instrument. The accelerometer was the most used instrument, present in 21 articles. The time of use of the accelerometers reported by the articles ranged from two to 7 days, with the 7-day record being the most used in 16 of the 21 articles. In addition, accelerometers were used on areas of the body, such as the wrist, hip/waist, and thigh, with the most frequent location being the hip/waist (mainly on the right side) in 10 articles and then in seven articles the wrist (three on the dominant wrist, two on the non-dominant wrist, and in two cases no information was provided). Two articles did not report the number of

days of use of the accelerometer, and two others did not specify the use location. After accelerometers, the most used instrument was the self-report questionnaire in 12 articles, followed by the Incidental and Planned Exercise Questionnaire (IPEQ) in four articles. Two articles did not provide information on the self-report questionnaire used.

Figure 2 displays the frequency of articles for each of the seven main categories of the Physical Activities Compendium, into which the behaviors described in 41 of the 45 included articles were classified. Walking was the most frequently used behavior for measuring IPA in 34 articles (60.8% of the 55 articles) and included behaviors such as steps, using stairs, or when walking was reported to perform activities. Home Activities included behaviors such as cooking, ironing a shirt, mopping the floor, childcare, or when was reported to be household or housework. Transportation included behaviors such as walking to work or school, transport-related walking, or when it was reported to be active commuting. Lawn & Garden included behaviors reported as gardening or yard work. Home Repair included behaviors reported as house maintenance or repair. Occupation included behaviors reported as walking for occupational work or working. Self care included behaviors reported as personal or self-care.

3.5 | Findings About Incidental Physical Activity

The findings on IPA were grouped into five categories: environmental factors, health and wellness, IPA features, IPA measurement, and physical activity interventions and promotion.

In 21 out of 55 included articles, findings related to health and well-being were presented. Most studies on IPA directly associate it with health, specifically regarding the absence of disease and the reduction of mortality. In five of these articles, we found an association centred on higher IPA and a lower risk of all-cause mortality, cardiovascular disease, cancer, and a lower risk of type 2 diabetes [14, 24, 32, 67, 77]. IPA and body composition were studied in four articles, two of which found no association with total fat or abdominal obesity [54, 58]. On the other hand, two other studies showed contradictory results. In one, participants with a lower body mass index (BMI) reported more weekly hours of IPA [34], whereas, in another study, it was reported

TABLE 4 | Categories and findings about incidental physical activity.

Reference	Categories	Study aim	IPA findings
Ahmadi et al. [32]**	Health & wellness	Examined the associations of bouts of moderate-to-vigorous intermittent lifestyle physical activity (MV-ILPA) and the proportion of vigorous activity contributing within these bouts with mortality and major adverse cardiovascular events (MACE)	Brief episodes of IPA, ranging from 1 to 3 min and less than 1 min, were linked to a reduced risk of mortality and major adverse cardiovascular events (MACE)
Alatorre-Cruz et al. [33]	Health & wellness	Evaluated how two levels of IPA (high or low) affect working memory processing and how this, in turn, may affect morphosyntactic processing in older adults	The IPA promotes cognitive strategies to cope with working memory loads and morphosyntactic processing
Andrews et al. [34]	Health & wellness	Investigated the relationship between automatic habit strength and PA engagement in older people across three aspects of PA—planned exercise, walking for exercise, and IPA	Higher automaticity scores, which measure the intensity of physical activity habits, were related to more hours of IPA per week. Additionally, participants with a lower body mass index reported more hours per week of IPA
Assemi et al. [35]	Environmental factors	Evaluated the advantages of using a smartphone app for collecting accurate, fine-grained, and objective data on people's transport-related walking	IPA was higher in areas with high density and diversity of urban functions, including shops, restaurants, public services, recreational, residential, educational, and work areas. The presence of public transportation stops and utility services influenced IPA. Home, educational, and residential centers are key generators of walking trips. In this sense, IPA is more common in areas with greater pedestrian and bicycle connectivity, especially during daylight hours
Beavis & Moodie [36]	Environmental factors	Observed levels of IPA to travel in Melbourne, and after determining key correlates, used an economic model to estimate the potential long-term health and health-economic benefits of changes in active transport patterns	Users of public transport, pedestrians, and cyclists presented higher levels of IPA than those who used vehicles (being higher in pedestrians and cyclists). Furthermore, an inverse relationship was identified between the distance to the city center and the place of residence, with the level of IPA

(Continues)

TABLE 4 | (Continued)

Reference	Categories	Study aim	IPA findings
Bellefriere et al. [37]	PA interventions and promotion	Evaluated the influence of sign prompts and participant factors, including past PA on stair ascent in an airport setting	Signs promoting the use of stairs at the airport were associated with increased stair climbing, regardless of participants' physical activity history or other covariates measured in the study
Benítez-Flores et al. [38]	PA interventions and promotion	The combined effects of resistance and sprint training, with very short efforts (5 s), on aerobic and anaerobic performances and cardiometabolic health-related parameters in young healthy adults were compared	After a 3-week sprint and resistance training intervention, the concurrent group spent more time doing moderate-intensity IPA than the sprint interval training group
Benítez-Flores et al. [39]	PA interventions and promotion	Compared the acute responses to three time-matched exercise regimens (sprint interval training, high-intensity interval training, and continuous training)	No differences in IPA were observed after a session of sprint interval training, high-intensity interval training, and continuous training, respectively
Bull et al. [40]	PA interventions and promotion	Compared the effectiveness of tailored, personalized and general health messages, and usual medical care in promoting leisure time physical activity and physical activities of daily living	Personalized and tailored health messages (e.g., based on exercise goals and preferences) increase physical activities of daily living, such as childcare, household activities, home maintenance, and gardening
Candido et al. [41]	PA interventions and promotion	Provided empirical evidence from studies conducted before and after relocation from contemporary open-plan offices to activity-based working spaces	After transitioning to a workspace based on the activity-based work model, no changes were observed in workers' step counts or distance traveled, but their IPA increased. In addition, a reduction in sedentary time was evident
Chudyk et al. [42]	Environmental factors	To better understand the mobility habits of older adults with low income, (1) described the types of destinations older adults with low income most commonly travel to in 1 week, and (2) determined the association between the prevalence of neighborhood destinations and the number of transportation walking trips these individuals make (average per day)	Accessibility to destinations such as shopping centres within the neighborhood was positively associated with walking in older persons
Conroy et al. [43]	Health & wellness	Tested whether implicit attitudes can prospectively predict objectively assessed PA and specifically unintentional PA	Implicit attitudes positively predicted IPA
Coronini-Cronberg et al. [44]	Environmental factors	Assessed the potential public health benefit of the National Bus Pass, introduced in 2006, which permits free local bus travel for older adults (≥ 60 years) in England	Seniors with a free bus pass were more likely to use active transportation and walk regularly (3 or more times per week) than those without the pass

(Continues)

TABLE 4 | (Continued)

Reference	Categories	Study aim	IPA findings
D'Alonzo & Cortese [45]	Environmental factors	Compared habitual and IPA among native Costa Rican and Costa Rican American adolescent girls	Costa Rican teenage girls had significantly higher incident physical activity levels than their American peers
D'Alonzo & Sharma [46]	IPA features	Explored the influence of <i>maritismo</i> beliefs on participation in habitual and IPA among middle-aged immigrant Hispanic women, using a community-based participatory research approach and Photovoice methodology	Religious beliefs and socioeconomic pressures negatively influenced women's ability to participate in physical activities
Engelen et al. [47]	PA interventions and promotion	Assessed whether signage to promote stair use results in changes to the proportion of stair-to-elevator use	Motivational and directional signs did not increase the use of stairs in university buildings
Eves et al. [48]	PA interventions and promotion	Reported how the isovist (i.e., in the opposite direction to the traffic flow) of an intervention for stair climbing installed on the way out of the station influenced the response to the intervention	After an intervention with signs to promote the use of stairs, an increase in the use of stairs was observed only for the largest isovist. Additionally, stair use was more frequent during the morning rush hour and at higher levels of foot traffic
Gilson et al. [49]	PA interventions and promotion	Compared the impact two different walking strategies had on step counts and reported sitting times	After a workplace walking intervention, those who walked incidentally (taking advantage of the office's physical environment, walking in the workplace, and performing work tasks) showed decreased sedentary time
Harding et al. [50]	PA interventions and promotion	Examined changes in walking cadence among older cancer survivors who participated in an intervention to interrupt sedentary behaviors with LPA (standing and stepping)	Older adult cancer survivors increased their selected step cadence in a 16-week intervention with reminders via a wrist device
Khalil et al. [51]*	IPA measurement	Assessed the convergent and criterion validity of the International Physical Activity Questionnaire (IPAQ) and the Incidental and Planned Exercise Questionnaire (IPEQ) in people with multiple sclerosis	The International Physical Activity Questionnaire (IPAQ) was more effective than the Incidental and Planned Physical Activity Questionnaire (IPEQ) in assessing IPA. However, both questionnaires overestimated physical activity intensities compared to accelerometry data
Kim et al. [52]	IPA features	Identified the stepping cadence patterns in Korean adults by using objectively measured accelerometer data to analyze the time spent in each cadence category by sex and age	Men spent more time on incidental movements than women. Furthermore, the average daily time in this category increases with age, being highest in the 50–59 age group

(Continues)

TABLE 4 | (Continued)

Reference	Categories	Study aim	IPA findings
Koch et al. [11]	Health & wellness	An ambulatory assessment study applied accelerometry in combination with e-diaries on smartphones in 134 individuals aged 12–17 years to investigate the specific influences of physical activity on mood in adolescents' everyday lives	Physical activity affects adolescents' moods in their daily lives, with variable effects depending on the type of activity. After engaging in IPA, teens reported feeling better and more energized
Macdonald et al. [53]	IPA features	Observed Year 1 children's physical activity and its contexts during school class time and identify opportunities to incorporate additional activity	First-grade children engaged in IPA more frequently in small group activities than whole class activities
Mark & Janssen [54]	Health & wellness	Explored the independent effects of physical activity intensity and incidental movement on total and trunk adiposity	IPA was not negatively related to total or trunk fat in adults
Marshall et al. [55]	PA interventions and promotion	Evaluated whether a stair-promoting signed intervention could increase the use of the stairs over the elevator in a healthcare facility	An intervention with motivational cues initially increased the use of stairs instead of the elevator. However, these effects were not maintained over time
McCormack et al. [56]	IPA measurement	Determined the test-retest reliability of items measuring habitual IPA, IPA behavior and sedentary behaviors	Adults can reliably remember the frequency of the usual IPA but not the duration
McGann et al. [57]	PA interventions and promotion	It highlighted the gap between management, design, and health-promotion strategies in the workplace and sought to illustrate how the disciplines of architecture and health promotion can work together to reduce sedentary behavior and increase opportunities for IPA within the working day	In addition to the physical design of the workplace, managerial and cultural aspects influence the reasons that lead workers to carry out IPA
McGuire & Ross [58]	Health & wellness	Determined the association between objectively measured IPA and sedentary behavior with abdominal obesity in a sample of inactive men and women	IPA was not associated with abdominal obesity in inactive men and women
Merom et al. [59]	IPA measurement	Assessed the criterion validity and responsiveness of the Incidental and Planned Exercise Questionnaire (IPEQ) specifically developed for aging research	IPA questions from the Incidental and Planned Physical Activity Questionnaire (IPEQ) were correlated with light accelerometer intensity. Furthermore, it was observed that incidental activities are mainly of low intensity
Munari et al. [60]	Health & wellness	Identified Medical Research Council and COPD Assessment Test (mMRC) cutoff points to discriminate sedentary behavior and physical activity of daily living level of subjects with COPD and verify whether these cutoff points differentiate pulmonary function, health-related quality of life (HRQOL), functional status, and mortality index in subjects with COPD	Those with Modified Medical Research Council (mMRC) scores greater than or equal to 2, and COPD Assessment Test greater than or equal to 16 and 20 exhibited lower levels of physical activity of daily living compared to those with mMRC < 2 and CAT < 16 and < 20

(Continues)

TABLE 4 | (Continued)

Reference	Categories	Study aim	IPA findings
Norrish et al. [61]	IPA features	Examined the effect of school uniforms on the amount and perceived intensity of physical activity undertaken by 10-year-old children during play breaks at school	Girls, but not boys, were more active at recess, lunch, and in general when wearing their sports uniform than their winter uniform. The school uniform did not affect the children's physical activity levels
Oliver & Kemps [18]	Health & wellness	Investigated how motivation and implicit processes contribute to levels of IPA	Implicit attitudes, autonomous and controlled motivation, and attentional bias were associated with IPA
Osborne et al. [62]	PA interventions and promotion	Tested the hypothesis that heat acclimation training would detrimentally affect sleep variables and alter IPA compared to a thermoneutral training control condition	Participants adjusted their IPA behaviors to recover after a high training load, reflected in a decrease in light physical activity
Pan et al. [63]	Health & wellness	Evaluated the efficacy and utility of robotic single-access bilateral nephrectomy (r-SABN)	IPA increased in patients undergoing robotic single-access bilateral nephrectomy (r-SABN)
Panisset & Galea [64]**	Environmental factors	Examined the effects of lockdowns on exercise in Australians with multiple sclerosis according to disability levels, lockdown severity and health technology use	During the COVID-19 pandemic lockdowns, a decrease in IPA was reported. Furthermore, in people with disabilities, this decrease was more significant for those with severe disabilities compared to those with mild disabilities
Perry et al. [65]	Health & wellness	Examined the effects of osteoarthritis and aging on muscle Na ⁺ -K ⁺ pump in 36 older adults (range 55–81 years), including 19 with osteoarthritis and 17 asymptomatic controls	Participants with knee osteoarthritis had higher levels of IPA than the asymptomatic control group
Puig-Ribera et al. [66]	PA interventions and promotion	Assessed the short and mid-term impacts of a workplace web-based intervention on self-reported sitting time, step counts and physical risk factors (waist circumference, body mass index, blood pressure) for chronic disease	An intervention for sedentary office workers showed positive changes by increasing IPA
Raisi et al. [67]**	Health & wellness	Investigated the association between flights of stairs used daily at home and all-cause mortality and cause-specific incidence and mortality	Stair use (> 15 times per day) was associated with a lower risk of all-cause mortality, cancer, and chronic obstructive pulmonary disease
Ross & McGuiire [68]	Health & wellness	Determined whether IPA, expressed as duration or intensity, was associated with cardiorespiratory fitness	A positive association was observed between the duration and intensity of IPA and cardiorespiratory capacity

(Continues)

TABLE 4 | (Continued)

Reference	Categories	Study aim	IPA findings
Ruff et al. [69]	Health & wellness	Analyzed the associations between building characteristics, stair prompts, and stair use in large urban worksites	Instructions for climbing stairs increased its use. Living on higher floors and having a higher body mass index were negatively associated. Additionally, women used fewer stairs compared to men
Sanchez-Lopez et al. [12]	Health & wellness	Evaluated the association of IPA level with cognitive functions and resting electroencephalogram (EEG) in healthy old participants	IPA was associated with better cognitive function and increased brain activity speed, as measured by the frequency of waves recorded in the electroencephalogram
Scharff et al. [70]	IPA features	Examined the rates and factors associated with physical activity in women of various ages	Family characteristics (e.g., having children) were associated with engaging in less structured and less intense physical activities of daily living among women aged 49 years or younger
Stamatakis et al. [14]	Health & wellness	Examined the association of Vigorous intermittent lifestyle physical activity (VILPA) with all-cause, cardiovascular disease (CVD) and cancer mortality in 25 241 nonexercisers (mean age 61.8 years, 14178 women/11063 men) in the UK Biobank	VILPA activity of up to 1–2 min is associated with lower risks of all-cause mortality, cardiovascular disease mortality, and cancer mortality
Stamatakis et al. [24]**	Health & wellness	Evaluated the dose–response association of device-measured daily vigorous intermittent lifestyle physical activity (VILPA) with incident cancer and estimated the minimal dose required for a risk reduction of 50% of the maximum reduction	Small amounts of VILPA were associated with a lower cancer risk overall
Straiton et al. [71]	Health & wellness	Explored the acceptability and feasibility of using wearable trackers to measure IPA in aortic stenosis patients before and after aortic valve replacement	After aortic valve replacement, the greatest improvements were seen in participants with the lowest incident physical activity

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TABLE 4 | (Continued)

Reference	Categories	Study aim	IPA findings
Thøgersen-Ntoumani et al. [72]	Environmental factors	Examined the barriers and enablers of VILPA among physically inactive adults using the Capability, Opportunity, Motivation, Behavior (COM-B) model as a conceptual framework	The barriers to realizing the VILPA were identified, including physical limitations, perceptions of aging, need for knowledge, environmental restrictions, perceptions of effort and energy, and fear. On the other hand, there were facilitators, including convenience, reframing physical activity as purposeful movement, use of reminders, normalization of active choice, gamification, sense of achievement, health improvements, personally relevant rewards, the adjustment of identity, and the transition from effortful to deliberate deliberation habitual action
Tonello et al. [13]	Health & wellness	Investigated the relationships between objective PA levels, CRF, and cardiac autonomic indices in adult, regular non-exercising female workers	In overweight adult women, IPA was associated with greater autonomic reactivation (e.g., better heart rate recovery)
Tudor-Locke et al. [73]*	IPA features	Determined cadence patterns in free-living adults, and in particular, time spent at increasing cadence increments, including 100 steps/min and beyond	Adults spend about 8.7 h a day with a cadence of 1 to 59 steps/min, 16 min a day with a cadence of 60–79 steps/min, 8 min with 80–99 steps/min, 5 min with 100–119 steps/min and 2 min with 120+ steps/min
Tudor-Locke et al. [74]	IPA measurement	Evaluated the potential for using accelerometer-determined ambulatory activity indicators (steps per day and cadence) to predict total energy expenditure (TEE) and physical activity energy expenditure (PAEE) derived from doubly labeled water (DLW)	The number of steps and cadence, measured by accelerometers, significantly predicted total energy expenditure and energy expenditure associated with physical activity, with greater precision in men than in women
Vancampfort et al. [75]	IPA measurement	Investigated the test–retest reliability of the 2-min walk test (2MWT) and the concurrent validity with the 6-min walk test (6MWT) in outpatients with psychosis	IPA explained some of the variance in the 2-min walk test score
Vancampfort et al. [76]	IPA measurement	Investigated the test–retest reliability of the 2-min walk test (2MWT) and its concurrent validity with the 6-min walk test (6MWT) in Ugandan patients with depression. And explored practice effects and assessed the minimal detectable change (MDC) and clinical correlates with the 2MWT	Variability in IPA was associated with variability in the 2-min walk test results

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TABLE 4 | (Continued)

Reference	Categories	Study aim	IPA findings
Wallmann-Sperlich et al. [22]	IPA features	(1) assessed moderate-to-vigorous PA duration and distribution of intensity during waking hours $\geq 50\%$ of heart rate reserve (HRR), (2) the type of PA was identified through daily assessment, (3) assigned these activities into structured and lifestyle incidental PA, and (4) Compared this information between students and office workers	There was no difference in the amount of IPA between students and office workers, but there was a difference in the type. Students included leisure and transportation; office workers included transportation, home, and leisure time
Wu et al. [77]	Health & wellness	Prospective evaluated the association of stair climbing with type 2 diabetes and assessed modifications by a genetic predisposition to type 2 diabetes	A greater number of stairs ascended was related to a lower risk of developing type 2 diabetes, especially in individuals with a low genetic predisposition to this disease
Ziviani et al. [79]	IPA features	Examined the extent to which Australian children walked to and from primary school and surveyed parents to identify factors influencing this behavior	Parents' perceptions of the importance of physical activity, parents' school transportation history, and the distance to school were important factors in children's participation in walking to and from school
Zheng et al. [78]**	Health & wellness	Compared peak 30-min cadence, peak 1-min cadence, and time spent in incremental cadence bands between persons with multiple sclerosis and healthy controls, and examined the associations between peak cadence and laboratory-assessed physical function and walking performance	People with multiple sclerosis accumulated more IPA (1–19 steps/min) than those without the disease

Note: *Articles were added to the systematic review because they were cited in the included articles. **Articles added in the update. Abbreviations: IPA, incidental physical activity; PA, physical activity; VILLPA, vigorous intermittent lifestyle physical activity.

that living on higher floors and a higher BMI were negatively associated [69]. Two articles explored the relationship between IPA and psychological variables, concluding that both implicit attitudes (i.e., those that manifest themselves subconsciously or automatically) as well as motivation, both autonomous and controlled, were associated with the level of IPA [18, 43]. Two articles explored the relationship of IPA with cognitive processes, observing an association with better cognitive function and greater speed in brain activity as an improvement in the comprehension and production of the grammatical structure of a language in older people [12, 33].

In 7 out of 55 articles, they presented findings on IPA and its relationship with contextual or environmental factors. Mainly, they stated that IPA was more common in urban areas with high density and diversity of functions, such as shops, restaurants, residential, educational, and work, especially during the day [35, 42]. The presence of public transport stops and free bus passes encouraged active transport and regular walking [35, 36, 44]. An inverse relationship was also identified between distance to the city center and place of residence with the level of IPA [36].

In 6 out of 55 articles, findings related to the measurement of IPA were presented [51, 56, 59, 74–76]. The use of accelerometers to measure IPA was mainly reported. The Incidental and Planned Physical Activity Questionnaire (IPEQ) was also compared with the accelerometer measurement, and the relationship between the IPAs and the 2-min walk test was analyzed. The findings indicate that the IPAQ and IPEQ questionnaires underestimated IPA intensities compared to accelerometer records. In self-report recording, adults can reliably remember the frequency of IPA but not the duration. In addition, the IPA level was associated with the results of the 6-min walk test.

In 13 out of 55 included articles, findings on interventions for promoting physical activity were presented. Six of these articles reported on the use of signs and messages to promote IPA, and four of them showed positive effects on IPA levels, mainly in the use of ladders and walking (Bellettiere et al., 2017; Bull et al., 1999; Eves et al., 2009; Harding et al., 2022), while two others showed no effects [47, 55]. Four other articles reported that workplace interventions, including modification of workspaces, had positive effects on IPA levels, and two of these studies also mentioned reducing sedentary time. Three other articles reported on the effects of exercise-based interventions on IPA, with an increase in the [38], a decrease [62], and no effect [39], respectively.

4 | Discussion

This review sought to synthesize the definitions of the IPA used in the scientific literature. We found 10 different names in the literature to refer to IPA, and a conceptual definition was provided in 33 (60.0%) of the included articles. These definitions described the intensity of the IPA from light to vigorous, mainly through the cadence of steps ranging from 1 to 40/min. IPA included activities performed as part of daily life without structure, planning, intention, purpose of exercise, sport, recreation, or health. IPA definitions cover a wide range of durations, from brief episodes of less than a minute to prolonged activities such

as housework or walking to school or work. This heterogeneity in the duration of IPA reflects the diversity of activities that are part of daily life. Behaviors composing IPA were primarily measured through accelerometers. They included walking, transportation, self-care, occupations, gardening, home repairs, and home activities, with walking being the most commonly studied. On the other hand, evidence on IPA suggests an association with a lower risk of all-cause mortality, including cardiovascular disease, cancer, and type 2 diabetes. Factors such as gender, age, parental beliefs, and environmental factors influence the level of IPA. In addition, interventions based on signage and messages in the workplace can promote the level of IPA.

4.1 | Definition of Incidental Physical Activity

There is a consensus that IPA is part of daily life that excludes recreational activities. Similarly, there is agreement that IPA is unstructured, unplanned, and unintentional and performed as a by-product of an activity with a different primary purpose. These findings clarify that unstructured and unplanned activities, such as active commuting or occupational physical activity, are considered IPA if performed unintentionally and as a by-product of the occupation or the need to commute. Likewise, IPA can encompass activities of varying intensity and duration, ranging from light to vigorous and from extended activities to brief episodes of less than 1 min, such as what the literature recently calls VILPA [21], as long as it is unintentional. It is important to mention that the diversity of terminology used in the literature to refer to IPAs can lead to confusion. For this reason, it is recommended to avoid the use of concepts such as “incidental movement”, which has been used in the scientific literature both to refer to IPA and also to describe involuntary body movements, such as gestures or tonic spasms, associated with pathological conditions [91–93].

Certain discrepancies arose when analyzing the behaviors considered within the IPA measurement and the definitions provided by the included articles. Although walking was the most frequently reported behavior in the IPA measurement, various other behaviors were also identified, such as self-care activities such as showering or brushing teeth. However, the definitions provided by the included articles did not explicitly include these self-care behaviors as part of IPA. This gap in the literature between the behaviors used to measure IPA and the definition used by the authors to describe IPA highlights the need for an integrative conceptual definition based on a literature review, which aims to understand the concept completely.

Based on everything mentioned above, the reported results, and the previous analysis, we propose a novel integrative definition of IPA (Table 5). This definition, developed from a recognized theoretical framework and an exhaustive systematic literature review, describes the characteristics and behaviors that constitute IPA. In addition to the seven behaviors in Figure 2, we have added other examples of behaviors from the Adult Compendium of Physical Activities that also meet the IPA characteristics. Our purpose is to improve understanding and unify the concept of IPA, thereby addressing the gaps and resolving the contradictions in the current literature concerning its definition to facilitate the study and measurement of IPA. This comprehensive

TABLE 5 | Integrative synthesis of the concept of incidental physical activity.

Integrative definition of the IPA	<i>Concept</i>
	<p data-bbox="756 306 1386 415">Unstructured, unplanned, and unintentional physical activities of daily living are performed as a by-product of an activity with a different primary purpose. These activities can be done during free time or in places of occupation. These activities do not have specific fitness, sport or recreation objectives. Include light and vigorous intensities ranging from short sessions of less than 1 min to prolonged ones</p> <p data-bbox="1032 417 1105 438"><i>Behaviors</i></p> <p data-bbox="756 441 1386 573">They include behaviors related to home activities (e.g., childcare or vacuuming), home repair (e.g., painting or washing a car), self-care (e.g., showering, brushing teeth, eating), lawn & gardening (e.g., mowing the lawn), miscellaneous (e.g., standing talking in person or vacation involving walking), occupation (e.g., carrying objects, getting around), transportation (e.g., walking or biking to get to or from work or school), and walking (e.g., walking the dog or using stairs)</p>

Note: The behaviors described here should always be reviewed against the conceptual definition of IPA, as some behaviors, although not structured or planned, may vary in the degree of intention with which they are performed, which could exclude them from being considered IPA.
Abbreviation: IPA: incidental physical activity.

definition of the IPA concept aligns with previous proposals, including those in the editorial article by Stamatakis et al. [20], the observational study by Wallmann-Sperlich et al. [22], and the systematic review by Reynolds et al. [19].

In the measurement of IPA, the accelerometer in the right hip was the most used instrument, with 7 days being the most frequent use time. In this regard, the data collection and processing criteria using accelerometers to assess physical activity suggest use for 7 days, 24 h a day, but located on the wrist, as better user compliance and longer usage times have been reported [94, 95]. In particular, the recommendation is to place the accelerometers on the non-dominant wrist [94, 95]. Otherwise, movements with the upper extremities, such as drawing, writing, brushing teeth, and playing with mobile electronic devices, can be considered time spent on physical activity [94, 95].

Given the complexity and variety of behaviors associated with IPA and the varying intensities and duration with which it can be conducted, self-report questionnaires or step counting for its assessment are not recommended. Our results indicated that self-report questionnaires underestimated the intensity of IPA, and it was further found that adults can reliably recall the frequency but not the duration of such activity [51, 56]. This is consistent with evidence suggesting that self-reported physical activity has a low correlation with objective measurement methods, such as accelerometers [96, 97].

4.2 | Findings on Incidental Physical Activity

The findings of the present review support an association between higher levels of IPA and a lower risk of all-cause mortality, including cardiovascular disease, cancer, and type 2 diabetes. These results are consistent with the ample evidence of the positive effects of physical activity on health [1, 4] as well as growing evidence of the relationship between physical activity of any duration and improved health outcomes [2, 3]. Evidence indicates that performing intermittent stair-climbing sessions for at least 1 to 3 min 3 days a week for 6 weeks leads to significant improvements in cardiorespiratory fitness [98–100]. Moreover, improved cardiorespiratory fitness is a protective

factor against cardiovascular disease, cancer, and all-cause mortality [101]. However, the evidence regarding mortality risk and IPA is mainly on VILPA [14, 24, 32]. Therefore, further evidence of IPA of any intensity and duration and its effects on health and mortality risk is required.

Among the background of the IPA, the importance of the environment and access to different urban areas and services stands out. Interventions that modify the environment, either through signage or modifications in the workplace, have shown positive effects on the level of IPA [37, 40, 41, 49, 50, 66]. These strategies focus on creating active environments, facilitating access to physical activity, and monitoring its performance through various technological devices [102].

4.3 | Strengths and Limitations

To our knowledge, this is the first attempt to delineate the IPA concept through a systematic literature review. To ensure its methodological quality, systematic review guidelines were followed, and the protocol was registered on an international platform of registered systematic review and meta-analysis protocols. It is important to note that, in the conceptual analysis of the IPA, guidelines created by recognized institutions such as the American College of Sports Medicine [89] were used, as well as the recently published update of the compendium of physical activities [90].

However, this review is not without limitations. First, in the systematic search, only studies that explicitly mentioned IPA or similar terms, such as incidental movement or physical activities of daily living that corresponded to IPA, were included. Therefore, it is possible that studies that did not use these terms were left out, which could have limited the findings on IPA. Second, due to the heterogeneity in the study designs of the included articles, it was not possible to analyze the risk of bias in these studies.

4.4 | Perspective

Our findings indicate that IPA mainly involves walking-related activities. While this is probably correct, it is also largely because

the IPA measurements were made by counting steps and using stairs, behaviors that are considered part of walking [90]. For this reason, we hope that in the future, the integrative definition of IPA provided in this review and the use of accelerometers on the wrist non-dominant 24/7 enable researchers to objectively and accurately report the proportions to which behaviors, such as those related to occupation, personal care, or household activities, contribute to IPA. However, at present, wrist-worn accelerometers cannot accurately track activities like bicycle commuting. Therefore, it is crucial to advance the development of a protocol and specific algorithm for accelerometers capable of processing the information of all the behaviors that constitute the IPA, including bicycle commuting. Furthermore, it is necessary to advance in developing and incorporating measurement and analysis techniques that complement the information recorded by accelerometers, allowing only the behaviors corresponding to IPA to be filtered. In this sense, we suggest that future research also include methodologies such as action cameras [14] or digital activity diaries to identify the degree of intentionality or planning in the IPA classification [35]. An example of this would be the incorporation of Ecological Momentary Assessment (EMA) [103], which would allow the recording of the type of behaviors that individuals perform while using accelerometers. In this sense, it is crucial to incorporate tools that allow large-scale data processing, such as the use of machine learning. In addition, we suggest avoiding classifications based solely on step ranges or focused on specific contexts, such as occupational activity or active commuting, as this limits the understanding of the variability of the IPA in terms of intensities and durations.

On the other hand, future research should explore how interventions aimed at increasing structured physical activity or modifying the environment impact IPA levels. In this context, it is essential to gain a deeper understanding of the individual, contextual, and environmental factors—such as motivation, barriers, and facilitators—that influence IPA. Population studies in low—and middle-income countries, considering diverse sociodemographic characteristics such as age, sex, race/ethnicity, and socioeconomic level, are necessary [104]. Furthermore, there is currently no explanatory model of the IPA that considers environmental and individual variables. This would allow for a better understanding of IPA, developing theory-based IPA interventions, and accurately identifying individuals at risk for incidental physical inactivity based on psychological and/or contextual variables.

5 | Conclusions

This scoping review provides a proposal for a comprehensive definition of IPA based on the synthesis of evidence, covering a wide variety of behaviors and describing the situations in which it occurs. IPA emerges as a crucial component of total physical activity and carries significant health benefits, including reducing the risk of mortality from various causes such as cardiovascular disease, cancer, and type 2 diabetes. However, progress is needed in their measurement systems, particularly in the ability of the instruments to capture the diversity of behaviors that constitute the IPA and the data processing methods obtained.

Progress in measuring IPA will allow for understanding and developing explanatory models for this activity, considering contextual and individual variables. This perspective is crucial for establishing a solid theoretical basis in IPA and addressing current challenges of physical inactivity and its potential impacts on public health worldwide.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.

Article

Adaptation and Psychometric Properties of the Behavioral Regulation in Exercise Questionnaire (BREQ-3) for Motivation Towards Incidental Physical Activity

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Abstract: This study aimed to adapt and analyze the psychometric properties of the Exercise Behavior Regulation Questionnaire (BREQ-3) for assessing motivation towards incidental physical activity. An instrumental study in a sample of 346 university students (21.1 ± 2.6 years, and 61.3% women) from various universities in Chile was undertaken. An adaptation of the BREQ-3 was applied, and a confirmatory factor analysis was performed using a robust weighted least squares estimator to assess the construct validity of the scale. Also, the convergent validity was evaluated using the average variance extracted, the discriminant validity using composite reliability, and the internal consistency using Cronbach's alpha (α) and McDonald's omega (ω) coefficients. The six-factor structure of intrinsic motivation ($\alpha = 0.96$, $\omega = 0.96$), integrated regulation ($\alpha = 0.95$, $\omega = 0.95$), identified regulation ($\alpha = 0.89$, $\omega = 0.90$), introjected regulation ($\alpha = 0.75$, $\omega = 0.77$), external regulation ($\alpha = 0.80$, $\omega = 0.83$), and amotivation ($\alpha = 0.75$, $\omega = 0.79$), with acceptable fit indices after eliminating items 8 and 11, was confirmed— χ^2/df : 2.196, CFI: 0.99, TLI: 0.99, RMSEA: 0.059 (90% CI; 0.051–0.067). Adaptation of the BREQ-3 appears to be a reliable measure for assessing motivation in the context of incidental physical activity. Its use will contribute to understanding the explanatory mechanisms underlying this behavior.

Keywords: BREQ-3; psychometric properties; factor analysis; reliability; incidental physical activity; self-determination theory

1. Introduction

Currently, approximately 31.3% of the adult population worldwide and 32.3% in Chile (Strain et al., 2024) do not meet the physical activity recommendations of the World Health Organization (Bull et al., 2020). The benefits of increasing physical activity include improved health and well-being (Dempsey et al., 2021; Díaz-Martínez et al., 2018; Kraus et al., 2019; Lacombe et al., 2019; Zhao et al., 2020). So, promoting physical activity is a public health priority (Stanaway et al., 2018; World Health Organization, 2018).

In this sense, understanding the factors that influence and predict physical activity behavior is of broad interest to the scientific community. In particular, motivational factors have been widely addressed (Owen et al., 2014; Howard et al., 2021; Manninen et al., 2022; Teixeira et al., 2012) using the self-determination theory as one of the theoretical references (Deci & Ryan, 1985).

1.1. Theory of Self-Determination

Self-determination theory has been used to explain a wide variety of human behaviors in different contexts, including work (Gagné & Deci, 2005; Henning et al., 2019), education (Manganelli et al., 2019; Reeve & Cheon, 2021; Stupnisky et al., 2019), health (Gillison et al., 2019; Ntoumanis et al., 2021), sports (Chan et al., 2020; Hagger & Chatzisarantis, 2007; Standage et al., 2019), and also for physical exercise (Hagger & Chatzisarantis, 2008; Hancox et al., 2018).

This theory points out that motivation is seen as a continuum of self-determination. At one end of this continuum is amotivation or demotivation, understood as the absence of intention towards a specific behavior. At the other extreme is intrinsic motivation, where an activity is performed because there is a natural incentive to act due to the internal satisfaction derived from that behavior. In intrinsic motivation, activity is pleasurable in itself, and its interest and enjoyment are inherent (Deci & Ryan, 1985, 2000; Ryan & Deci, 2020).

A third form of motivation, extrinsic motivation, lies between amotivation and intrinsic motivation. Extrinsic motivation involves engaging in an activity to obtain some outcome separate from the activity itself, as it presents instrumentally manipulated and goal-oriented incentives to carry out the behavior. Four forms of extrinsic motivation, called regulations, are given below in order of the least to the highest degree of self-determination: external regulation, introjected regulation, identified regulation, and integrated regulation (Deci & Ryan, 1985; Ryan & Deci, 2020).

External regulation refers to behaviors driven by external rewards. Introjected regulation is a partially internalized form of self-regulation where people engage in activities motivated by internal rewards, punishments, self-esteem, or ego. In identified regulation, people consciously identify with the value of an activity and, therefore, experience a high degree of desire, willingness, or willingness to act. In integrated regulation, people not only recognize and identify the value of the activity but also find it to be congruent with their interests and values (Ryan & Deci, 2020).

Based on the self-determination theory, instruments have been developed that allow the theoretical evaluation of the relationship between motivation and different types of physical activity, such as physical exercise or sport. These instruments have been updated in more comprehensive versions over the years and have been translated into several languages to expand their use. These include the Perceived Locus of Causation Questionnaire (Ryan & Connell, 1989), the Behavioral Regulation in Sport Questionnaire (Lonsdale et al., 2008), and the Exercise Behavioral Regulation Questionnaire (BREQ) (Mullan et al., 1997).

1.2. Behavioral Regulation in Exercise Questionnaire (BREQ)

The Behavioral Regulation in Exercise Questionnaire (BREQ) was developed by Mullan et al. (1997) to assess levels of motivation towards physical exercise based on self-determination theory (Mullan et al., 1997). In its first version, it opted for a 15-item model grouped into four factors with adequate model fit indices ($\chi^2 = 277.19$, $p < 0.001$, root mean square error of approximation or RMSEA = 0.07) and internal consistency using Cronbach's alpha (external regulation = 0.79, introjected regulation = 0.78, identified regulation = 0.79, intrinsic motivation = 0.90). This first version did not consider the dimension of amotivation because it was statistically problematic and left out integrated regulation (Mullan et al., 1997). In this way, the model consisted of the dimensions of external regulation, introjected regulation, identified regulation, and intrinsic motivation (Mullan et al., 1997). Although some evidence of validity was observed for this first version of the BREQ, the exclusion of the dimension of amotivation remained incongruent with the taxonomy of motivation based on self-determination theory.

Subsequently, a second version of the BREQ (BREQ-2) developed by Markland and Tobin (2004) of 19 items grouped into five factors incorporated the dimension of amotivation. The BREQ-2 presented an excellent fit of the model to the data ($\chi^2 (125) = 136.49$, $p = 0.23$, RMSEA = 0.02, comparative fit index or CFI = 0.95, Tucker–Lewis indices or TLI = 0.94, standardized root mean square residual or SRMR = 0.05), and also an internal consistency at acceptable levels (Markland & Tobin, 2004). The original BREQ-2 demonstrated satisfactory evidence of construct validity in English for university students (D'Abundo et al., 2014), and also for its translations in different languages in the general population (Costa et al., 2018; Liu et al., 2015; Moustaka et al., 2010).

A third version of the questionnaire (BREQ-3) was developed to resolve the conceptual discrepancy between self-determination theory and BREQ by including integrated regulation. However, this new version initially left out the dimension of amotivation (Wilson et al., 2006). It was then that González-Cutre et al. (2010) expanded on the work done by Wilson et al. (2006) and by Markland and Tobin (2004), developing the BREQ-3 in Spanish with the inclusion of the dimension of motivation. In this way, the BREQ-3 in Spanish comprised 23 items grouped into six dimensions that covered the continuum of self-determination from amotivation to intrinsic motivation (González-Cutre et al., 2010). The BREQ-3 in Spanish presented adequate fit indicators— $\chi^2 (215) = 689.13$, $p < 0.001$; $\chi^2/df = 3.20$; CFI = 0.91; RMSEA = 0.06; SRMR = 0.06 (González-Cutre et al., 2010). The BREQ-3 has been adapted and validated in countries such as Germany, Brazil, China, and Italy, where it has presented acceptable adjustment indices and invariance across gender and age (Cavichiole et al., 2022; Cid et al., 2018; Cocca et al., 2024; Luo et al., 2022). The BREQ-3 has evidence of application in the adult population in Chile (Jofré-Saldía et al., 2023; Mella-Norambuena et al., 2020; Reyes-Molina et al., 2023), having an adequate internal consistency for university students (Mella-Norambuena et al., 2020).

1.3. BREQ-3 and Incidental Physical Activity

BREQ was designed for use in physical exercise, that is, a planned, structured, repetitive physical activity that aims to improve physical fitness (Caspersen et al., 1985; Ferguson, 2014). However, there are other types of less structured physical activities, such as incidental physical activity, which have growing evidence of a positive association with indicators of physical health and well-being (Ahmadi et al., 2023; Raisi et al., 2024; Stamatakis et al., 2022, 2023; Wu et al., 2022) in addition to a higher adherence rate over time than physical exercise (Chung et al., 2018; Levine, 2007; Mak et al., 2011). Incidental physical activity is characterized as physical activity of daily living, performed at home, at work or study, or during leisure time, that does not require additional time or have recreational or physical

health purposes (e.g., climbing stairs, active transportation, standing, shopping, household chores, occupational, physical activity, among others.) (Reynolds et al., 2014; Stamatakis et al., 2019, 2021).

Adaptations of motivational instruments have been made for the study of incidental physical activity (Niven & Markland, 2016; Oliver & Kemps, 2018). In particular, Oliver and Kemps adapted the Perceived Locus of Causality Questionnaire (Ryan & Connell, 1989) and found that both more self-determined motivations and introjected and external regulations predicted levels of incidental physical activity in a group of college students. Another study adapted the BREQ-3 to analyze motivation in walking behavior, which is considered a sub-behavior of incidental physical activity. The results showed negative relationships with amotivation and external regulation, no relationship with introjection, and positive relationships with identified and intrinsic regulation (Niven & Markland, 2016). However, according to the empirical review carried out, there are no published studies that have adapted the BREQ-3 to measure motivation towards incidental physical activity. Having an instrument such as the BREQ-3 to assess incidental physical activity would allow us to understand the motivational factors underlying this type of physical activity, as well as to generate scientific evidence from various populations from different cultural backgrounds.

With the above background, this study aimed to adapt and analyze the psychometric properties of the Exercise Behavior Regulation Questionnaire (BREQ-3) for assessing motivation towards incidental physical activity.

2. Materials and Methods

2.1. Design

A quantitative approach was followed with an instrumental study design (Ato et al., 2013) developed from the cross-sectional survey method (Creswell, 2012) through collecting information at a single point in time. This study followed the recommendations for validating psychometric instruments in social and health sciences (López-Pina & Veas, 2024).

2.2. Participants

Through a non-probabilistic convenience sampling, 346 university students were recruited, aged between 18 and 34 years (mean 21.1 ± 2.6 years; 61.3% women), from 11 universities in different regions of Chile. Of these, 54% ($n = 188$) practiced sports or physical exercise at least once a week. The inclusion criterion was to be a regular undergraduate student in a higher education institution. No exclusion criteria related to physical exercise, level of physical activity, or other factors were applied since the study focused on motivation toward incidental physical activity. This type of activity corresponds to activities of daily living carried out by both people who practice physical exercise and those who do not.

All participants were informed about the general purpose of the study and their rights to anonymity and confidentiality. They agreed to participate in the study by signing informed consent forms before answering the questionnaire.

2.3. Instruments

The third version of the Exercise Behavior Regulation Questionnaire was adapted to Spanish (BREQ-3) (González-Cutre et al., 2010; Wilson et al., 2006). The BREQ-3, in its Spanish version, is composed of 23 items grouped in six dimensions, which evaluate amotivation, external regulation, introjected, identified, integrated, and intrinsic motivation (González-Cutre et al., 2010; Wilson et al., 2006). All items begin with the statement “I do physical exercise” and are rated on a five-point Likert-type scale, ranging from “0” (not true at all) to “4” (totally true). Items 4, 12, 18, and 22 correspond to the dimension

of intrinsic motivation (example item, “because I think exercise is fun”); items 5, 10, 15, and 20 for integrated regulation (example item, “because it is in accordance with my way of life”); items 3, 9, and 17 for identified regulation (example item, “because I value the benefits of physical exercise”); items 2, 8, 16, and 21 for introjected regulation (example item, “because I feel guilty when I do not practice it”); items 1, 7, 13, and 19 for external regulation (example item, “because others tell me I should do it”); and items 6, 11, 14, and 23 for amotivation (example item, “I do not see why I have to”). The BREQ-3 scale, initially in English, has been adapted and validated in countries such as Brazil, Italy, and Spain, with psychometric properties that indicate acceptable fit indices and that corroborate its six-dimensional factor structure and with invariance across gender and age (Cavicchiolo et al., 2022; Cid et al., 2018; González-Cutre et al., 2010). In university students in Chile, internal consistency was reported with Cronbach’s alpha values of $\alpha = 0.87$ for intrinsic motivation, $\alpha = 0.87$ for integrated regulation, $\alpha = 0.66$ for identified regulation, $\alpha = 0.72$ for introjected regulation, $\alpha = 0.78$ for external regulation, and $\alpha = 0.70$ for amotivation (Mella-Norambuena et al., 2020).

2.4. Procedure

First, permission was requested from the corresponding author of the BREQ-3 in its Spanish version to adapt the instrument, and who gave his consent for its free use. Next, the adaptation process began, which included adding a statement to the instructions of the original questionnaire, with the purpose of placing the university students in the context of the incidental physical activities of daily life, which they had to keep in mind when answering the questionnaire (see Supplementary Tables S1 and S2). Then, the statement “*I do physical activity*” was prefixed to each item, unlike the original questionnaire, where this was only in the instructions. The concept of “*physical exercise*” was replaced throughout the questionnaire by “*physical activity*”.

In order to evaluate the adaptations made to the original questionnaire, to verify the correct understanding of the items, and for the relevance of the questionnaire in the context of university students, cognitive interviews were carried out (Smith-Castro & Molina, 2011). The interviews used paraphrasing techniques, in which the interviewer rephrased the question to verify comprehension and clarify meaning, together with specification tests using additional questions, such as how they defined or interpreted certain terms, to explore how the participant arrived at their answer. All of the above had the purpose of detecting problems in the four moments of the question–answer process (comprehension, information retrieval, estimation, and execution) (Smith-Castro & Molina, 2011). Participants for cognitive interviews were selected through convenience sampling among students who met the same inclusion criteria as the study and who also signed the informed consent (Otzen & Manterola, 2017). Eight students from a university in the Biobío region participated, three men and five women, between 18 and 27 years old, from engineering and pedagogy careers. Each interview was audio-recorded, lasted approximately 60 min, and took place at a pre-arranged location. Each student was provided with a laptop so that they could read aloud the questionnaire available on the Google Forms platform while the interviewer (principal investigator) recorded, asked questions, and took notes. The answers submitted by the students to each of the items were analyzed, and the necessary modifications were made where comprehension difficulties were identified. Five out of the eight students expressed doubts or suggestions about one of the 23 items on the questionnaire. This led to light modifications being made in the wording of items 2, 3, 6, 8, 11, 12, 13, 14, 16, 18, and 23 (see Table 1).

Table 1. Modifications were made after the cognitive interview.

Item	Original Questionnaire	Modification
2	Because I feel guilty when I do not practice it.	I do physical activity because I feel guilty when I do not.
3	Because I value the benefits of physical exercise.	I do physical activity because I value the benefits of doing it.
6	I do not see why I have to.	I do physical activity, but I do not see why I have to do it.
8	Because I feel embarrassed if I miss the session.	I do physical activity, but I do not see why I have to do it.
11	I do not see why I have to bother exercising.	I do physical activity, but I do not see why I have to bother doing it.
12	Because I enjoy exercise sessions.	I do physical activity because I enjoy doing it.
13	Because other people will not be happy with me if I do not exercise.	I do physical activity because other people will not be happy with me if I do not do physical activity.
14	I do not see the point of exercising.	I do physical activity, but I do not see the point of doing physical activity.
16	Because I feel like I have failed when I have not exercised for a while.	I do physical activity because I feel that I have failed when I have not done physical activity for a while.
18	Because I find exercise an enjoyable activity.	I do physical activity because I find it to be an enjoyable activity.
23	I think exercising is a waste of time.	I do physical activity, but I think that doing it is a waste of time.

After these modifications, the online questionnaire was applied to university students from all over Chile through the snowball method. The link to access the questionnaire hosted on the Google Forms platform was open access, and the research team disseminated it through social networks and emails between November 2023 and June 2024.

2.5. Data Analysis

The first step was to carry out a qualitative analysis through a thematic analysis of the results obtained in the cognitive interviews. The next step, before proceeding with factor analyses, was to review the suitability of the data for analysis. A descriptive analysis of the data showed that there were no missing data. The mean and standard deviation were presented for each item. Then, a confirmatory factor analysis was carried out on the sample of 346 participants. All of this was estimated with the support of the statistical tool R (version 4.4.1), using the packages “psych” and “lavaan”. Since the study variables were measured with ordinal scales, a robust weighted least squares estimator (WLSMV) was used (Brown, 2015). To evaluate the fit of the models, chi-square indices (χ^2 ; expected values $p > 0.05$) were used; the mean square root of approximation error (RMSEA) (which is considered a good fit if it has values less than 0.05–0.08); and the comparative fit index (CFI) and Tucker–Lewis indices (TLI) (where values > 0.95 are expected) (Brown, 2015; Hair et al., 2014). The convergent and discriminant validity of the factors was analyzed using the average variance extracted (AVE) and the composite reliability (CR). The AVE measures the level of variance captured by a construct compared to the variance attributed to measurement error. According to Fornell and Larcker (1981), discriminant validity compares the square root of the AVE with the correlations between latent constructs. A latent construct should explain more variance in itself than the variance shared with other latent constructs. Therefore, the square root of each AVE should be greater than the correlations between the other latent constructs. The recommended cut-off points are 0.50

for the AVE and 0.70 for the CR (Fornell & Larcker, 1981; Hair et al., 2014). Subsequently, Cronbach's alpha and McDonald's omega coefficients were calculated to evaluate the internal consistency of the constructs, where values > 0.70 are expected (Luján Tangarife & Cardona Arias, 2015).

3. Results

Table 2 presents the descriptive statistics for each item and the dimensions assessed in the instrument. The mean, standard deviation (SD), and minimum and maximum values observed (min–max) are reported on a scale from 0 to 4 for each dimension. The item means per dimension show a trend toward higher levels of intrinsic motivation and identified regulation, while external regulation and amotivation are the least predominant.

Table 2. Descriptive statistics by item and by dimension.

Dimension	Item	Mean (SD)	Min–Max
Intrinsic motivation	4	2.52 ± 1.50	0–4
	12	2.49 ± 1.52	0–4
	18	2.54 ± 1.49	0–4
	22	2.42 ± 1.51	0–4
Integrated regulation	5	2.25 ± 1.53	0–4
	10	1.96 ± 1.62	0–4
	15	1.91 ± 1.65	0–4
	20	1.95 ± 1.55	0–4
Identified regulation	3	2.65 ± 1.39	0–4
	9	2.41 ± 1.50	0–4
	17	2.36 ± 1.46	0–4
Introjected regulation	2	1.14 ± 1.29	0–4
	8	0.57 ± 1.03	0–4
	16	1.11 ± 1.35	0–4
	21	0.84 ± 1.22	0–4
External regulation	1	0.47 ± 0.89	0–4
	7	0.39 ± 0.84	0–4
	13	0.28 ± 0.75	0–4
	19	0.27 ± 0.69	0–4
Amotivation	6	0.38 ± 0.86	0–4
	11	0.75 ± 1.18	0–4
	14	0.25 ± 0.71	0–4
	23	0.23 ± 0.67	0–4

SD: standard deviation.

3.1. Confirmatory Factor Analysis

The original model of the BREQ-3 questionnaire, which consists of six factors, was evaluated. Then, a second model was evaluated, excluding items 8 and 11, because the residue analysis showed a high residual relationship between these two items (>0.05). Both models presented a significant chi-square (χ^2), which indicates a significant difference between the expected and observed covariance matrix, suggesting that the models proposed in both cases do not correctly represent the relationships between the observed variables. However, the CFI and TLI values are appropriate. Model 2 also presented a χ^2/df and RMSEA in adequate ranges, with values lower than three and 0.08, respectively, which indicates a better fit (see Table 3).

Table 3. Adjustment of the models of the Regulation of Behavior in Exercise Questionnaire (BREQ-3) analyzed.

Model	χ^2	χ^2/df	CFI	TLI	RMSEA
Model 1: Six factors	781.58 *	3.635	0.99	0.99	0.087 (IC 90%; 0.081–0.094)
Model 2: Six factors without items 8 and 11	382.18 *	2.196	0.99	0.99	0.059 (IC 90%; 0.051–0.067)

χ^2 : chi-square; df: degree of freedom; CFI: comparative adjustment index; TLI: Tucker–Lewis index; RMSEA: mean square root of approximation error. * p -value < 0.001.

3.2. Convergent and Discriminant Validity

The convergent and discriminant validity indicators show that in both models, the average variance extracted (AVE) is adequate for the factors of intrinsic motivation and integrated and identified regulation since it exceeds the threshold of 0.50. However, amotivation has a PAVE lower than 0.50 in Model 1 (AVE = 0.35). The modification in Model 2, which excludes items 8 and 11, improves the AVE of amotivation (AVE = 0.51), reaching an adequate value. The composite reliability (CR) in both models is acceptable for all factors, except for the amotivation factor in Model 1, with a CR lower than 0.7 (CR = 0.67), which, after modification in Model 2, improves to acceptable values (CR = 0.75) (see Table 4).

Table 4. Indicators of convergent and discriminant validity and internal consistency.

	Model	AVE	CR	α	ω
Model 1	Intrinsic motivation	0.86	0.96	0.96	0.96
	Integrated regulation	0.84	0.95	0.95	0.95
	Identified regulation	0.75	0.90	0.89	0.90
	Introjected regulation	0.50	0.80	0.79	0.82
	External regulation	0.51	0.81	0.80	0.83
	Amotivation	0.35	0.67	0.68	0.73
Model 2	Intrinsic motivation	0.86	0.96	0.96	0.96
	Integrated regulation	0.84	0.95	0.95	0.95
	Identified regulation	0.75	0.90	0.89	0.90
	Introjected regulation	0.52	0.76	0.75	0.77
	External regulation	0.51	0.80	0.80	0.83
	Amotivation	0.51	0.75	0.75	0.79

AVE: average extracted variance; CR: composite reliability; α : Cronbach's alpha; ω : McDonald's omega.

3.3. Internal Consistency Analysis

The internal consistency in both models presents adequate values of Cronbach's alpha (α) and McDonald's omega (ω) for the factors of intrinsic motivation and integrated and identified regulation, with values above 0.90. In Model 2, the internal consistency indicators for the amotivation factor improve compared to Model 1, reaching an $\alpha = 0.75$ and $\omega = 0.79$, respectively (see Table 4).

The six-factor Model 2 was chosen without items 8 and 11 since it shows a robust fit, with good indices of χ^2/df , CFI, TLI, and RMSEA. In addition, the model showed adequate convergent and discriminant validity, with AVE and CR in acceptable values for all its dimensions. Internal consistency was also strong, with α and ω values ranging from good (>0.60) to excellent (>0.90). All items had factor loads greater than 0.60, and most exceeded 0.80, except for item 1 (0.75), item 2 (0.63), and item 6 (0.73). Intrinsic motivation, integrated regulation, and identified regulation showed high correlation with each other, with values equal to or greater than 0.90, as well as a low correlation with the introjected regulation factor, and a low and negative correlation with external regulation and amotivation (see Figure 1).

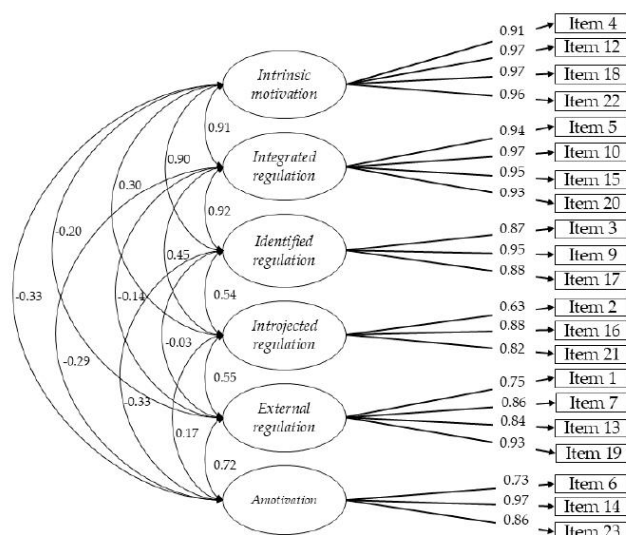


Figure 1. Diagram of the multifactorial structure of the version of the BREQ-3 for motivation towards incidental physical activity.

4. Discussion

This research aimed to adapt and analyze the BREQ-3 psychometric properties for the assessment of motivation towards incidental physical activity. Confirmatory factor analysis supported the six-factor structure corresponding to the dimensions of intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation, and amotivation of the original BREQ-3 model in its Spanish version (González-Cutre et al., 2010). These findings are in line with validation studies and psychometric properties of BREQ-3 in other languages and population groups, where the six-factor model has been shown to be a good fit for the data (Cavichiole et al., 2022; Cid et al., 2018; González-Cutre et al., 2010; Guedes & Sofiati, 2015; Luo et al., 2022).

The adjustment indices of the adaptation of the BREQ-3 that we proposed to study the motivation towards incidental physical activity, after eliminating items 8 and 11, were similar to those of the Spanish version of the BREQ-3 by González-Cutre et al. (2010) — $\chi^2 = 215$, $p < 0.001$, $\chi^2/df = 3.20$; CFI = 0.91; TFI = 0.91; RMSEA = 0.06. It is important to note that the version of the BREQ-3 by González-Cutre et al. (2010) was applied to a sample composed of practitioners from various exercise contexts, while in the present study, the sample consisted of university students, both those who practiced sports or exercised (54%) and those who did not. In this sense, the original version of the BREQ-3 was designed to assess motivation towards physical exercise (González-Cutre et al., 2010; Wilson et al., 2006), although it may share types of motivation with incidental physical activity (Lindwall et al., 2017; O'Dougherty et al., 2010), which refer to activities with a different purpose and context. This could explain some of the differences found in the initial fit of the model in the adaptation we proposed, especially with item 8 (“I do the physical activity because I feel embarrassed if I do not do it”), belonging to the dimension of amotivation, and item 11 (“I do physical activity, but I do not see why I have to bother doing it”) of the introjected regulation dimension. These items would not fit the context of incidental physical activity, an activity that is part of daily life and is reflected in behaviors such as walking, climbing stairs, doing the toilet, or shopping, among others. In this sense,

the improvement in the convergent and discriminant validity indices (AVE and CR) for the dimension of amotivation, after eliminating the items, confirms this observation.

On the other hand, the correlations between the dimensions of the instrument were consistent with the theory, presenting the most self-determined dimensions, such as intrinsic motivation and integrated and identified regulation, with high correlations with each other. In addition, these more self-determined dimensions showed negative correlations with less self-determined dimensions, such as introjected and external regulation, as well as with amotivation. This pattern of correlations is consistent in the various linguistic adaptations of the BREQ-3 identified in a recent systematic review (Ursino et al., 2023), which supports the multidimensionality of motivation as a continuum of self-determination (Alivernini et al., 2018; Brooks et al., 2018; Luo et al., 2022).

Notably, although the classical six-dimensional taxonomy of motivation is widely used, an alternative classification has been proposed that groups the self-determination continuum into three categories: amotivation, controlled motivation (which includes introjected and external regulation), and autonomous motivation (which includes intrinsic motivation and integrated and identified regulation) (Vansteenkiste et al., 2010). In particular, a study of 825 university students in China showed acceptable fit indices— $\chi^2(431) = 808.070$, $p < 0.01$; RMSEA = 0.053 (0.047–0.059); CFI = 0.93; TLI = 0.93—and an adequate internal consistency for a three-factor model, in which the items were grouped into the dimensions of amotivation, controlled motivation, and autonomous motivation (Luo et al., 2022). This taxonomy, observed in the research that applied the BREQ-3, could explain the correlations between the dimensions observed in the present study. Other proposals have integrated behavioral regulations as second-order variables in models regrouped into two factors: autonomous and controlled motivation (Brunet et al., 2015; Cid et al., 2012; Howard et al., 2020; Luo et al., 2022). While these measures of motivation have been consistent with the central distinction underlying the self-determination continuum proposed in self-determination theory (Cid et al., 2012), combining the subscales could dismiss the differential consequences associated with each regulation (Howard et al., 2020).

Strengths and Limitations

To our knowledge, this is the first study to explore the psychometric properties of an adaptation of the BREQ-3 for the analysis of motivation towards incidental physical activity. This study reported on the construct, convergent, discriminant validity, and internal consistency of this adaptation of the BREQ-3, making it a reliable and psychometrically suitable scale for use in the context of incidental physical activity. Understanding the different forms of motivation that people experience during exercise can help predict potential outcomes (Hagger et al., 2014). This study contributes significantly to the literature by expanding the instruments available for motivational research, which may facilitate international comparisons.

However, the present study has limitations that must be considered when interpreting its results. First, although sample sizes of more than 200 cases are considered adequate to assess the quality of a test (Ferrando Piera & Anguiano Carrasco, 2010), the optimal conditions suggest having more than 400 cases, which allow exploratory and confirmatory factor analyses to be carried out (Lloret-Segura et al., 2014). Second, the study did not include a measure of incidental physical activity or a re-test in the sample of students to whom the instrument was applied. Therefore, in the present study, there are no indicators of concurrent validity or temporal stability of the adaptation of the BREQ-3. Finally, the version of the BREQ-3 validated in Spanish that was used in this study has 23 items, unlike the English versions of the BREQ-3 adapted to other languages, such as German, Portuguese, and Chinese, which include an additional item in the identified regulation

dimension, adding up to a total of 24 items, with four items per factor (Cid et al., 2018; Cocca et al., 2024; Luo et al., 2022).

Future research should evaluate the psychometric properties of this adaptation of BREQ-3 in larger samples and in populations of various ages and occupations. Its concurrent validity to objective measures of incidental physical activity and the temporal stability of the instrument should also be examined, as well as to determine if this new version of the BREQ-3 maintains the original six-factor structure or if it fits into a three-factor structure corresponding to the dimensions of autonomous motivation, controlled motivation, and amotivation. It would also be desirable to study the psychometric properties of this adaptation, including the fourth item in the identified regulation dimension that was incorporated into the English versions of BREQ-3.

This adaptation of the BREQ-3 will contribute to the research on motivation towards incidental physical activity, where evidence on the psychological mechanisms that explain these behaviors is limited (Levine, 2007; Reynolds et al., 2014; Tudor-Locke et al., 2007). To date, evidence on the psychological factors influencing incidental physical activity has focused primarily on the interaction between the continuum of motivation and implicit processes, such as attitudes, attentional biases, and approach-avoidance mechanisms (Oliver & Kemps, 2018). However, there is literature that describes, for example, how the incorporation of the self-determination continuum into the theory of planned behavior can help explain behaviors related to physical activity (Gómez-Mazorra et al., 2022; Hagger & Chatzisarantis, 2014). It has even been described how the most self-determined motivations mediate between personality traits, the constructs of the theory of planned behavior, and physical activity (Kekäläinen et al., 2022).

5. Conclusions

The present study, which adapted and analyzed the psychometric properties of BREQ-3, provides evidence that it is an adequate measure to assess motivation in the context of incidental physical activity. The confirmatory factor analysis showed a good fit to the six-factor model, supporting the structure corresponding to the dimensions of intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation, and amotivation. Future research should address the limitations of this research, such as sample size and lack of measures of concurrent validity and temporal stability. However, this adaptation of the BREQ-3 offers a valid and reliable tool in the study of the psychological mechanisms underlying motivation towards incidental physical activity, an area that has so far received little attention.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/bs15020114/s1>, Table S1: Adaptation of the BREQ-3 Spanish version; Table S2: Adaptation of the BREQ-3 English version.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki (World Medical Association, 2013) and the ethical standards in the scientific research of sport and exercise (Harriss et al., 2022). This study was approved by the Ethics, Bioethics, and Biosafety Committee of the University of Concepción (CEBB code 1503-2023, approved on 30 September 2023).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author due to restrictions imposed to safeguard the identity of the subjects studied and to comply with applicable ethical regulations.

Conflicts of Interest: The authors declare no conflicts of interest.

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5.3 Estudio III

Personality Traits, Motivation, and Attitudes Implicit in Incidental Physical Activity in College Students: A Model of Structural Equations

Personality Traits, Motivation, and Attitudes Implicit in Incidental Physical Activity

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Abstract:

Introduction: Promoting incidental physical activity (IPA) can help reduce sedentary lifestyles and levels of physical inactivity. Although there are explanatory psychological variables for physical activity, evidence is limited on an explanatory model of IPA in university students that integrates personality traits, motivation, and implicit attitudes. **Objective:** To evaluate a hypothetical explanatory model of IPA in university students based on personality traits, motivation and implicit attitudes towards IPA. **Methodology:** A cross-sectional explanatory study with latent variables analysed using a structural equation model (SEM) in 223 university students (21.13 \pm 2.03 years; 63.67% women). Personality traits were assessed with the Big Five Questionnaire, controlled and autonomous motivation with a BREQ-3 adaptation, and implicit attitudes with an Implicit Association Task. The IPA was measured with wrist-based accelerometers worn for 7 days. **Results:** The structural model showed a satisfactory fit and explained 18.30 % of the variance in the IPA. Positive direct effects of extroversion ($\beta = 4.89$, $p < 0.001$) and autonomous motivation ($\beta = 3.11$, $p = 0.002$) were observed, and a negative direct effect of openness to experience ($\beta = -3.51$, $p < 0.001$). Agreeableness and conscientiousness had a positive indirect effect through autonomic motivation ($\beta = 2.72$, $p = 0.006$; $\beta = 2.96$, $p = 0.003$), and neuroticism had a negative indirect effect ($\beta = -2.65$, $p = 0.008$). **Conclusion:** Extroversion, openness to experience, agreeableness, conscientiousness, and autonomous motivation explain the IPA. Effective promotion of the IPA must consider personality traits and autonomous motivation. Future research should replicate this model in diverse samples and evaluate the causality of these relationships.

Keywords:

Incidental physical activity; College; Personality; Theory of Self-determination; Implicit attitudes; SEM.

Data availability statement:

The data that support the findings of this study are available from the corresponding author upon reasonable request.

INTRODUCTION

The global prevalence of physical inactivity in adults is 31.30%, i.e., almost a third of the population does not meet the World Health Organization (WHO) recommendation of 150–300 minutes per week of moderate activity or 75–150 minutes of vigorous activity (Bull et al., 2020; Strain et al., 2024). The benefits of increasing physical activity in adulthood are widely documented in both health and well-being (Dempsey et al., 2021; Díaz-Martínez et al., 2018; Kraus et al., 2019; Lacombe et al., 2019; Zhao et al., 2020). However, the transition period to adulthood has been characterised by

unhealthy lifestyles. For example, in university students, between 7 and 14 hours a day are reported in sedentary behaviours, such as sitting or lying down (Castro et al., 2020; Kwan et al., 2012; Moulin et al., 2021; Pengpid et al., 2015). In this sense, high levels of sedentary lifestyle are detrimental even in those who reach the minimum weekly physical activity recommendations (Ekelund et al., 2016, 2019; Panahi & Tremblay, 2018; Thakkar et al., 2018; Thorp et al., 2011). For this reason, the WHO recommends reducing sedentary time by replacing it with activity of any intensity (Bull et al., 2020) and, in its Global Action Plan on Physical Activity 2018–2030, proposes incidental physical activity (IPA) as a key strategy to reduce sedentary lifestyles and increase physical activity (World Health Organization, 2019).

IPA comprises unstructured, unplanned, and unintentional activities that arise as a byproduct of activities that are not aimed at physical conditioning, sports, or recreation, such as climbing stairs, mowing the lawn, walking the dog, or actively moving around (Reyes-Molina et al., 2025). Unlike structured exercise, IPA requires less equipment and overcomes many reported barriers (Delahanty et al., 2019; Farah et al., 2021; Thøgersen-Ntoumani et al., 2023). Studies with wearable devices show that more than 90% of daily physical activity is accumulated in bursts of less than three minutes of IPA (Ahmadi et al., 2023; Stamatakis et al., 2022). It has also been observed that university students can accumulate significant amounts of IPA during their waking hours (Wallmann-Sperlich et al., 2022). A recent study in 22,368 UK adults reported that brief periods of moderate to vigorous incidental activity offset the cardiovascular risks associated with a sedentary lifestyle (Koemel et al., 2025). Consistently, representative cohort studies using objective measurement of incidental activity have shown that short periods of IPA are associated with a lower risk of all-cause mortality, cancer, stroke, and cardiovascular disease (Stamatakis et al., 2022, 2025).

Although the literature has mainly explored environmental and contextual factors of IPA (Thøgersen-Ntoumani et al., 2023), there are fewer studies on the individual and psychological variables that explain it (Reyes-Molina et al., 2025). A study by Oliver and Kemps (2018), in which they combined Self-Determination Theory (Deci & Ryan, 1985) and the Reflexive-Impulsive Dual Processing Model (Strack & Deutsch, 2004) reported that implicit attitudes were negatively related, while autonomic motivation and controlled motivation had positive and independent associations with IPA, measured through step counting (Oliver & Kemps, 2018). However, this study did not consider Personality Theory, which has one of the longest and richest traditions in psychology and with ample evidence in physical activity (McCrae & Costa Jr., 2008; Rhodes & Smith, 2006; Sutin et al., 2016; Wilson & Dishman, 2015; Wilson & Rhodes, 2021). Current evidence supports a relationship between personality traits and physical activity, mediated both by sociocognitive constructs (e.g., enjoyment) and by more direct determinants of behaviour such as implicit attitudes (Wilson & Rhodes, 2021).

The Big Five Theory or Five Factor Model, developed by Costa and McCrae (1992), divides the human personality into five main dimensions: Agreeableness, Extroversion, Neuroticism, Conscientiousness, and Openness to Experience (hereinafter, openness). Personality traits are relatively stable during adulthood, reflecting long-lasting and consistent individual characteristics that determine how people respond to environmental stimuli and self-regulate their behaviour (Costa & McCrae, 1992; McCrae et al., 2000; McCrae & Costa Jr., 2008; Wilson & Rhodes, 2021). This model is especially useful for understanding how personality interacts with physical activity (Costa & McCrae, 1992; McCrae et al., 2000; McCrae & Costa Jr., 2008) and how well-established personality patterns can influence the adoption of sedentary lifestyles.

Systematic reviews and meta-analyses indicate that a profile of high extroversion and Conscientiousness, and low neuroticism is consistently associated with a higher likelihood of participation in physical activity (Rhodes & Smith, 2006; Sutin et al., 2016; Wilson & Dishman, 2015). However, findings on openness to experience are inconsistent, and overall, agreeableness does not

appear to significantly influence the level of physical activity (Rhodes & Smith, 2006; Sutin et al., 2016; Wilson & Dishman, 2015). A study by Kekäläinen et al. (2022) conducted on adult women showed that autonomous motivation was positively associated with leisure-time physical activity, while neuroticism exerted a negative indirect effect through autonomous motivation (Kekäläinen et al., 2022).

Despite these findings, the evidence of integrative explanatory models that include attitudinal aspects as well as personality traits is limited. Having an explanatory model of the IPA would provide a theoretical basis for designing interventions aimed at reducing sedentary lifestyles and promoting incidental activity in the university context. Therefore, this study aimed to evaluate a hypothetical explanatory model of IPA in university students based on personality traits, motivation, and implicit attitudes towards IPA (see Figure 1).

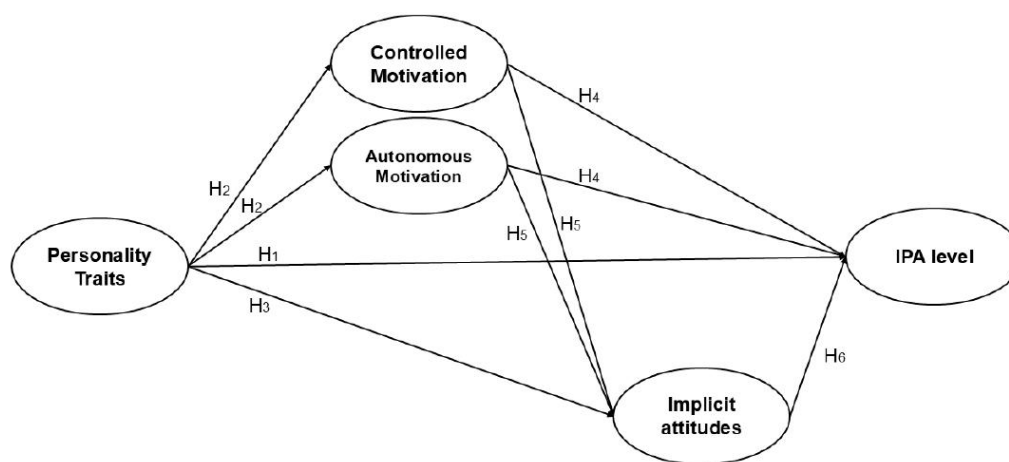


Figure 1. Hypothetical explanatory model of IPA through personality traits, motivation and implicit attitudes towards IPA. *H: Hypothesis. H1: Extroversion, agreeableness, conscientiousness, and openness personality traits have a direct positive effect, and neuroticism has a direct negative effect on the level of IPA; H2: Extroversion, agreeableness, conscientiousness, and openness personality traits have a positive indirect effect, and neuroticism has a negative indirect effect on the level of IPA through controlled and autonomous motivation; H3: Extroversion, agreeableness, conscientiousness, and openness personality traits have a positive indirect effect, and neuroticism has a negative indirect effect on the level of IPA through implicit attitudes; H4: Controlled and autonomous motivation have a direct positive effect on IPA; H5: Controlled and autonomous motivation has a positive indirect effect on IPA through implicit attitudes; H6: Implicit attitudes towards IPA have a direct effect on the level of IPA.*

METHOD

Design

The present study has a quantitative approach and a cross-sectional explanatory design with latent variables (Ato et al., 2013). This type of design is suggested to explain complex behaviours such as physical activity, in which multiple explanatory variables concur (Migueles et al., 2022). In addition, the recommendations of the STROBE guideline for the reporting of observational studies (Cuschieri, 2019) were followed.

Participants

Through a non-probabilistic sampling for convenience through institutional emails, WhatsApp, social networks and posters on campus. A total of 223 undergraduate university students (63.7% women) aged between 18 and 30 years (21.13 ± 2.03 years) were recruited. Belonging to the Faculty of Social Sciences, Faculty of Medicine, or Faculty of Nursing of a university in south-central Chile. Of these, 47.08% did not practice physical exercise. The inclusion criteria were: 1) to be a regular undergraduate university student; and 2) to be 30 years old or younger (Barrera-Herrera & Vinet, 2017). The exclusion criteria were: 1) having a physical or health condition that limits the ability to move on foot or by bicycle; 2) being a foreign student in an internship, and 3) not having completed any of the questionnaires or not reaching the minimum number of days of physical activity registration. All eligible students were contacted through a call on social networks, posters and institutional emails, inviting them to participate voluntarily. As an incentive for participation, eight headphones were raffled among the total number of participants (incentive equivalent to a value of less than \$600 CLP per participant).

The sample size was estimated a priori at 200 participants (Soper, 2015; Westland, 2010), to detect a median effect ($TE = 0.30$), with a confidence level of 95% and power of 80% in a model of 8 latent variables and 51 observed variables (Castro & Martini, 2014; Westland, 2010). A total of 263 students responded to the call. Of these, 261 were included, as two exceeded the age limit. After data collection, 22 were excluded for not complying with the minimum record of days and hours of use of the accelerometer and 16 for not completing any of the self-report questionnaires. The final sample was 223 participants.

All participants signed an informed consent form that was approved by the Ethics, Bioethics, and Biosafety Committee of the sponsoring institution (CEBB 1503-2023, approved in September 2023). The procedures were in accordance with the ethical guidelines of the Declaration of Helsinki (World Medical Association, 2013).

Variables and instruments

Personality traits: To assess personality traits, the adapted and valid version of the *Big Five Inventory* (BFI) scale (Benet-Martinez & John, 1998; John et al., 1991). This version consists of 32 items, out of the original 44, grouped into five dimensions and rated on a five-point Likert scale (1 = strongly disagree; 5 = strongly agree). In this version, items 1, 6R, 16, 27R, 43 correspond to the dimension of extroversion (for example, "he is very talkative"); items 7, 24, 37, 41 for agreeableness (e.g. "Generous and helpful to others"); items 3, 8R, 14, 18R, 21R, 25R, 29, 34, 42R for conscientiousness (e.g., "is thorough at work"); items 4, 9R, 15, 19R, 30 for neuroticism (e.g., "he's depressed, melancholic") and items 5, 10, 12R, 17, 20, 23, 31, 36, 39, 44R for openness to experience (e.g., "he's original, he comes up with new ideas"). Items that are attached with a letter "R" are reverse-scored items. This version presents evidence of adequate psychometric properties (Lara et al., 2021).

Motivation towards incidental physical activity: The third Spanish version of the Exercise Behaviour Regulation Questionnaire (BREQ-3) (González-Cutre et al., 2010; Wilson et al., 2006) adapted for the IPA (Reyes-Molina et al., 2025). This adaptation of the BREQ-3 is composed of 21 items (items 8 and 11 were discarded) grouped into six dimensions, which evaluate amotivation, external regulation, introjected, identified, integrated, and intrinsic motivation. All items begin with the statement "I do physical activity" and are rated on a five-level Likert scale, ranging from "0" (not at all true) to "4" (totally true). Items 4, 12, 18, 22 correspond to the dimension of intrinsic motivation (example item, "because I think exercise is fun"); items 5, 10, 15, 20 for integrated regulation (example item, "because it is in accordance with my way of life"); items 3, 9, and 17 for identified regulation (example item, "because I value the benefits of physical exercise"); items 2, 16, 21 for introjected regulation (example of item, "because I feel guilty when I don't practice it"); items 1, 7,

13, 19 for external regulation (example item, "because others tell me I should do it"), and items 6, 14, 23 for amotivation (example item, "I don't see why I have to do it"). This adaptation reported adequate psychometric properties in university students in Chile (Reyes-Molina et al., 2025). For this study, an alternative classification of the self-determination continuum was used, grouped into three dimensions: amotivation, controlled motivation, and autonomous motivation. Only the dimensions of controlled motivation (external and introjected regulation) and autonomous motivation (identified, integrated, and intrinsic motivation) (Vansteenkiste et al., 2010) were used, since amotivation did not have theoretical support for its inclusion in the explanatory model of IPA.

Implicit attitudes towards incidental physical activity: It was assessed using an implicit association test (IAT), following the protocol of Greenwald et al. (2003, 2022) and Greenwald and Farnham (2000), previously employed by Oliver and Kemps (2018) to measure implicit attitudes towards IPA in university students (Greenwald et al., 2003, 2022; Oliver & Kemps, 2018). The test was designed and administered on the online platform PsyToolkit (Kim et al., 2019; Stoet, 2010). IAT tests assess the strength of automatic association between mental concepts using reaction times in simple classification tasks (Greenwald & Farnham, 2000). In this case, the response time is recorded from the appearance of a visual stimulus (word or image) on the screen until the participant presses an assigned key ("q" or "p"). Eight images were selected that represent incidental physical activities in university students, such as housework (e.g., cleaning), occupational activity (e.g., climbing stairs in college), active commuting (e.g., cycling), and leisure time (e.g., walking the dog). Each image was paired with an image of sedentary behaviour (e.g., watching TV, working at a desk, lying down), allowing for a balanced representation of both categories. The test categories were organised into two types: target categories, which correspond to "IPA" and "sedentary behaviour", and attribute categories (valence), which correspond to "like" and "dislike". The test consists of a total of 190 tests distributed in specific blocks. Block 1: Practice in the classification of the target categories (IPA and sedentary behaviour) with 20 trials. Eight images from each category are randomly submitted. Block 2: Practice in classifying attribute categories (likes and dislikes), also with 20 essays. Participants classify words with positive (e.g., "Joy," "Love") and negative (e.g., "Agony," "Terrible") connotations. Blocks 3 and 4: Combined classification of images and words into the four categories, with 20 and 40 trials, respectively, in which the assigned keys indicate combinations of categories (IPA/like and sedentary behaviour/dislike). Block 5: Practice in the classification of the target categories, but with an inverted key assignment with respect to Block 1, with a total of 30 tests. Blocks 6 and 7: Combined classification of the four categories, keeping the key assignment reversed, with 20 and 40 trials, respectively. For data analysis, the combined blocks (3-4 and 6-7) were considered. Trials with latencies greater than 10,000 milliseconds and participants who had more than 10% responses with latencies greater than 300 milliseconds were eliminated. Subsequently, the average latency of each block and a standardised D-score for each participant were calculated. The D score allows for the interpretation of implicit attitudes, where a value of 0 indicates neutrality, a positive score suggests favourable attitudes towards IPA, and a negative score indicates a preference for sedentary behaviour (Greenwald et al., 2003).

Incidental physical activity: It was evaluated using ActiGraph GT3X triaxial accelerometers (ActiGraph, Pensacola, FL, USA), following the recommendations for data collection and processing in physical activity studies using these devices (Migueles et al., 2017). Each participant wore the accelerometer on the non-dominant wrist 24/7 continuously, removing it only for activities in contact with water (swimming and showering). For data recording, the accelerometers were configured with Actilife software (Actilife, Pensacola, FL, USA), at a sampling rate of 100 Hz, applying a low-frequency extension filter (LFE) to optimise the capture of low-intensity movements typical of incidental activity. Likewise, the exact start date and time of each accelerometer were programmed. Data processing was carried out with the GGIR v3.1- 5 package in RStudio (Migueles et al., 2019),

through four main stages: 1) Self-calibration: automatic adjustment of the data with local gravity to reduce calibration errors and ensure comparability between devices (van Hees et al., 2014). 2) Calculation of the ENMO metric (Euclidean Standard Minus One): $\sqrt{(x^2 + y^2 + z^2)} - 1G$, with negative values truncated to zero. 3) Non-use and anomaly detection: any 15-minute block in which at least two axes had a standard deviation < 13 mG or range < 50 mG in a surrounding window of 60 minutes was marked as "unused", and sustained accelerations > 5.5 G were identified. 4) Imputation and selection of valid days: the periods of non-use and structured activity or bicycle use were imputed (according to the participants' record sheet), the start and end days of the measurement were discarded and those with ≥ 10 hours of recording and a minimum of four full days of the week and one of the weekend were preserved (Migueles et al., 2017). Finally, to obtain the level of incidental physical activity from the activity record, periods of structured physical activity and/or bicycle use were excluded from the analyses. Descriptive reports of record quality, daily measurements and graphs were generated. The average daily ENMO (mG) during waking hours was used as an overall indicator of the level of IPA.

Procedure

Data was collected between September 2024 and April 2025 from undergraduate students at a university in south-central Chile. The measurement protocol was structured in weekly cycles with the following stages. Day 0: download the data from the accelerometers corresponding to the previous seven days, recharge and schedule the devices for the following week. Day 1: signing of the informed consent; delivery of the accelerometer and activity log sheet (e.g. physical exercise and cycling); instructions for use and return of accelerometers; and sending to the institutional email a link to the online questionnaire hosted on Google Forms, with the self-report scales (personality, motivation, implicit attitudes) and the sociodemographic form. Days 1 to 7: continuous use of the accelerometer during 24 hours, daily recording of the indicated activities, and response to self-report scales and sociodemographic data. Day 7: Return of the accelerometer and physical activity diary in a sealed envelope to the responsible researcher.

Data Analysis

First, descriptive statistics were calculated for the items of the scales, the standardised D score of implicit attitudes, the mean daily ENMO of IPA, and the sociodemographic variables of the sample. For the self-report scales, Cronbach's alpha (α) and McDonald's omega (ω) coefficients were estimated to evaluate their internal consistency.

Next, the recommended two-step strategy for structural equation modelling (SEM) was applied. First, the analysis of the measurement model, and then, the analysis of the structural model (Whittaker & Schumacker, 2022). The measurement model included all latent constructs, personality traits (extroversion, agreeableness, conscientiousness, neuroticism, and openness), controlled and autonomous motivation. The measurement model was evaluated using a confirmatory factor analysis (CFA) with the weighted diagonal least squares (DWLS) estimator, recommended for ordinal data (Lloret-Segura et al., 2014). It was verified that all factor loads were ≥ 0.50 , and the adequate adjustment of indicators recommended in psychometric studies (Brown, 2015; Hair et al., 1995; Hu & Bentler, 1999), such as: a) non-significant chi-square (χ^2) with values of $\chi^2/df < 3$; b) Tucker-Lewis index (TLI) and comparative fit index (CFI) ≥ 0.90 for an acceptable fit and ≥ 0.95 for a good fit; c) mean square error of approximation (RMSEA) ≤ 0.08 for an acceptable fit and ≤ 0.06 for a good fit.

Then, the structural model analysis was carried out through an SEM analysis, which allows for the simultaneous examination of relationships between observed and latent variables (Hair et al., 2014). The model included the five personality traits (extroversion, agreeableness, conscientiousness, neuroticism, and openness) as endogenous variables. Three mediating variables, controlled and

autonomous motivation, and implicit attitudes towards the IPA and the IPA as an exogenous variable (see Figure 1). The adequate fit of the structural model was evaluated through the same indicators used in the analysis of the measurement model, and the indirect effects were estimated via bootstrap (5000 iterations). Then, sociodemographic covariates were applied to test the robustness of the structural model. All analyses were carried out in R Studio 4.3.1.

RESULTS

The sample was composed of 223 university students with a mean age of 21.13 years ($M = 21.13$; $SD = 2.03$) and 63.67% of women. Regarding the area of study, 39.6% of the participants were studying pedagogy, 37.90% belonged to the area of health, and 22.6% to social sciences. They were in the first and fourth grades. The distance between home and university averaged 40 km ($M = 40.37$; $SD = 24.84$), moving mainly by public transport (69.9%), followed by walking (24.7%). 47.1% did not do physical exercise.

In relation to personality traits, openness ($M = 36.94$; $SD = 6.85$) and conscientiousness ($M = 30.00$; $SD = 5.70$), while agreeableness ($M = 15.65$; $SD = 2.88$), extroversion ($M = 15.33$; $SD = 4.75$), neuroticism ($M = 15.58$; $SD = 4.49$) showed relatively symmetrical distributions. With respect to motivation towards IPA, greater autonomous motivation was observed than controlled motivation (5.24 ± 5.10 vs. 24.48 ± 14.27). The D-score of implicit attitudes was positive, indicating implicit attitudes towards IPA. The IPA level was 26.77 ± 6.36 mG. Internal consistency, assessed using Cronbach's alpha coefficient (α) and McDonald's omega (ω), presented values ranging from acceptable (> 0.70) to excellent (> 0.90) both in the dimensions of personality traits and in those of motivation towards incidental physical activity.

Table 1. Characteristics of the university student sample.

Variable	Total		Asymmetry	Kurtosis	α	ω
	(n=223, 100%)	M in – Max				
Age (years), $M \pm SD$	21.13 \pm 2.03	18 - 30	1.38	3.15		
Sex, n (%)						
<i>Women</i>	142 (63.67%)					
<i>Man</i>	81 (36.33%)					
Study area, n (%)						
<i>Area of Social Sciences</i>	89 (22.55%)					
<i>Health Area</i>	53 (37.88%)					
<i>Pedagogies</i>	93 (39.57%)					
Year of study, n (%)						
<i>First year</i>	35 (15.69%)					
<i>Second year</i>	64 (28.70%)					
<i>Third year</i>	72 (32.28%)					
<i>Fourth year</i>	52 (23.32%)					
Distance home–university (Km) $M \pm SD$	40.37 \pm 24.84	1 - 120	0.90	0.38		

autonomous motivation, and implicit attitudes towards the IPA and the IPA as an exogenous variable (see Figure 1). The adequate fit of the structural model was evaluated through the same indicators used in the analysis of the measurement model, and the indirect effects were estimated via bootstrap (5000 iterations). Then, sociodemographic covariates were applied to test the robustness of the structural model. All analyses were carried out in R Studio 4.3.1.

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<i>Fourth year</i>	52 (23.32%)					
Distance home–university (Km) $M \pm SD$	40.37 \pm 24.84	1 - 120	0.90	0.38		

Home-university commute, <i>n</i> (%)						
<i>Bicycle</i>	5 (2.24%)					
<i>Walking</i>	55 (24.66%)					
<i>Public transport</i>	156 (69.96%)					
<i>Private vehicle</i>	7 (3.14%)					
Physical exercise practice, <i>n</i> (%)						
<i>No</i>	105 (47.08%)					
<i>1 to 2 days</i>	27 (12.10%)					
<i>3 to 4 days</i>	62 (27.80%)					
<i>5 to 7 days</i>	29 (13.02%)					
Personality Traits, <i>M</i> ± <i>SD</i>						
<i>Extroversion</i>	15.33 ±4.75	5 – 25	0.10	-0.76	0.85	0.86
<i>Agreeableness</i>	15.65 ±2.88	4 – 25	-1.21	2.59	0.71	0.70
<i>Conscientiousness</i>	30.00 ±5.70	17 – 45	0.07	-0.30	0.76	0.79
<i>Neuroticism</i>	15.58 ±4.49	5 – 25	-0.21	-0.41	0.80	0.80
<i>Openness</i>	36.94 ±6.85	15 – 49	-0.57	-0.08	0.83	0.85
Motivation towards IPA, <i>M</i> ± <i>SD</i>						
<i>External Regulation</i>	1.69 ±2.85	0 – 16	2.44	6.64	0.82	0.83
<i>Introjected Regulation</i>	3.55 ±3.44	0 – 12	0.82	-0.38	0.94	0.95
<i>Identified Regulation</i>	7.26 ±3.86	0 – 12	-0.47	-0.98	0.88	0.88
<i>Integrated Regulation</i>	7.69 ±5.93	0 – 16	0.11	-1.55	0.94	0.94
<i>Intrinsic Motivation</i>	9.52 ±5.52	0 – 16	-0.45	-1.16	0.96	0.82
<i>Controlled Motivation</i>	5.24 ±5.10	0 – 28	1.46	2.71	0.78	0.82
<i>Autonomous Motivation</i>	24.48 ±14.27	0 – 44	-0.23	-1.29	0.96	0.97
Implicit attitudes toward the IPA (D-score IAT), <i>M</i> ± <i>SD</i>	0.53 ±0.31	-0.40 – 1.22	-2.20	-0.03		
IPA level (mG), <i>M</i> ± <i>SD</i>	26.77 ±6.36	12.73 – 59.04	1.08	2.52		

IPA: Incidental physical activity; *M*: arithmetic mean; *SD*: standard deviation; *Min*: minimum; *Max*: maximum; *Skewness*: skewness coefficients; *Kurtosis*: Kurtosis coefficient; α : Cronbach's alpha coefficient; ω : McDonald's omega coefficient for internal consistency; *IAT*: Implicit Association Test; *mG*: milligravity, unit of acceleration recorded by the accelerometer.

Table 2 shows that extraversion was positively associated with agreeableness ($r = 0.17, p < 0.05$), openness ($0.23, p < 0.001$), autonomous motivation ($0.16, p < 0.05$), and IPA ($0.20, p < 0.01$), and negatively associated with neuroticism ($-0.20, p < 0.01$). In turn, agreeableness correlated with conscientiousness ($0.56, p < 0.001$), openness ($0.48, p < 0.001$), and autonomous motivation ($0.30,$

$p < 0.001$), and inversely with neuroticism ($-0.44, p < 0.001$). Conscientiousness, on the other hand, was associated with openness ($0.45, p < 0.001$), autonomous motivation ($.28, p < 0.001$), and negatively with neuroticism ($-0.25, p < 0.001$). Neuroticism also showed a positive correlation with external regulation ($0.44, p < 0.001$) and a negative correlation with autonomous motivation ($-0.47, p < 0.001$) and implicit attitudes ($-0.18, p < 0.01$). In the motivational field, openness was associated with introjected regulation ($0.20, p < 0.001$) and amotivation ($0.24, p < 0.001$); Introjected regulation was associated with external regulation ($0.28, p < 0.001$), autonomous motivation ($0.54, p < 0.001$), and IPA ($0.18, p < 0.01$); whereas external regulation was negatively associated with autonomous motivation ($-0.50, p < 0.001$) and IPA ($-0.14, p < 0.05$). Finally, autonomous motivation was positively correlated with implicit attitudes ($0.16, p < 0.05$) and IPA ($0.26, p < 0.001$).

Table 2. Correlations between the variables of the IPA explanatory model.

	1	2	3	4	5	6	7	8	9	10
1. Extroversion	1									
2. Agreeableness	0.17*	1								
3. Conscientiousness	0.07	0.56***	1							
4. Neuroticism	-0.20**	-0.44***	-0.25***	1						
5. Openness	0.23***	0.48***	0.45***	-0.11	1					
6. Introjected Regulation	0.09	0.11	0.10	-0.06	0.20**	1				
7. External Regulation	-0.12	-0.11	-0.11	0.44***	0.00	0.28***	1			
8. Autonomous Motivation	0.16*	0.30***	0.28***	-0.47***	0.24***	0.54***	-0.50***	1		
9. Implicit Attitudes	0.06	0.09	-0.04	-0.18**	0.05	0.11	-0.07	0.16*	1	
10. IPA	0.20**	-0.02	0.08	-0.08	-0.09	0.18**	-0.14*	0.26***	0.03	1

IPA: Incidental physical activity. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 3 presents the results of the confirmatory factor analysis of the measurement model. The initial model showed an acceptable fit ($\chi^2/df < 3$, RMSEA < 0.08 , CFI and TLI indices > 0.90 being acceptable). However, the modification indices indicated that controlled motivation should be separated into its dimensions of introjected regulation and external regulation. This is consistent with what has been reported in the literature, where it has been observed that for a good fit, the dimensions of the BREQ-3 are grouped into autonomous motivation and external and introjected regulation (Luo et al., 2022). Therefore, a second measurement model was analysed that maintains the structure of personality traits, autonomous motivation and implicit attitudes, but divides controlled motivation into introjected regulation and external regulation. This second model showed a better fit than the one initially proposed. In particular, the CFI and TLI indices are observed in good fit values (> 0.95)

Table 3. Fit indices of the measurement model

Model	χ^2	χ^2/df	CFI	TLI	RMSEA [90% CI]
<i>Model 1:</i>					
Personality, Controlled M., Autonomous M., and Implicit A.	$\chi^2 (1203) = 2531.75^{***}$	2.10	0.93	0.93	0.07 [0.09, 0.10]***
<i>Model 2:</i>					
Personality, External R., Introjected R., Autonomous M., and Implicit A.	$\chi^2 (1196) = 2089.33^{***}$	1.75	0.96	0.95	0.08 [0.08, 0.09]***

χ^2 : Chi-square; *df*: degrees of freedom; *TLI*: Tucker-Lewis index; *CFI*: comparative fit index; *RMSEA*: root mean square error of approximation. *** $p < 0.001$.

Based on the fit indices observed in the measurement models, it was decided to move forward with the structural analysis of the second measurement model, where controlled motivation is separated into introjected regulation and external regulation. This yielded a $\chi^2_{(1282)} = 2886.05$, $p < 0.001$; *CFI* = 0.98; *TLI* = 0.98; and *RMSEA* = 0.07 [0.07, 0.08] ***, indicating a satisfactory fit of the structural model. All factor loadings exceeded 0.50 and were significant, and the covariances between the dimensions of each latent construct were statistically significant ($p < 0.001$). For personality traits, the covariances were positive, except for the covariances with the trait neuroticism, which presented negative correlations with the other traits. Autonomous motivation exhibited positive covariance with introjected regulation and negative covariance with external regulation. Meanwhile, a positive covariance was observed between introjected and external regulation.

Figure 2 shows the standardised loadings (β) of the structural model analysed. The conscientiousness trait presented a direct and positive relationship with autonomous motivation ($\beta = 6.43$, $p < 0.001$). The neuroticism personality trait presented a direct and positive relationship with external regulation ($\beta = 7.74$, $p < 0.001$), and a negative relationship with autonomous motivation ($\beta = -16.02$, $p < 0.001$). Openness presented a direct and positive relationship with external regulation ($\beta = 2.59$, $p = 0.010$), introjected regulation ($\beta = 5.05$, $p < 0.001$) and autonomous motivation ($\beta = 5.88$, $p < 0.001$). Regarding direct effects on IPA, extraversion and autonomous motivation had a positive direct effect ($\beta = 4.82$, $p < 0.001$; $\beta = 1.97$, $p = 0.049$), while openness had a negative direct effect ($\beta = -3.60$, $p < 0.001$). No personality trait or motivation type explained implicit attitudes toward IPA, nor did these have a direct effect on IPA. Similarly, no significant indirect effects were observed through motivation (introjected, external, or autonomous) or through implicit attitudes toward IPA. The model explained 15.50% of the variance in IPA.

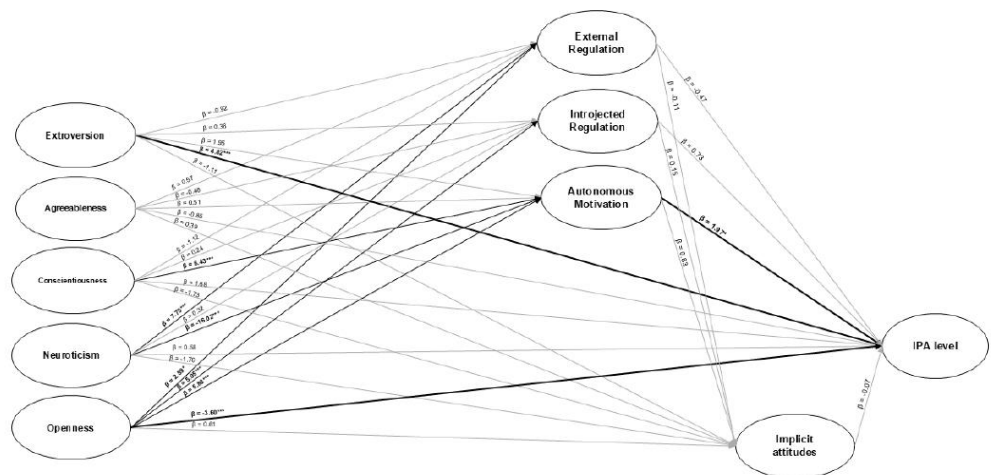


Figure 2. Structural Model 2. $n=223$; estimator = DLWS; Bootstrap = 5000. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

After adjusting for age, sex, exercise level, and home–university distance, the model maintained a satisfactory fit ($\chi^2_{(1474)} = 3377.46$, $p < 0.001$; CFI = 0.953; TLI = 0.956; RMSEA = 0.076, 90% CI [0.07–0.08]). The direct effects on IPA were maintained, where extraversion and autonomous motivation had a positive direct effect ($\beta = 4.89$, $p < 0.001$; $\beta = 3.11$, $p = 0.002$), and openness had a negative direct effect ($\beta = -3.51$, $p < 0.001$). Additionally, three new indirect effects of personality on IPA emerged through autonomous motivation. Specifically, agreeableness ($\beta = 2.72$, $p = 0.006$) and conscientiousness ($\beta = 2.96$, $p = 0.003$) had a positive effect on IPA, while neuroticism had a negative effect ($\beta = -2.65$, $p = 0.008$).

The covariates sex, physical exercise, and home–university distance were significantly associated with external regulation, introjected regulation, and autonomous motivation. Specifically, being male was associated with lower external regulation ($\beta = -2.68$, $p = 0.007$) and higher autonomous motivation ($\beta = 9.26$, $p < 0.001$). Exercise was positively associated with introjected regulation ($\beta = 5.65$, $p < 0.001$) and autonomous motivation ($\beta = 25.26$, $p < 0.001$), and negatively associated with external regulation ($\beta = -30.3$, $p = 0.002$). Home–university distance was positively associated with autonomous motivation ($\beta = 2.85$, $p = 0.004$). With these adjustments, the explanatory power of the model increased to 18.30% of the variance in the IPA.

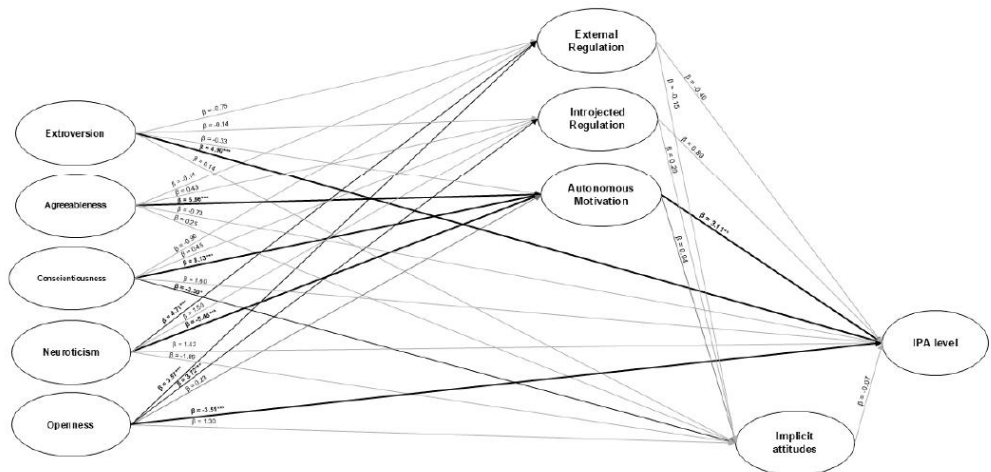


Figure 3. Structural model adjusted for covariates. $n = 223$; estimator = DLWS; Bootstrap = 5000. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

DISCUSSION

The present study found a sample of university students with a personality profile characterised by high scores on openness and conscientiousness. This reflects tendencies toward creativity, intellectual curiosity, and a sense of duty and organisation. Furthermore, the students presented higher levels of autonomous motivation than controlled motivation and positive implicit attitudes toward IPA. The main findings indicate that the measurement model separating external from introjected regulation within controlled motivation obtained a satisfactory fit, superior to the initially hypothesised model. In the structural analysis, extraversion and autonomous motivation showed positive direct effects on IPA, while openness had a negative direct effect. After adjusting for

covariates (age, sex, exercise activity, and home-university distance), agreeableness and conscientiousness traits showed positive indirect effects on IPA through autonomous motivation, and neuroticism presented a negative indirect effect. These covariates were associated with the different types of motivational regulation, but did not modify the effects of personality traits or motivation on physical behaviour. Overall, the model explained 18.30% of the variance in the IPA.

The results of this study support the evidence indicating that individual factors, particularly psychological variables such as motivation, are related to IPA levels (Conroy et al., 2010; Oliver & Kemps, 2018). In addition, they provide new evidence by reporting on the direct and indirect effects (through motivation) of personality traits on IPA. Extending the extensive evidence linking personality traits to physical activity (Rhodes & Smith, 2006; Sutin et al., 2016; Wilson & Dishman, 2015) now in the field of IPA.

Specifically, Hypothesis 1 was partially supported, as extraversion showed a direct and positive effect on IPA, while openness showed a direct and negative effect. The trait of extraversion is characterised by high levels of energy and sociability (McCrae & Costa, 2008), which may naturally lead people to engage in activities that involve movement, such as walking while conversing, or taking the stairs instead of the elevator (Canada et al., 2021; Courneya & Hellsten, 1998; Hagan & Hausenblas, 2005). In contrast to what has been reported in the literature, where the trait of openness is positively related to higher levels of physical activity (Canada et al., 2021; Sutin et al., 2016; Wilson & Dishman, 2015), the findings of this study indicated a direct and negative effect of openness on IPA. One plausible explanation is that the openness trait encompasses characteristics such as intellectual curiosity, sensation seeking, and a preference for variety (McCrae & Costa, 2008). Thus, people high in openness tend to spend more time engaged in mentally stimulating or creative activities, such as reading and listening to music (McCrae & Costa, 2008). Their high value on learning and intellectual exploration may lead them to forgo IPA opportunities, such as active commuting or leisure walking, in order to pursue their interests.

After adjusting for age, sex, exercise intensity, and home-to-college distance, Hypothesis 2 was partially supported. Agreeableness and conscientiousness showed positive indirect effects on IPA through autonomous motivation, whereas neuroticism had a negative indirect effect. Sex and exercise intensity emerged as the strongest external predictors of regulation types. Specifically, being male was associated with lower external regulation and higher autonomous motivation. Exercise intensity was positively associated with introjected regulation and autonomous motivation and negatively associated with external regulation, and home-to-college distance was positively associated with autonomous motivation. However, the inclusion of covariates did not offset the direct effects of extraversion, openness, or autonomous motivation on IPA.

These results are consistent with studies indicating that, in university populations, men report higher levels of intrinsic and identified motivation for physical activity than women (Lauderdale et al., 2015) and that exercise is consistently associated with autonomous motivation (Teixeira et al., 2012). This gender difference could be explained by cultural norms that favour associating the male role with more stimulating, dynamic, and active activities than those traditionally attributed to the female role (Durán-Vinagre et al., 2023). Additionally, our results support the idea that personality traits modulate physical behaviour through social cognitions such as enjoyment, self-efficacy, and perception of barriers (Wilson & Rhodes, 2021). These findings are consistent with the systematic review by Macali et al. (2025), who identified conscientiousness and neuroticism as key determinants of motivation towards physical activity (Macali et al., 2025). In that review, neuroticism was consistently associated with barriers and negatively with motivation, probably due to its link with

anxiety and worry (McCrae & Costa, 2008), making it difficult to internalise movement as valuable or pleasurable. In contrast, conscientiousness, characterised by discipline, organisation, and planning (McCrae & Costa, 2008), was related to a predominance of intrinsic regulation and less external and introjected regulation (Macali et al., 2025). This facilitates the setting of health goals, for example, walking for its benefits, and promotes the formation of unplanned habits, reinforcing internal motivation as a bridge that transforms intention into IPA. Finally, agreeableness, by reflecting concern for one's own and others' well-being (McCrae & Costa, 2008), promotes the internalisation of reasons for moving and facilitates the emergence of IPA without the need for external incentives.

Similarly, Hypothesis 4 was partially supported, as only autonomous motivation showed a direct effect on IPA. This finding is consistent with systematic reviews and meta-analyses indicating that intrinsic motivation, identified regulation, and introjected regulation are positively associated with higher levels of physical activity (Owen et al., 2014; Hagger & Chatzisarantis, 2009; Howard et al., 2021; Ng et al., 2012; Vasconcellos et al., 2020). In contrast, Oliver and Kemps (2018) reported that both autonomous and controlled motivation were positively related to incidental activity (Oliver & Kemps, 2018). However, their study was based on a small sample and used pedometers to count steps instead of accelerometers, which may have influenced their results. A plausible explanation for our findings lies in the very nature of these forms of motivation. According to Self-Determination Theory, autonomous motivation drives physical activity for enjoyment or because it is personally valued (Deci & Ryan, 2000, 2008; Ryan & Deci, 2020), considering it plausible that this type of motivation drives incidental movements such as climbing stairs, walking to campus, or active breaks during study, without the need for supervision or external rewards.

Unlike Oliver and Kemps (2018), the present study did not find an association between IPA, controlled motivation, or implicit attitudes (Oliver & Kemps, 2018). Controlled motivation conceives movement as an obligation or a means to obtain incentives (Deci & Ryan, 2000, 2008; Ryan & Deci, 2020), which explains its predictive capacity in planned activities and its limited relevance for behaviours that involve IPA. On the other hand, implicit attitudes, automatic associations, have an effect mainly in contexts of high cognitive load or in the face of explicit contextual cues such as, for example, a sign inviting one to use the stairs (Strack & Deutsch, 2004), while daily routine offers more diffuse stimuli. The absence of an association between personality traits and implicit attitudes can be explained because both operate at different levels. Traits are stable dispositions that guide behaviour in a deliberate manner (McCrae & Costa, 2008), whereas implicit attitudes emerge from automatic processes based on associative learning and context (Strack & Deutsch, 2004). Consequently, these explicit and implicit systems do not always converge (Rebar et al., 2016). This finding opens new lines for the design of interventions aimed at enhancing IPA, recognising that automatic processes and stable dispositions can act as parallel routes of influence and, therefore, require specific strategies adapted to each system.

Strengths and limitations

To our knowledge, this is the first study to integrate personality theory, motivation, and implicit attitudes into an explanatory model of IPA, objectively measured using accelerometers. Instruments adapted and validated for university populations (BFI and BREQ-3) and a two-phase approach (CFA and SEM with DWLS) were used, achieving adequate internal consistency and optimal factorial fit.

However, this study is not without limitations. Its cross-sectional design prevents establishing causal relationships, and convenience sampling limits the representativeness of the results. Furthermore, the use of wrist-mounted accelerometers does not capture cycling, as this behaviour requires the use of a thigh-mounted accelerometer. Thus, a component of the IPA (Migueles et al., 2017) was

excluded from this study. The model explained 18.30% of the variance in the IPA, suggesting that, in addition to personality and motivation, other individual or contextual variables not considered here are involved. Future research should test this model in larger, randomised, and more diverse samples, add additional contextual variables, explore longitudinal designs to clarify causality, and advance measurement technologies that capture all types of behaviour included in the incidental sample.

CONCLUSION

In the present study, personality traits and autonomous motivation significantly contributed directly and indirectly to the variability of IPA in university students, explaining 18.30% of their variance. Specifically, extroversion and autonomous motivation exert positive direct effects, while openness shows a negative direct effect. Agreeableness and conscientiousness have a positive indirect effect, while neuroticism presents a negative indirect impact through autonomous motivation. These findings reinforce the importance of designing interventions that enhance autonomous motivation and consider personality profiles to promote changes in IPA in university students. Future research should test this model in larger and more diverse samples, include additional contextual variables, and explore longitudinal designs to clarify causal relationships.

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6. DISCUSIÓN Y CONCLUSIONES

6.1 Discusión

La presente tesis doctoral evaluó un modelo hipotético explicativo de la actividad física incidental en estudiantes de la Universidad de Concepción, basado en rasgos de personalidad, motivación y actitudes implícitas hacia la actividad física incidental. Para ello se articularon tres estudios complementarios.

El Estudio I definió la actividad física incidental como aquellas actividades físicas no estructuradas, no planificadas y no intencionales que se realizan en la vida diaria como subproducto de una actividad cuyo propósito principal es diferente, ya sea en el tiempo libre o en contextos ocupacionales, y sin objetivos específicos de acondicionamiento físico, deporte o recreación. Este tipo de actividad puede incluir tanto intensidades ligeras como vigorosas, abarcando desde sesiones muy breves (menores a un minuto) hasta períodos prolongados. Entre los ejemplos se encuentran actividades domésticas, cuidado personal, jardinería, ocupaciones laborales, transporte activo y caminatas.

Esta definición exhaustiva concuerda con descripciones previas de la literatura, como las propuestas por la editorial de Stamatakis et al. (2019), el estudio observacional de Wallmann-Sperlich et al. (2022) y la revisión sistemática de Reynolds et al. (2014). Las cuales coinciden en caracterizar la actividad física incidental como no estructurada, no planificada y carente de un propósito específico relacionado con el acondicionamiento físico. Sin embargo, el Estudio I incorporó dos criterios clave para delimitar esta actividad con mayor precisión: (1) debe tratarse de un subproducto de una actividad física cuyo propósito principal sea distinto a la realización de actividad física (por ejemplo, caminar para tomar el bus o ir de compras), y (2) debe realizarse de forma no intencional. Esta distinción fue fundamental para diferenciar entre actividades físicas incidentales y no incidentales durante la medición objetiva llevada a cabo en el Estudio III. Por ejemplo, si un estudiante decide conscientemente caminar hacia la universidad o subir escaleras en lugar de usar el ascensor con el objetivo deliberado de realizar actividad física (por ejemplo, por motivos de salud), dicha conducta ya no se consideraría actividad física incidental, ya que implica una intencionalidad explícita en el comportamiento.

El *Estudio II*, mediante un análisis factorial confirmatorio informó adecuadas propiedades psicométricas de la adaptación del BREQ-3 para medir la motivación hacia la

actividad física incidental. Se confirmó la estructura de seis factores correspondiente a las dimensiones originales del BREQ-3: motivación intrínseca, regulación integrada, regulación identificada, regulación introyectada, regulación externa y amotivación (González-Cutre et al., 2010). De esta manera, se respaldó su aplicación en el Estudio III. Por otro lado, las dimensiones más autodeterminadas, como la motivación intrínseca y la regulación integrada e identificada, presentaron altas correlaciones entre sí (> 0.90) y correlaciones negativas con las dimensiones menos autodeterminadas, como la regulación introyectada y externa. Cabe destacar que, aunque la taxonomía clásica de seis dimensiones de la motivación es ampliamente utilizada, se ha propuesto una clasificación alternativa que agrupa el continuo de autodeterminación en tres categorías: amotivación, motivación controlada (que incluye regulación introyectada y externa) y motivación autónoma (que incluye motivación intrínseca y regulación integrada e identificada) (Vansteenkiste et al., 2010). En particular, un estudio en 825 estudiantes universitarios en China mostró adecuadas propiedades psicométricas y de consistencia interna para un modelo de tres factores, en el que los ítems del BREQ-3 original se agruparon en las dimensiones de amotivación, motivación controlada y motivación autónoma (Luo et al., 2022).

Los hallazgos de los Estudios I y II hicieron posible el Estudio III, que aplicó un diseño explicativo transversal con variables latentes en una muestra de 223 estudiantes de la Universidad de Concepción. Los estudiantes presentaron un perfil de personalidad caracterizado por altas puntuaciones en apertura a la experiencia y responsabilidad. Esto refleja tendencias hacia la creatividad, curiosidad intelectual y el sentido del deber y la organización (McCrae & Costa, 2008). Además, presentaron una mayor motivación autónoma que controlada y actitudes implícitas positivas hacia la actividad física incidental. El modelo de medida que separa la regulación externa de la introyectada dentro de la motivación controlada obtuvo un ajuste satisfactorio y superior al modelo hipotético inicial. En el análisis estructural, tras ajustar por covariables (edad, sexo, práctica de ejercicio y distancia hogar-universidad), el modelo explicó el 18,3 % de la varianza en la actividad física incidental y respaldó parcialmente las Hipótesis 1, 2 y 4 de la presente tesis.

En el análisis estructural del Estudio III, la extroversión y la motivación autónoma presentaron efectos directos positivos sobre la actividad física incidental, mientras que la apertura a la experiencia tuvo un efecto directo negativo. Tras ajustar por covariables, los

rasgos de amabilidad y responsabilidad mostraron efectos indirectos positivos a través de la motivación autónoma, y el neuroticismo presentó un efecto indirecto negativo. Estos hallazgos respaldan la evidencia que indica que factores individuales, en particular variables psicológicas como la motivación, están relacionados con los niveles de actividad física incidental (Conroy et al., 2010; Oliver & Kemps, 2018). Además, aportan nueva evidencia al informar sobre los efectos directos e indirectos (a través de la motivación) de los rasgos de personalidad en la actividad física incidental. Extendiendo la amplia evidencia que vincula los rasgos de personalidad con la práctica de actividad física (Rhodes & Smith, 2006; Sutin et al., 2016; Wilson & Dishman, 2015) ahora al ámbito de la actividad física incidental.

La Hipótesis 1 obtuvo un respaldo parcial, ya que de los cinco rasgos de personalidad, solo la extroversión presentó un efecto directo y positivo sobre la actividad física incidental, mientras que la apertura a la experiencia presentó un efecto directo negativo. El rasgo de extroversión se caracteriza por altos niveles de energía y sociabilización (McCrae & Costa, 2008). Esto puede llevar a las personas naturalmente a involucrarse en actividades que implican movimiento, como por ejemplo, caminar mientras conversan, o subir escaleras en lugar de tomar el ascensor (Canada et al., 2021; Courneya & Hellsten, 1998; Hagan & Hausenblas, 2005). En contraste con lo reportado en la literatura, donde el rasgo de apertura a la experiencia se relaciona positivamente con mayores niveles de actividad física (Canada et al., 2021; Sutin et al., 2016; Wilson & Dishman, 2015), los hallazgos de este estudio indicaron un efecto directo y negativo de la apertura a la experiencia sobre la actividad física incidental. Una explicación plausible es que el rasgo de apertura a la experiencia abarca características como la curiosidad intelectual, la búsqueda de sensaciones nuevas, y la preferencia por la variedad (McCrae & Costa, 2008). Por ello, las personas con un alto nivel de apertura a la experiencia tienden a dedicar más tiempo a actividades mentalmente estimulantes o creativas, como por ejemplo, leer y escuchar música (McCrae & Costa, 2008). El valorar profundamente el aprendizaje y la exploración intelectual, podría llevar a descartar oportunidades de actividad física incidental, como desplazamientos activos o caminatas en el tiempo libre, para dedicar ese tiempo a sus intereses.

La Hipótesis 2 también obtuvo apoyo parcial, tras ajustar el modelo por edad, sexo, práctica de ejercicio y distancia hogar–universidad, únicamente la amabilidad y la responsabilidad mostraron efectos indirectos positivos sobre la actividad física incidental a

través de la motivación autónoma, mientras que el neuroticismo presentó un efecto indirecto negativo. En relación con las covariables aplicadas en el modelo, el sexo y la práctica de ejercicio se identificaron como los predictores externos más potentes de los distintos tipos de regulación. Específicamente, ser hombre se asoció con menor regulación externa y mayor motivación autónoma. Practicar ejercicio se asoció positivamente con regulación introyectada y motivación autónoma y negativamente con regulación externa y la distancia hogar–universidad se asoció positivamente con motivación autónoma. Sin embargo, al controlar por covariables no se desplazó los efectos directos de la extroversión, la apertura a la experiencia ni de la motivación autónoma sobre la actividad física incidental.

Estos resultados coinciden con estudios que indican que, en población universitaria, los hombres reportan niveles más altos de motivación intrínseca e identificada hacia la actividad física que las mujeres (Lauderdale et al., 2015), y que la práctica de ejercicio se asocia de forma consistente con la motivación autónoma (Teixeira et al., 2012). Esta diferencia de género podría explicarse por normas culturales que favorecen la asociación del rol masculino con actividades más estimulantes, dinámicas y activas que las tradicionalmente atribuidas al rol femenino (Durán-Vinagre et al., 2023). Adicionalmente, nuestros resultados respaldan la idea de que los rasgos de personalidad modulan la conducta física mediante el disfrute, la autoeficacia y la percepción de barreras (Wilson & Rhodes, 2021). Estos hallazgos coinciden con la revisión sistemática de Macali et al. (2025), quienes identificaron la responsabilidad y el neuroticismo como determinantes clave de la motivación hacia la actividad física (Macali et al., 2025). En dicha revisión, el neuroticismo se asoció de forma consistente con barreras y negativamente con la motivación, probablemente por su vínculo con la ansiedad y la preocupación (McCrae & Costa, 2008), lo que dificulta internalizar el movimiento como valioso o placentero. Por el contrario, la responsabilidad, caracterizada por disciplina, organización y planificación (McCrae & Costa, 2008), se relacionó con un predominio de la regulación intrínseca y una menor regulación externa e introyectada (Macali et al., 2025). Esto facilita el establecimiento de metas de salud, por ejemplo, caminar por sus beneficios, y promueve la formación de hábitos no planificados, reforzando la motivación interna como puente que transforma la intención en actividad física incidental. Finalmente, la amabilidad, al reflejar preocupación por el bienestar propio y ajeno (McCrae & Costa,

2008), promueve la internalización de razones para moverse y facilita la aparición de actividad física incidental sin necesidad de incentivos externos.

La Hipótesis 4 también obtuvo apoyo parcial, ya que únicamente la motivación autónoma mostró un efecto directo sobre la actividad física incidental. Este hallazgo concuerda con revisiones sistemáticas y metaanálisis que señalan que la motivación intrínseca, la regulación identificada y la introyectada se asocian positivamente con mayores niveles de actividad física (Owen et al., 2014; Hagger & Chatzisarantis, 2009; Howard et al., 2021; Ng et al., 2012; Vasconcellos et al., 2020). En contraste, Oliver y Kemps (2018) informaron que tanto la motivación autónoma como la controlada se relacionaban positivamente con la actividad incidental (Oliver & Kemps, 2018). Sin embargo, su estudio se basó en una muestra reducida y utilizó podómetros para contar pasos en lugar de acelerómetros, lo cual pudo haber influido en sus resultados. Una explicación plausible para nuestros hallazgos es a través de la propia naturaleza de estas formas de motivación. Según la Teoría de la Autodeterminación, la motivación autónoma impulsa la actividad física por disfrute o porque se valora personalmente (Deci & Ryan, 2000, 2008; Ryan & Deci, 2020), considerando plausible que este tipo de motivación impulse movimientos incidentales como, subir escaleras, caminar al campus, o pausas activas durante el estudio, sin necesidad de supervisión ni recompensas externas.

A diferencia de Oliver y Kemps (2018), en el Estudio III no encontró asociación de la motivación controlada ni las actitudes implícitas con la actividad física incidental (Oliver & Kemps, 2018). La motivación controlada concibe el movimiento como una obligación o un medio para obtener incentivos (Deci & Ryan, 2000, 2008; Ryan & Deci, 2020), lo que explica su capacidad predictiva en actividades planificadas y su limitada relevancia para los comportamientos que involucran a la actividad física incidental. Por su parte, las actitudes implícitas, asociaciones automáticas tienen un efecto principalmente en contextos de alta carga cognitiva o ante señales contextuales explícitas como, por ejemplo, un cartel que invite a usar la escalera (Strack & Deutsch, 2004), mientras que la rutina diaria ofrece estímulos más difusos. La ausencia de asociación entre los rasgos de personalidad y las actitudes implícitas puede explicarse porque ambos operan en niveles distintos. Los rasgos son disposiciones estables que guían la conducta de forma deliberada (McCrae & Costa, 2008), mientras que las actitudes implícitas emergen de procesos automáticos basados en el

aprendizaje asociativo y el contexto (Strack & Deutsch, 2004). En consecuencia, estos sistemas explícito e implícito no siempre convergen (Rebar et al., 2016). Este hallazgo abre nuevas líneas para el diseño de intervenciones orientadas a potenciar la actividad física incidental, reconociendo que los procesos automáticos y las disposiciones estables pueden actuar como rutas paralelas de influencia y, por tanto, requieren estrategias específicas adaptadas a cada sistema.

A nivel práctico, si bien rasgos como la personalidad o las actitudes implícitas son características relativamente estables (Greenwald et al., 1998; McCrae & Costa, 2008), los hallazgos de este estudio pueden orientar el diseño de estrategias universitarias más eficaces. En lugar de intentar modificar directamente estas variables, las intervenciones podrían centrarse en adaptar el entorno o los mensajes de promoción de la actividad física incidental según distintos perfiles psicológicos. Por ejemplo, estudiantes con alta apertura a la experiencia podrían beneficiarse de estrategias más variadas, exploratorias o gamificadas que incluyan desafíos o situaciones novedosas, como “rutas activas” que cambien semanalmente, mini-retos diarios o entornos interactivos que incorporen tecnología o arte urbano. En cambio, estudiantes con baja motivación autónoma, es decir, que no encuentran un sentido personal ni valor en moverse durante el día. Podrían responder mejor a intervenciones que vinculen estas conductas con valores significativos para ellos, como cuidar el medioambiente a través del desplazamiento activo o mejorar el estado de ánimo en períodos de estrés académico.

6.1.1 Fortalezas y limitaciones

La tesis estructurada en tres estudios complementarios que, en conjunto, constituyeron una base sólida para el análisis de la actividad física incidental. El Estudio I permitió una operacionalización precisa y orientó la medición objetiva de la actividad física incidental empleada en el Estudio III. El Estudio II proporcionó evidencia de propiedades psicométricas adecuadas y confirmó la validez interna de la adaptación del BREQ-3 para medir la motivación hacia la actividad física incidental en estudiantes universitario. Finalmente, el Estudio III combinó escalas de autorreporte con evidencia de validez y confiabilidad en estudiantes universitarios chilenos (BREQ-3 adaptado y BFI) y la medición objetiva de la actividad física mediante acelerómetros que, a diferencia de la actividad física por autorreporte, no está sujeta a sobreestimaciones (Celis-Morales et al., 2012; Martorell

et al., 2020). Proporcionando así una evaluación rigurosa de los comportamientos de actividad incidental y de las variables psicológicas del modelo explicativo. Según nuestro conocimiento, este es el primer trabajo que integra la teoría de la personalidad, la motivación y las actitudes implícitas en un único modelo explicativo de actividad física incidental, revelando tanto asociaciones directas como vías mediadas que enriquecen la comprensión de los mecanismos psicológicos subyacentes a este comportamiento. Este logro fue posible mediante un enfoque de dos fases, primero un AFC seguido de un análisis SEM, que garantizaron una consistencia interna óptima, un ajuste factorial excelente y una evaluación válida y confiable de todas las variables incluidas en el modelo.

Sin embargo, la presente tesis doctoral no está exenta de limitaciones. En primer lugar, el diseño transversal impide establecer relaciones causales entre las variables analizadas. Además, el muestreo por conveniencia, centrado exclusivamente en estudiantes universitarios chilenos de una única institución, restringe la posibilidad de generalizar los hallazgos a otros contextos culturales y educativos. Las expresiones de la personalidad, la motivación y las actitudes hacia la actividad física pueden variar significativamente según normas culturales, creencias colectivas y estilos de vida propios de cada país o región. Por ello, se considera necesario replicar el modelo propuesto en otras culturas y tipos de instituciones (como centros de formación técnica, no universitarios o con poblaciones estudiantiles de mayor edad) para evaluar su validez transcultural y su aplicabilidad en contextos más diversos. No obstante, el enfoque integrador adoptado, junto con el uso de instrumentos validados internacionalmente, otorgan una base teórica robusta que puede adaptarse a distintos escenarios, abriendo la posibilidad de realizar estudios comparativos entre países o regiones con realidades socioculturales distintas. Por otro lado, el uso de acelerómetros en la muñeca no capta los desplazamientos en bicicleta, pues para este comportamiento se requiere el uso del acelerómetro en el muslo (Migueles et al., 2017). De esta manera se dejó fuera del presente estudio un componente de la actividad física incidental. El modelo explicó el 18,30 % de la varianza en la actividad física incidental, lo que sugiere que, además de la personalidad y la motivación, intervienen otras variables individuales o contextuales no consideradas aquí.

Para profundizar en la comprensión de la actividad física incidental, futuros estudios podrían emplear diseños longitudinales o experimentales que permitan evaluar la dirección

causal de las relaciones identificadas, en especial el papel mediador de la motivación autónoma. Asimismo, sería valioso ampliar la muestra a poblaciones no universitarias (por ejemplo, personas mayores o trabajadores) para mejorar la representatividad de los resultados. En cuanto a la medición, conviene incorporar técnicas que complementen la información de los acelerómetros y permitan filtrar exclusivamente los comportamientos de actividad física incidental. Por ejemplo, el uso de cámaras de acción (por ejemplo, Stamatakis et al., 2022), diarios digitales de actividad (por ejemplo, Assemi et al., 2020) o la Evaluación Momentánea Ecológica (EMA) (Dunton, 2017) ayudaría a identificar la intencionalidad y planificación de los movimientos. Además, para una mayor comprensión del papel de las variables psicológicas como, rasgos de personalidad y motivación en la actividad física incidental, futuras investigaciones basadas en diseños cualitativos o mixtos deberían explorar su interacción con variables contextuales tales como infraestructura, clima y cultura organizacional. Por último, la implementación de intervenciones personalizadas basadas en perfiles de personalidad y de motivación permitirá evaluar la eficacia de estrategias dirigidas a fomentar movimientos incidentales en la vida diaria.

6.2 Conclusiones

La presente tesis doctoral, articulada en tres estudios, evaluó un modelo hipotético explicativo de la actividad física incidental en estudiantes de la Universidad de Concepción, basado en rasgos de personalidad, motivación y actitudes implícitas. El modelo propuesto explica el 18,3 % de la varianza en la actividad física incidental y ofrece respaldo parcial a las hipótesis 1, 2 y 4 de la presente investigación. En particular, la extroversión y la motivación autónoma mostraron efectos directos positivos, mientras que la apertura a la experiencia presentó un efecto directo negativo. Tras ajustar por covariables, los rasgos de amabilidad y responsabilidad tuvieron efectos indirectos positivos a través de la motivación autónoma, y el neuroticismo ejerció un efecto indirecto negativo.

Estos hallazgos amplían la comprensión de los mecanismos psicológicos subyacentes a la actividad física incidental. No obstante, la naturaleza transversal del diseño y la muestra restringida a estudiantes universitarios limitan la inferencia causal y la generalización de los resultados. Por ello, futuros estudios deberían emplear diseños longitudinales o experimentales, diversificar las poblaciones de análisis y combinar la acelerometría con EMA para capturar la intencionalidad del movimiento. En conjunto, este trabajo sienta las bases teóricas y metodológicas para promover de manera más efectiva los comportamientos incidentales de actividad física en contextos universitarios.

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7. ANEXOS

7.1 Anexo 1: Escala de Los Cinco Grandes o Big Five Inventory (BFI)

El siguiente cuestionario de 44 preguntas, busca medir rasgos de personalidad. Seleccione la respuesta según corresponda.

Recuerde, no existen respuestas correctas ni incorrectas. Por favor, responda de la manera más honesta posible.

INTRUCCIONES:

Indique cuáles de las siguientes expresiones la o lo describen con mayor o menor precisión. Por favor responda seleccionando una de las opciones de respuesta según su grado de acuerdo o desacuerdo con estas afirmaciones.

Por ejemplo, ¿está de acuerdo en que usted es alguien “*chistoso, a quien le gusta bromear*”?

Respuesta: Ligeramente de acuerdo

		Muy en desacuerdo	Ligeramente en desacuerdo	Ni de acuerdo ni en desacuerdo	Ligeramente de acuerdo	Muy de acuerdo
1.	Es bien hablador/a					
2.	Tiende a ser criticón o critica					
3.	Es minucioso/a en el trabajo					
4.	Es depresivo/a, melancólico/a					
5.	Es original, se le ocurren ideas nuevas					
6.	Es reservado/a					
7.	Es generoso/a y ayuda a los demás					
8.	Puede a veces ser algo descuidado/a					
9.	Es calmado/a, controla bien el estrés					

10.	Tiene intereses muy diversos					
11.	Está lleno/a de energía					
12.	Prefiere trabajo que son rutinarios					
13.	Inicia disputas con los demás					
14.	Es un trabajador/a cumplidor/a, digno de confianza					
15.	Con frecuencia se pone tenso/a					
16.	Tiende a ser callado/a					
17.	Valora lo artístico, lo estético					
18.	Tiende a ser desorganizado/a					
19.	Es emocionalmente estable, difícil de alterar					
20.	Tiene una imaginación activa					
21.	Persevera hasta terminar el trabajo					
22.	Es a veces maleducado/a con los demás					
23.	Es inventivo/a o creativo/a					
24.	Es generalmente confiado/a					
25.	Tiende a ser flojo/a, vago/a					
26.	Se preocupa mucho por las cosas					
27.	Es a veces tímido/a, inhibido/a					

28.	Es indulgente, no le cuesta perdonar					
29.	Hace las cosas de manera eficiente					
30.	Es temperamental, de humor cambiante					
31.	Es ingenioso/a, analítico/a					
32.	Irradia entusiasmo					
33.	Es a veces frío/a y distante					
34.	Hace planes y los sigue cuidadosamente					
35.	Mantiene la calma en situaciones difíciles					
36.	Le gusta reflexionar, jugar con las ideas					
37.	Es considerado/a y amable con casi todo el mundo					
38.	Se pone nervioso/a con facilidad					
39.	Es educado/a en arte, música, o literatura					
40.	Es asertivo/a, no teme expresar lo que quiere					
41.	Le gusta cooperar con los demás					
42.	Se distrae con facilidad					
43.	Es extrovertido/a, sociable					
44.	Tiene pocos intereses artísticos					

7.2 Anexo 2: Adaptación del Cuestionario de la Regulación de la Conducta en el Ejercicio (BREQ-3) para la actividad física incidental

Para responder el siguiente cuestionario de 23 preguntas, considere únicamente aquellas actividades físicas realizadas en la vida diaria, es decir, las realizadas en el hogar, en el estudio, trabajo, y tiempo libre. Por ejemplo, actividades como utilizar escaleras, ir de compras, caminar o andar en bicicleta, hacer aseo, pasear a las mascotas, etc. Al responder el cuestionario no se deben tener en cuenta el ejercicio físico realizado en gimnasios, talleres deportivos, o deportes a nivel competitivo o recreativo.

INSTRUCCIONES:						
Seleccione una de las opciones de respuesta según qué tan ciertas sean para usted las siguientes afirmaciones.						
<i>Recuerde que la actividad física que hace referencia el cuestionario son las actividades físicas de la vida diaria descritas anteriormente.</i>						
		Nada verdadero	Algo verdadero	Medianamente verdadero	Mayormente verdadero	Totalmente verdadero
1	Yo hago actividad física porque los demás me dicen que debo hacerlo					
2	Yo hago actividad física porque me siento culpable cuando no lo hago					
3	Yo hago actividad física porque valoro los beneficios que tiene realizarla					
4	Yo hago actividad física porque creo es divertida					
5	Yo hago actividad física porque está de acuerdo con mi forma de vida					
6	Yo hago actividad física, pero no veo por qué tengo que hacerla					
7	Yo hago actividad física porque mis amigos/familia/pareja me dicen que debo hacerlo					
8	Yo hago actividad física porque me siento avergonzado/a si no lo hago					
9	Yo hago actividad física porque para mí es importante hacer actividad física regularmente					

10	Yo hago actividad física porque considero que la actividad física forma parte de mí					
11	Yo hago actividad física, pero no veo por qué tengo que molestarme en hacerla					
12	Yo hago actividad física porque disfruto realizarla					
13	Yo hago actividad física porque otras personas no estarán contentas conmigo si no hago actividad física					
14	Yo hago actividad física, pero no veo el sentido que tiene hacer actividad física					
15	Yo hago actividad física porque veo la actividad física como una parte fundamental de lo que soy					
16	Yo hago actividad física porque siento que he fallado cuando no he realizado un rato de actividad física					
17	Yo hago actividad física porque pienso que es importante hacer el esfuerzo de hacer actividad física regularmente					
18	Yo hago actividad física porque encuentro que es una actividad agradable					
19	Yo hago actividad física porque me siento bajo la presión de mis amigos/familia para realizar actividad física					
20	Yo hago actividad física porque considero que está de acuerdo con mis valores					
21	Yo hago actividad física porque me pongo nervioso/a si no realizo actividad física regularmente					
22	Yo hago actividad física porque me resulta placentero y satisfactorio realizarla					
23	Yo hago actividad física, pero pienso que realizarla es una pérdida de tiempo					

7.3 Anexo 3: Cuestionario sociodemográfico

1. Indique su nombre y apellidos. *(Solicitamos su nombre para poder vincular su información con las demás medidas del estudio. No obstante, una vez realizado este proceso, sustituiremos dichos datos por códigos con el fin de preservar el anonimato de la información.)*
2. Seleccione su edad
 - a. Se despliega opciones desde los 18 a los 30 o más años
3. Seleccione el género con el cuál se identifica:
 - a. Masculino
 - b. Femenino
 - c. No binario
 - d. Otro
4. Indique nacionalidad:
 - a. Si se encuentra realizado una pasantía: Sí No
5. Indique la comuna donde vive durante los periodos o semestres académicos (Ej: Concepción)
6. Seleccione su carrera de estudio
 - a. Se despliegan las opciones de carrera de pregrado de la Universidad de Concepción.
7. Seleccione el año en que ingreso a la carrera de estudio.
 - a. Se despliegan opciones de años de 2010 en adelante.
8. Presenta alguna condición de salud que le impida hacer actividad física o desplazamientos caminando de manera regular:
 - a. Sí
 - b. No

Si su respuesta es sí, especifique cuál:
9. Mi principal medio de transporte a la universidad es:
 - a. auto particular,
 - b. locomoción colectiva (considera trayecto de acercamiento caminando),
 - c. bicicleta,
 - d. solo caminar.
10. Indique ¿Qué distancia (km) debe recorrer desde su hogar hasta su universidad? (Ej: 80 km) *Si vive cerca puede indicar el número de cuadras (ejemplo: 2 cuadras)*

7.4 Anexo 4: Consentimiento informado



Universidad de Concepción

Departamento de Psicología

Modelo explicativo de la actividad física incidental en estudiantes universitarios desde la psicología del ejercicio

Investigador Responsable: Daniel Reyes Molina

Estimado (a) participante:

Ud. ha sido invitado/a participar en el estudio *Modelo explicativo de la actividad física incidental en estudiantes universitarios desde la psicología del ejercicio*, a cargo del Sr. Daniel Reyes Molina, estudiante del Doctorado en Psicología de la Universidad de Concepción.

A. *Propósito de la investigación*: El objetivo de esta investigación, desarrollada por el estudiante Daniel Reyes Molina es evaluar un modelo explicativo hipotético de la actividad física incidental en estudiantes de la Universidad de Concepción basado en variables de la personalidad, motivación hacia la actividad física, predictores de la intención, intención hacia la actividad física incidental, y actitudes implícitas hacia la actividad física incidental.

B. *Descripción de su participación*: Si usted decide participar del estudio, se le pedirá que acepte su participación a través del presente consentimiento informado. Su participación consistirá en completar un cuestionario de autorreporte sobre variables psicológicas de la personalidad, motivación hacia la actividad física, predictores de la intención, intención hacia la actividad física incidental, actitudes implícitas hacia la actividad física incidental, además de variables sociodemográficas. Este cuestionario tomará aproximadamente 20 minutos de su tiempo. Además, para el registro de la actividad física, deberá usar un acelerómetro en su muñeca durante 24 horas al día por 7 días consecutivos, retirándolo solo para bañarse o en actividades que impliquen contacto con el agua. Durante estos 7 días, también deberá registrar en un diario de papel y lápiz los periodos de actividad física estructurada que realice, como ejercicio físico y deporte.

C. *Posibles riesgos*: Un eventual riesgo podría ser que se sintiera incómodo/a durante el proceso de registro de actividad física o mientras contesta alguno de los cuestionarios de autorreporte. No obstante, usted es libre de dejar el estudio en cualquier momento, sin necesidad de dar ningún tipo de explicación.

D. *Beneficios*: La información que usted aporte será de gran valor para la investigación respecto a la relación existente entre las variables de estudio: rasgos de personalidad, variables motivaciones hacia la actividad física, predictores de la intención y la intención hacia la actividad física incidental, y actitudes implícitas hacia la actividad física incidental, y el nivel de actividad física incidental de los estudiantes universitarios.

E. *Confidencialidad y resguardo de la información*: Toda la información derivada de su participación será manejada con estricta confidencialidad. Sólo el equipo de investigación tendrá acceso a los datos por usted proporcionados. La información será



Universidad de Concepción

Departamento de Psicología

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resguardada según todos los requerimientos que las leyes chilenas explicitan (ley 20.120). Asimismo, tanto en el análisis como en la publicación y difusión científica de los resultados, no se identificará la identidad de ninguno de los/as participantes ni su respectiva organización, para así resguardar el anonimato. La información que entregue mediante su participación sólo será utilizada con fines científicos y relativos a esta investigación y no será usada con fines ajenos a los explícitamente expresados en este documento.

F. *Voluntariedad*: La participación en esta investigación es absolutamente voluntaria y usted puede retirarse en cualquier momento del estudio, sin que ello tenga ninguna consecuencia.

G. *Derechos del/de la participante*: Cualquier pregunta que yo quisiera hacer con relación a mi participación en este estudio será contestada por el investigador responsable Sr. Daniel Reyes Molina en el correo electrónico danielreyes@udec.cl. Para cualquier duda que no me haya sido satisfactoriamente resuelta por el investigador responsable me podré dirigir a la Dra. Andrea Rodríguez T. Presidenta del Comité de Ética, Bioética y Bioseguridad de la Universidad de Concepción. Correo: secrevid@udec.cl.

Después de haber recibido y comprendido la información de este documento y de haber podido aclarar todas mis dudas, otorgo el consentimiento para participar en el estudio: "*Modelo explicativo de la actividad física incidental en estudiantes universitarios desde la psicología del ejercicio*".

Comprendo y acepto la información que se entregó anteriormente y declaro conocer los objetivos del estudio.

En atención a estas consideraciones, libremente marque la que corresponda.

Yo ACEPTO

Yo NO ACEPTO

7.5 Anexo 5: Certificado Comité de Ética y Bioética Departamento de Psicología de la Universidad de Concepción



UNIVERSIDAD DE CONCEPCION
Facultad Ciencias Sociales

CERTIFICADO

El Comité de Ética y Bioética del Departamento de Psicología de la Universidad de Concepción ha evaluado el proyecto “Modelo explicativo de la actividad física incidental en estudiantes universitarios desde la psicología del ejercicio”, a cargo del estudiante de doctorado Daniel Reyes Molina. Evaluado el proyecto se considera que este satisface los estándares éticos requeridos y aprueba su desarrollo.



Mauricio Garrido Vásquez
PRESIDENTE
COMITÉ DE ÉTICA y BIOÉTICA

CONCEPCION, 29 de junio de 2023.

Por el desarrollo libre del espíritu
Departamento de Psicología Barrio Universitario s/n Fonos (56-41) 2204301 - 2204323 Fax (56-41) 2220810 Casilla 160 C
- Correo 3
Concepción Chile Http: www.psicologiaudec.cl

7.6 Anexo 6: Certificado Comité de Ética, Bioética, y Bioseguridad de la Universidad de Concepción



Universidad de Concepción
Vicerrectoría de Investigación y Desarrollo
Comité de Ética, Bioética y Bioseguridad

CEBB 1503-2023

Concepción, septiembre de 2023.

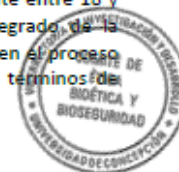
CERTIFICADO

El Comité de Ética, Bioética y Bioseguridad de la Vicerrectoría de Investigación y Desarrollo de la Universidad de Concepción ha evaluado el Proyecto de Tesis titulado **“MODELO EXPLICATIVO DE LA ACTIVIDAD FÍSICA INCIDENTAL EN ESTUDIANTES UNIVERSITARIOS DESDE LA PSICOLOGÍA DEL EJERCICIO”**, cuyo Investigador Responsable es el Psicólogo **MG. DANIEL ESTEBAN REYES MOLINA**, candidato al grado de Doctor en Psicología por la Universidad de Concepción, junto a sus Profesores Guía **DRA. GABRIELA NAZAR CARTER**, académica del Departamento de Psicología de la Facultad de Ciencias Sociales y **DR. RAFAEL EDUARDO ZAPATA LAMANA**, académico adscrito al Departamento de Didáctica, Currículo y Evaluación de la Escuela de Educación, ambas unidades de la Universidad de Concepción, y ha comprobado que el referido proyecto de tesis cumple con las normas y procedimientos éticos y bioéticos establecidos nacional e internacionalmente para la investigación con la participación de personas.

En este Proyecto de Tesis doctoral, el objetivo general propone evaluar un modelo explicativo hipotético de la actividad física incidental en estudiantes de la Universidad de Concepción basado en variables de la personalidad, motivación hacia la actividad física, predictores de la intención, intención hacia la actividad física, y actitudes implícitas hacia la actividad física incidental. Para esto, plantea ejecutar 03 (tres) objetivos específicos, a saber: inicialmente pretende establecer la relación entre los rasgos de personalidad, la motivación hacia la actividad física, predictores de la intención, intención hacia la actividad física, actitudes implícitas hacia la actividad física incidental, y el nivel de actividad física incidental en estudiantes de la Universidad de Concepción; después, buscará estimar el efecto directo de la motivación hacia la actividad física, control conductual percibido, intención hacia la actividad física, y actitudes implícitas hacia la actividad física incidental sobre el nivel de actividad física incidental de estudiantes de la Universidad de Concepción y el efecto indirecto de los rasgos de personalidad sobre el nivel de actividad física incidental de estudiantes de la Universidad de Concepción mediado por la motivación hacia la actividad física, predictores de la intención, intención hacia la actividad física, y actitudes implícitas hacia la actividad física incidental.

El desarrollo metodológico se estructura en 02 (dos) estudios: (1) por una parte, una revisión sistemática de alcance, de acuerdo con los lineamientos establecidos por la declaración PRISMA (Tricco *et al.*, 2018) y (2) un diseño explicativo transversal con (17) variables latentes (DVL) (Ato *et al.*, 2013), desde el paradigma pospositivista, con una estrategia asociativa. Este último se divide en 04 (cuatro) fases: planificación, prueba cognitiva y prueba piloto, convocatoria y medición.

La participación de cada sujeto que cumpla con los criterios de inclusión -estudiante entre 18 y 25 años que posea la condición de alumno regular en alguna de las carreras de pregrado de la Universidad de Concepción-, siendo considerados los criterios de exclusión, estará basada en el proceso de consentimiento informado, toda vez que sea regularmente aplicado y aceptado sus términos de



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 Vicerrectoría de Investigación y Desarrollo
 Comité de Ética, Bioética y Bioseguridad

manera individualizada y registrada, todo documentado conforme modelo presentado a este Comité institucional.

Los instrumentos de medición estarán disponibles en un vínculo de internet, al que se podrá acceder al recibir la invitación, que llegará a la dirección electrónica institucional de los estudiantes de pregrado (@udec.cl), y serán distribuidos por la Dirección de Tecnologías de Información - DTI UdeC (prueba piloto y medición), con la autorización expresa y escrita procedente.

En los análisis de los datos, se utilizará pruebas estadísticas adecuadas para obtener el resultado que busque dar respuesta a lo planteado.

La custodia de la información y de los resultados del estudio, serán de responsabilidad del Investigador Responsable, Sr. Daniel Esteban Reyes Molina.

La ejecución de las actividades descritas asegura que no vulnera los derechos y la dignidad de los participantes en el estudio, garantizando la autonomía, la libertad, la voluntariedad y la privacidad de los mismos, presentando para ello los métodos de protección que aseguran la confidencialidad de los datos de investigación y de custodia estricta de la información obtenida, observando todas las características formales y necesarias para su validez.

El Comité de Ética, Bioética y Bioseguridad de la Vicerrectoría de Investigación y Desarrollo de la Universidad de Concepción, considera que el Proyecto de Tesis presentado observa los derechos asegurados en la Declaración Universal de los Derechos Humanos, los derechos y principios de la Declaración Universal sobre Bioética y Derechos Humanos, las Normas Éticas de la Organización Panamericana de la Salud para Investigaciones con Sujetos Humanos, la Declaración de Helsinki (*World Medical Association, WMA*), la Constitución Política de la República de Chile, la Ley N° 20.120 "Sobre la Investigación Científica en el Ser Humano, su Genoma y Prohíbe la Clonación Humana", la Ley N° 19.628, "Sobre Protección de la Vida Privada", la Ley N° 20.393, que establece la responsabilidad penal de las personas jurídicas en los delitos que indica y la Ley N° 21.369, que Regula el Acoso Sexual, la Violencia y la Discriminación de Género en el Ámbito de la Educación Superior. Así también, sigue las Sugerencias para Escribir un Consentimiento Informado en Estudios con Personas, del Comité Asesor de Bioética FONDECYT/CONICYT.

En atención a todo lo anterior y dado que el Proyecto de Tesis titulado "**MODELO EXPLICATIVO DE LA ACTIVIDAD FÍSICA INCIDENTAL EN ESTUDIANTES UNIVERSITARIOS DESDE LA PSICOLOGÍA DEL EJERCICIO**", presentado por el Psicólogo **MG. DANIEL ESTEBAN REYES MOLINA**, en calidad de Investigador Responsable, candidato al grado de Doctor en Psicología por la Universidad de Concepción, no muestra elementos que puedan transgredir las normas y principios éticos y bioéticos de la investigación en seres humanos, así como también los principios rectores de nuestra Institución Universitaria, los delineados en la Declaración de Singapur sobre la Integridad en la Investigación (Resolución Exenta N° 157, de 2013 - CONICYT) y las normas relativas adoptadas por la Comisión Nacional de Investigación Científica y Tecnológica - CONICYT, este Comité resuelve aprobarlo confiriendo el presente Certificado.



DRA. M. ANDREA RODRÍGUEZ TASTETS

**PRESIDENTA
 COMITÉ DE ÉTICA, BIOÉTICA Y BIOSEGURIDAD
 VICERRECTORÍA DE INVESTIGACIÓN Y DESARROLLO
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Este documento ha sido firmado electrónicamente por:
 María Andrea Rodríguez Tastets <andrea@udec.cl>
 Certificado por E-Sign S.A. en conformidad a la Ley 19.799