The psychological research on physical activity in Puerto Rico: A narrative literature review

La investigación psicológica sobre la actividad física en Puerto Rico: Una revisión de literatura narrativa

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Abstract

Physical activity (PA) is considered a natural act of body movement meant to generate physical and emotional well-being. However, physical inactivity is recognized as a pandemic that urges prompt worldwide action. In 2017, only 5.4% of Puerto Ricans reported reaching 150 minutes per week of PA recommended by the Centers for Disease Control and Prevention. The purpose of this Narrative Literature Review (NLR) with systematic techniques is to synthesize the PA research conducted with an insular Puerto Rican sample. Simultaneously, this review aims to examine the state of the PA psychological research in Puerto Rico. To our knowledge, this is the first PA NLR conducted with a Puerto Rican sample. To conduct the review we used full-text articles published between 2000-2019 in ClinicalKey, Ebsco Databases, Medline, PsycINFO, PubMed, and ProQuest Dissertations-Theses UPRRP. The search period was carried out in October 2019-February 2020. The inclusion criteria included: a) research on PA in participants with chronic diseases, b) an insular Puerto Rican sample, and c) studies with a population older than 13 years. A total of 1,600 articles were found, and only 17 met the inclusion criteria. We found only two investigations from the psychology field. Our findings provide a perspective of the current state of PA investigations, suggesting a lack of PA psychological research in Puerto Rico.

Keywords: Chronic Illness, Mental health, Physical Activity, Psychology, Puerto Rico

Resumen

La actividad física (AF) se considera un acto natural de movimiento corporal destinado a generar bienestar físico y emocional. Sin embargo, la inactividad física se reconoce como una pandemia que insta a una acción inmediata en todo el mundo. En 2017, solo el 5.4% de las personas puertorriqueñas informó haber alcanzado los 150 minutos semanales de AF recomendados por los Centros para el Control y la Prevención de Enfermedades. El propósito de esta Revisión de Literatura Narrativa (NLR) con técnicas sistemáticas es sintetizar la investigación de AF realizada con una muestra de personas puertorriqueñas insulares. Al mismo tiempo, esta revisión tiene como objetivo examinar el estado de la investigación psicológica de la AF en Puerto Rico. Hasta donde sabemos, esta es la primera PA NLR realizada con una muestra de personas puertorriqueñas. Para realizar la revisión utilizamos artículos de texto completo publicados entre 2000 y 2019 en ClinicalKey, Ebsco Databases, Medline, PsycINFO, PubMed y ProQuest Dissertations-Theses UPRRP. El período de búsqueda se realizó de octubre de 2019 a febrero de 2020. Los criterios de inclusión incluyeron: a) investigación sobre AF en participantes con enfermedades crónicas, b) una muestra de personas puertorriqueñas insulares, y c) estudios con una muestra mayor de 13 años. Se encontraron un total de 1600 artículos y solo 17 cumplieron los criterios de inclusión. Solo encontramos dos investigaciones del campo de la psicología. Nuestros hallazgos brindan una perspectiva del estado actual de las investigaciones de la AF, lo que sugiere una escasez de investigación psicológica de la AF en Puerto Rico.

Palabras Clave: Actividad física, Enfermedades Crónicas, Salud Mental, Psicología, Puerto Rico

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The history of evolution shows that the human body is designed to perform Physical Activity (PA) by nature (Paffenbarger et al., 2001). Over human history, industrial and technological advances have caused a marked reduction in the amount of PA that humans perform during daily tasks (Bouchard et al., 2012). PA went from natural to be an intentional act, seen as compulsory behavior rather than habitual. Human beings are paying the price of industrial development with their physical and emotional health (Paffenbarger et al., 2001). PA is considered a natural act of body movement meant to generate physical and emotional well-being (Hibbert, 2016). PA and exercise are different. However, these terms are sometimes used synonymously.

The Surgeon General of the United States Report (1994) redefined PA as "Any bodily movement that is produced by the contraction of skeletal muscle and that substantially increases energy expenditure" (p. 29). Examples of PA can be: going for a walk, running, dancing, taking the stairs, doing household chores, recreational activities, and forms of active transport such as cycling (WHO, 2020). Exercise is a subcategory of PA defined as: "A type of physical activity that involves planned, structured, and repetitive bodily movement to maintain or improve one or more components of physical fitness" (CDC, 2017, p. 105). Exercise means maintaining or improving the components of physical fitness (CDC, 2019). Despite the evidence of the mental and physical benefits of doing PA, people continue to remain physically inactive or sedentary.

Physical inactivity

The World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC) PA guidelines suggest moderate to vigorous PA (WHO, 2021). PA can be achieved by accumulating a minimum of 150 minutes per week of "moderate activities" or 75 minutes per week of "vigorous activities." Moderate-intensity activities are those that get the person to move fast enough or strenuously enough to burn off three to six times as much energy per minute as the person does when sitting or activities that clock in at 3 to 6 Metabolic Equivalent Method (METs) (e.g., walking very brisk 4 mph, cleaning, mowing the lawn, bicycling light effort 10-12 mph). Vigorous-intensity activities burn more than 6 METs (e. g., hiking, jogging at 6 mph, carrying heavy loads, bicycling fast 14-16 mph: Obesity Prevention Source, 2017). Failure to achieve the WHO recommended guidelines of PA is classified as physical inactivity (PI) or sedentarism (Thivel, 2018). A physically inactive or sedentary person doesn't engage enough PA.

Sedentarism refers to many activities commonly associated with lying down, sitting, reclining, and the variety of actions often performed in low-energy states (Fox, 2012). In the United States, less than 5% of adults participate in 30 minutes of physical activity each day (USDHHS, 2020). Only 1 in 3 adults receive the recommended amount of PA each week. More than 80% of adults do not meet the guidelines for both aerobic and muscle-strengthening activities. More than 80% of adolescents do not do enough aerobic physical activity to meet the guidelines stated for youth (USDHHS, 2020). In Latin America and the Caribbean, levels of PI increased from 33% to 39% between 2011 and 2016, having the highest percentage of the population with insufficient physical activity to stay healthy (WHO, 2020). Recently, the WHO published new PA guidelines to respond to the PI among all ages. PI is recognized as a pandemic that urges prompt worldwide action (Kohl et al., 2012).

Physical Activity in Puerto Rico

The data published in Puerto Rico by the CDC (2019) uses the Behavioral Risk Surveillance System (BRFSS). The BRFSS is the largest uninterrupted telephone-based survey that collects health-related risk behaviors and chronic health conditions in U.S. residents (CDC, 2019). The BRFSS results reflect a decrease in the amount of PA that Puerto Ricans have performed in recent years. In 2017, only 5.4% of Puerto Ricans who participated in the BRFSS reported reaching the recommended 150 minutes per week of moderate to vigorous PA or 75 minutes per week of vigorous PA. According to the CDC (2018), the percentage of Puerto Rican adults who reported being physically inactive were as follows: between 18-24-year-old group (38%), 25-34-year-old group (48%), 35-44 age group (52%), 45-54 age group (59%), 55-64 age group (56%), and 60% in the 65 years or older group (CDC, 2019). The data relating to PI in Puerto Rico is alarming, and the probability of sedentary behaviors increases with age. To support the previous survey, Mattei et al. (2018) conducted a survey using the BRFSS (N = 380) with insular Puerto Rican adults (age 30-75). The research aimed to examine the prevalence of risk factors and health conditions. These results were similar to the BFSRR results. Only 8% of the sample met the WHO's PA guidelines. This sedentarism suggests a predominant physically inactive lifestyle among insular Puerto Rican adults (Mattei et al., 2018). The PI prevalence in PR is alarming, and it requires attention from the scientific community.

Physical inactivity (PI) is one of the leading risk factors of death worldwide. Globally, 1 in 4 adults is not active enough, and more than 80% of the adolescent population is insufficiently active. Furthermore, lack of PA has been associated with an increased risk of mental health disorders and a significant risk factor for chronic diseases (Silvaa et al., 2020; WHO, 2018).

Prevalence of mental health and chronic diseases in Puerto Rico

A prevalence report by the Administration of Mental Health and Anti-Addiction Services (ASSMCA) on the mental health disorders in Puerto Rico informed that 2 in 10 adults (18.7%) meet the criteria for a mental health disorder (Canino et al., 2016). Women led with 10.5%, of mental health disorders while men showed 8.2%. Anxiety disorders are the most common mental health disorder in Puerto Rico, affecting 12.5% of the adult population. The second place corresponds to mood disorders with 10.4% (Canino et al., 2016). Statistics on mental disorders among children and adolescents in Puerto Rico present rates similar to those in the US. However, Puerto Rico has lower rates of anxiety disorders yet higher rates in substance use disorders, especially alcohol in adolescents (Canino, 2019). Mattei et al. (2018) conducted a survey using the BRFSS (N = 380) with insular Puerto Rican adults (age 30-75) to examine the prevalence of risk factors and health conditions. Anxiety-related disorders were the most common (30%), while depressive disorders followed (26%; Mattei et al., 2018). The prevalence of chronic diseases among insular Puerto Rican adults is higher than the prevalence of mental health disorders (Research Institute in Behavioral Sciences, 2016).

The Research Institute in Behavioral Sciences (2016) reported about 5 of 10 Puerto Rican adults to have at least one chronic illness (e.g., cardiovascular diseases, cancer, diabetes, asthma, arthritis). Alzheimer's disease constitutes the principal cause of death and incapacity

in Puerto Rico. Mattei et al. (2018) showed similar results. Their results indicated that insular Puerto Rican adults (N = 380; age 30-75) were diagnosed with the following chronic diseases: hypertension (39%), obesity (28%), arthritis (26%), hypercholesterolemia (24%), and respiratory problems (21%).

According to the Chronic Diseases Action Plan for Puerto Rico 2014-2020 (2010), 66.6% of the total population are obese and have sedentary lifestyles. Most of these diseases are preventable, and PI is the number one factor associated with the development of chronic diseases (Department of health, 2010). For people with mental and chronic health conditions, PA is beneficial (Hays, 1999; Hibbert, 2016; Otto et al., 2011). As the body and the mind are non-separable entities, scientific evidence has also clearly established the benefits of PA in mental health (Rebar et al., 2015; Warburton & Bredin, 2017).

Brief evidence of physical activity benefits in mental and physical health

The health benefits of physical activity in mental and physical health are seen in children and adolescents, young and middle-aged adults, older adults, women and men, people of different races and ethnicities, and people with chronic conditions or disabilities (U.S. Department of Health and Human Services, 2018). Systematic reviews and longitudinal studies show that PA has long-term physical and health benefits (Chan et al., 2019; McDowell et al., 2019; Reiner et al., 2013). Some benefits of PA are reduction of anxiety and blood pressure, and improvements in sleep and cognitive functions. Other advantages include increased cardiorespiratory fitness and muscular strength and decreases in depressive symptoms (Hibbert, 2016; Otto et al., 2011). PA can also slow or delay chronic diseases, such as hypertension and type 2 diabetes. The benefits of PA also outweigh the risk of injury and heart attacks, two concerns that may prevent people from becoming physically active (U.S. Department of Health and Human Services, 2018). Research supports that regularly performed PA improves cognitive functioning (learning, memory, introspection, decision-making, and judgment). It also increases serotonin, dopamine, and norepinephrine levels, neurotransmitters found at low levels in people suffering from depression, anxiety, and other mental disorders.

Additionally, PA is related to the increase in endorphins, a chemical in the body that reflects feeling well, with good spirits and energy. Likewise, it reduces and helps manage stress and burnout, improves self-esteem, body image, and the quality of social and family relationships. Recently, literature has endorsed regular PA as a buffer for cognitive dementias, including Alzheimer's, to prevent the brain cell loss, a normal process in aging and memory loss (Choi et al., 2018; Pedersen, 2019). It helps with targeting, planning, and cognitive strategies for problem-solving and learning (Hibbert, 2016; Otto et al., 2011; Pedersen, 2019).

The evidence indicating the health benefits of PA is undeniable. However, to effectively engage people in PA requires a lifestyle change, which involves considering sociocultural factors. For example, Foster et al. (2005) conducted a Cochrane Systematic Review to examine the effectiveness of strategies to engage people in PA. They concluded that PA was effectively engaged when there was self-directed professional guidance and ongoing professional support. Effectively engaging in PA may require social support and guidance. On the other hand, Cruz et al.

(2013) examined the relationship between PA and perceived stress of academic workload. Their results indicated that moderate levels of perceived stress related to academic workload were associated with lower PA. Perceived stress of academic workload depends on the socio-cultural environment of the participants. Thus, to effectively engage people in PA, sociocultural considerations are required.

Physical activity psychological research in Puerto Rico

In Puerto Rico, the PA research with an insular Puerto Rican sample is limited. This research field is relatively new, as stated by Baez-Ávila (2006): "I consider it interesting to note that no research regarding PA was found until the nineties" (p. 561). Studies have been conducted with an insular Puerto Rican sample to examine the PA's effect on chronic diseases. Amaral-Figueroa (2014) conducted a descriptive pilot study with end-stage renal disease patients in PR (N = 31). The results showed that PA reduced postprandial glucose and insulin levels.

Similarly, Tirado-Gómez et al. (2016) conducted a descriptive study with a total of 50 adults who had a diagnosis of invasive breast cancer or ductal carcinoma. The purpose of the study was to explain the PA among Puerto Rican breast cancer survivors. The participants reported not engaging in vigorous PA (94%) or moderate PA (76%). Morales et al. (2017) conducted an open clinical trial (N=18) with a group of breast cancer survivors. This study aimed to examine the impact of a Behavioral Activation intervention through physical activity. Results showed a significant reduction in depression and anxiety.

Another study from cognitive psychology found that sports may improve cognitive processes (Baez-Ávila, 2018). The author conducted a quasi-experimental study (N = 30). The Cognitive Assessment System measured were compared between non-athletes adolescents and athletes adolescents (14-16 age). Significant differences between both groups were found, with the performance of athlete's adolescents being significantly higher in CAS planning processes than non-athletes adolescents. These findings present sport as an alternative for developing and stimulating cognitive processes.

Even though studies have been conducted about PA, psychological research in Puerto Rico remains unknown. This NLR with systematic techniques aims to synthesize the PA research conducted with an insular Puerto Rican sample. Simultaneously, this review aims to examine the state of the PA psychological research in Puerto Rico. To our knowledge, this is the first PA NLR conducted with a Puerto Rican sample.

Method

We performed an NLR with systematic techniques to synthesize the literature regarding PA in Puerto Rico. This design is the most appropriate due to the lack of literature on PA and Puerto Rico. The use of an NLR also allowed us to consider many types of articles to analyze the data.

Eligibility criteria

Regarding the recollection of articles, the inclusion criteria followed these specific requirements: a) research on PA in participants with chronic diseases, b) an insular Puerto Rican sample, and c) studies with a population older than 13 years.

Information sources

To locate research on PA in Puerto Rico, one member of the research team used the following electronic databases: ClinicalKey, Ebsco Databases, Medline Complete, PubMed, PsycArticles, Psychology, and Behavioral Sciences Collection, PsycINFO, ProQuest Dissertations and Theses UPRRP, Puerto Rican Journal of Psychology and other sources. The articles were separately searched from October 2019 to February 2020.

Search Strategy

The search strategy for all the databases followed the same structure. The searches were conducted in English and Spanish. The following combination of keywords was always used: 1) Physical Activity AND Puerto Rico, 2) Exercise AND Puerto Rico, 3) Physical Activity AND Adolescents and Puerto Rico, 4) Physical Activity AND Adults AND Puerto Rico 4) Physical Activity AND Chronic Diseases AND Puerto Rico. To conduct the review, one member of the research team searched for peer-reviewed articles that were full texts and published between 2000-2019. Table 1 shows the specific keywords.

Table 1

Keywords				
Physical Activity	AND	Puerto Rico		
Exercise	AND	Puerto Rico		
Physical Activity	AND	Adolescents	AND	Puerto Rico
Physical Activity	AND	Adults	AND	Puerto Rico
Physical Activity	AND	Chronic Diseases	AND	Puerto Rico

Selection Process

To decide whether a study met the inclusion criteria of the NLR, one member of the research team reviewed each title to identify if they included at least one of the following keywords: 1) Physical Activity, 2) Exercise or 3) Puerto Ricans. Titles that did not meet this first screening were excluded. A second screen was conducted with the articles that met the first screening based on titles, this time abstracts and full-texts were evaluated with the inclusion criteria for their selection and further analysis. Abstracts that did not met the inclusion criteria were excluded.

Data collection process

Studies were chosen based on the inclusion criteria through assessment of titles, abstracts, and full-text papers. After the application of the inclusion criteria over the title, a total of 1,600 articles were identified. A second screening was established to identify the abstracts that met the inclusion criteria. A total of 25 articles were relevant and were further considered after reading each article meticulously. Following the screening, an additional eight articles were removed because of the inclusion criteria. A final sample of 17 articles was identified.

Ten articles were obtained in a full-text Portable Document Format (PDF). The additional seven sources were Master's Theses in Exercise Sciences with a Specialty in Exercise Physiology from the University of Puerto Rico, Río Piedras (UPR-RP) campus. Data extraction was collected and completed during February 2020.

Data analysis

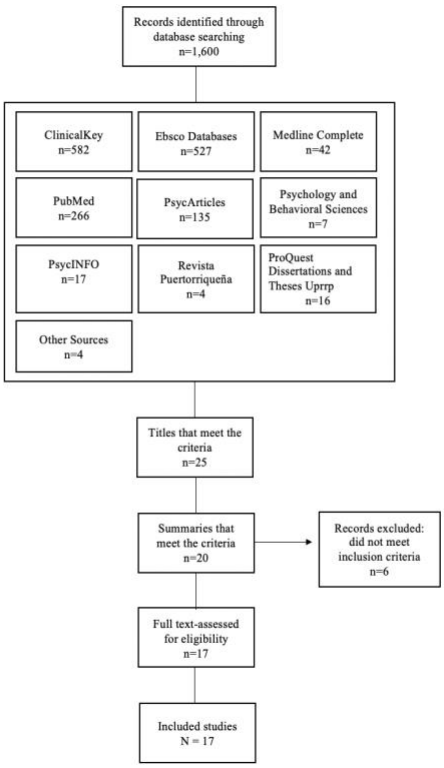
Further analysis of the articles was entered in Excel spreadsheets that included: (a) first author and year; (b) title of the article; (c) sample size; (d) research design; (e) exposure variables such as the type of physical activity assessed; (f) main findings; (g) summary of the significant associations that were identified. Analysis of the data was conducted throughout individual evaluations of each article and organized into the table. References of each one of the databases were downloaded and organized matching the databases, date of searching and exact keyword combination. All studies identified were recorded in an Excel Spreadsheet. Once all the references were obtained, duplicates were eliminated from the archives to get the total number of the studies.

Results

One thousand six hundred articles were identified from the following databases: ClinicalKey N=582; Ebsco Databases N=527; PubMed N=266; PsycArticles N=135, Medline Complete N=42; PsycINFO N=17; ProQuest Dissertations and Theses UPRRP N=16; Psychology and Behavioral Sciences N=7; Revista Puertorriqueña de Psicología N=4; Other Sources N=4. After the first screening was applied, twenty-five articles met the criteria and were further examined for the second screening based on summaries. Twenty articles met the criteria based on summaries. Six records were excluded after the second screening because they did not meet the inclusion criteria. Seventeen articles met the inclusion criteria. Figure 1 shows the NLR flowchart.

Figure 1

Flow chart



Ten articles were empirical studies. The additional seven documents were unpublished Master's Theses in Exercise Sciences with a Specialty in Exercise Physiology from the University of Puerto Rico, Río Piedras (UPR-RP) campus. The results from the selected articles revealed that seven of the seventeen articles employed a descriptive design in their studies. Another four articles were correlational studies. Three other articles implemented an exploratory design. Two other articles used a pre-experimental/open-clinical method. Similarly, the last article used a pre-experimental design.

Eleven studies examined the variables of chronic diseases and PA. Two of the studies examined the variables of PA in adolescents. Another two studies considered the older population and PA; one study implemented the modality of Psychoballet. One previous study addressed dietary patterns, PA, and weight status. Eleven of the seventeen articles used validated self-completed questionnaires to acquire the data from the studies. Four other articles used a combination of validated questionnaires and physical assessment to measure results. The two remaining articles examined physical assessment to measure the outcomes.

Eight of the seventeen articles reported that PA was below the recommended standards. Three articles were found from the psychology field. One of them found a statistically significant difference in the reduction of symptoms of depression and anxiety after an intervention that implemented PA, using the Behavioral Activation Model (Morales-Cruz et al., 2017). One previous study found the treatment alternative of psychoballet viable for the population with Down Syndrome (Serrano-Goytía, 2003).

An article that examined the variables of chronic diseases and PA found that it reduced postprandial glucose and insulin levels in renal disease patients in Puerto Rico. Similarly, another article found a relationship between functional capacity, body composition, and glomerular filtration, suggesting that the higher the percentage of body fat, the lower the functional capacity in patients diagnosed with type 2 diabetes mellitus and chronic kidney dysfunction (González-Otero, 2019). Another study suggested that physically active women diagnosed with Rheumatoid Arthritis in Puerto Rico have a lower perception of pain than those who do less PA (Pacheco-Parés, 2019). In addition, one study found the capacity to develop and conduct a questionnaire for the Puerto Rican population of women with a first-time diagnosis of unilateral breast cancer who had received surgical treatment for breast cancer.

Weight control and well-being were the most frequently mentioned benefits of participating in an exercise program during the administration of this questionnaire (Mulero-Portela et al., 2012). In other studies, the results showed mixed outcomes when examining the variable of PA. One study found that PA was not associated with prostate cancer mortality in a group of Puerto Rican men (Crespo et al., 2008). One study informed that the levels of PA of women with breast cancer and without breast cancer in Puerto Rico have no significant differences (Feliciano-Gutiérrez, 2014). Another study suggested that the participants comply with the PA recommendations and the sedentary criteria, and both aspects affect lung function in patients with obstructive sleep apnea (González-Rodríguez, 2016). The disciplines that reported the PA variable in their studies were the following: Exercise Physiology N=11; Psychology N= 3; Education N=2; and Physical Therapy N=1. Table 2 shows a summary of the article includes in this NLR. https://psmhs-my.sharepoint.com/:w:/g/personal/nramos19_stu_psm_edu/EWV3Zi0qqWdFksaazYWaEU4BECEn3nar3HXDJRjjkP6_3Q?e=pZs5oa

Discussion

This study aimed to synthesize the PA scientific literature conducted with insular Puerto Ricans. This article was achieved by classifying and reviewing studies using an NLR with systematic techniques. The most consistent pattern of findings suggested a lack of evidence regarding the effectiveness of PA interventions with insular Puerto Ricans. However, there were mixed results from various instruments and measures used to assess the variable PA in Puerto

Rico. This variability does not give the community an effective way to evaluate the information since the measures to evaluate the PA variable were not consistent from study to study.

Similarly, there is a lack of consensus between researchers on the adequate instrument to use when evaluating the current state of PA in the Puerto Rican community. This might be problematic due to the inability to evaluate PA with accuracy. Moreover, many studies used self-reported questionnaires to assess the engagement of PA among insular Puerto Ricans. One of the disadvantages of using self-reported questionnaires is the possibility of providing invalid answers and incurring phenomena such as social desirability and response bias (Demetriou, 2015). Objective measures are needed to assess the current state of PA in Puerto Rico. Furthermore, the current data regarding the engagement of PA in Puerto Rico comes from surveys performed in the U.S. mainland. The results from these surveys are not a necessarily reliable source for insular Puerto Ricans due to our socio-cultural and political characteristics (e.g. lifestyle, resources, access to secure and accessible places to realize PA, institutions, and education for the community), that are different from the United States.

In addition, previous research focused on how PI might have implications for the mental and physical health of individuals. Our findings suggest that the lack of evidence in Puerto Rico requires attention from the scientific community to explore future interventions and address the problem of PI in the Puerto Rican community. Many of the studies reported in this review come from unpublished dissertations. This situation brings importance to the discussion of publishing the works of graduate students. It has been recommended for theses and dissertations to be published to continue disseminating research, not just serve as institutional degree requirements (Kubota et al., 2021).

The findings of this review suggest a perspective on the current state of research for the insular Puerto Ricans. Only three publications were found in our review from psychology as a discipline. Those investigations used PA as an intervention to explore the impact in psychological measures (anxiety and depression) (Morales-Cruz, 2016; Morales-Cruz et al., 2017). Exercise Physiology as a discipline conducted most of the found research, many of them focused on chronic diseases and PA and do not include the psychological variables. This result may constitute a challenge in the psychological research. It is well sustained that the interaction between mental and physical health cannot remain separate. The separation of both continues to be a challenge for the health-promoting professions. It could lead to the lack of evidence regarding the PA in the Psychology field in Puerto Rico (Aybar-Soltero & Morales-Cruz, 2020). From a Health Psychology perspective, the biopsychosocial Engel Model (1977) proposes the integration of these two, including the social aspect. Given the increase in mental health diagnoses and chronic health diseases (Canino 2016/2019; CDC, 2020), psychology cannot dissociate its work from this integrative perspective. The team recognizes that education strategies regarding PA guidelines have been shared for the general population. Still, it has not been enough to get the community to engage in the recommended PA guidelines. Recent WHO (2020) guidelines suggest increasing PA interventions and research on these populations due to the rise of sedentary behaviors in our technological era.

Despite the evidence generated through different mechanisms, the general population remains inactive or performs PA intermittently (Buckworth, 2013).

Psychology plays a vital role in changing behavior among individuals and groups, and PA could be integrated for better emotional and physical health results, including mental disorders and chronic diseases (Aybar-Soltero & Morales-Cruz, 2020). Psychology as a discipline plays an essential role in the promotion, education, initiation, and maintenance of PA to obtain changes across healthy lifestyles (Aybar-Soltero & Morales-Cruz, 2020). Action from the scientific community is necessary to decrease the gap of PA in Puerto Rico, in turn promoting intervention models that integrate PA for the Puerto Rican community.

Limitations and recommendations for further reviews

This NLR has some limitations. The review does not include a population under 13 years of age. For future studies, the team recommends including children and youth under 13 years old as part of the inclusion criteria. This review only explores research with insular Puerto Ricans. The research team suggests future reviews to include research conducted in the U.S. mainland. Another limitation is the lack of publications from graduate student dissertations and theses. The team hypothesizes that other university libraries will have copies of unpublished graduate research that we may not include in this review. Furthermore, this article is not a systematic literature review. Nonetheless, systematic techniques were implemented. For future articles on this topic, the team suggests including evaluation by judges of the quality of the research collected. It is recommended to conduct a systematic review using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). It is also recommended to include additional databases such as Oviedo, Scielo, and Dialnet to compile more articles that probably comprised studies with the Puerto Rican population. Future reviews should consist of studies from the Iberian Peninsula, South and Central America, and the Caribbean due to an increase in the PI levels.

Conclusion

This article synthesizes the PA scientific literature conducted with insular Puerto Ricans. This paper is the first NLR reporting PA research in Puerto Rico to our knowledge. The results of the studies suggested a lack of solid evidence regarding PA psychological research in Puerto Rico. Our results indicate that the current state of PA research requires attention from the scientific community to answer important questions for future interventions that address the problem of PI in the Puerto Rican populaation. Future research may extend this work by exploring possibilities to create behavioral interventions based on PA to promote and prevent the increment of mortality rates due to sedentarism in Puerto Rico.

Compliance with research ethics standards

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Declaration of Conflicting Interests

The authors declared no potential conflicts of interest for the research, authorship, and/or publication of this article.

Informed Consent/Assent

This SRL does not obtain any written informed consent/assent.

Institutional Review Board for Human Subjects (IRB)

This SRL does not have IRB approval.

References

Álvarez, A. J., Ramírez-Marrero, F. A., Ortiz, A., & Rosario-Martínez, L. (2013). Niveles de actividad física en mujeres adolescentes en Puerto Rico: Un estudio piloto. Pensar en

Movimiento: Revista de Ciencias del Ejercicio y la Salud, 11(1), 1-12. https://www.redalyc.org/articulo.oa?id=4420/442042964002

Álvarez-Morales, A. J. (2008). Niveles determinantes de actividad física entre adolescentes féminas en Puerto Rico [Unpublished master's thesis]. University of Puerto Rico, Río Piedras.

Amaral-Figueroa, M. I. (2014). Physical activity in end-stage renal disease patients: A pilot project in Puerto Rico. Puerto Rico Health Sciences Journal, 33(2), 74-79.

Aybar-Soltero, J., & Morales-Cruz, J. (2020). Introducción a la psicología del deporte y la actividad física. Publicaciones Gaviota.

Baez-Ávila, L., S. (2006). Una mirada a la investigación de la psicología deportiva en Puerto Rico: Recorrido de los últimos 20 años. Revista Puertorriqueña de Psicología, v. 17, n. 1, p. 552-569. ISSN 23316950.

Baez-Ávila, L., S. Procesos de Planificación en Adolescentes Baloncelistas. Revista Puertorriqueña de Psicología, v. 29, n. 2, p. 332-346, ISSN 23316950. http://www.ojs.repsasppr.net/index.php/reps/article/view/425

Booth, F. W., Roberts, C. K., & Laye, M. J. (2012). Lack of Exercise Is a Major Cause of Chronic Diseases. Comprehensive Physiology, 1143–1211. https://doi.org/10.1002/cphy.c110025

Bouchard, C., Blair, S. N., & Haskell, W. L. (Eds.). (2012). Physical activity and health. Human Kinetics.

Buckworth, D. E. A. (2013). Exercise Psychology, 2Nd Edition (2nd ed.). Human Kinetics.

Canino, G., Vila, D., Santiago-Batista, K., García, P., Vélez-Báez, G., & Moreda-Alegría, A. (2016). Need assessment sudy of mental health and substance use disorders and service utilization among adult population of Puerto Rico. https://www.assmca.pr.gov/BibliotecaVirtual/Estudios/Need%20Assessment%20Study%20of%20Mental%20Health%20and%20Substance%20of%20Puerto%20Rico%202016.pdf

Center for Disease Control and Prevention. (2017). Physical activity and health: A Report of the Surgeon General. P. 105. https://www.cdc.gov/nccdphp/sgr/index.htm

Center for Disease Control and Prevention. (2018). Physical Activity: Guidelines for Americans 2nd Edition. https://health.gov/paguidelines/secondedition/pdf/Physical_Activity_Guidelines_2nd_edition.pdf

Centers for Disease Control and Prevention. (2018). Physical Activity Guidelines for School- Aged Children and Adolescents. https://health.gov/sites/default/files/2019-09/Physical_Activity_Guidelines_2nd_edition.pdf

Center for Disease Control and Prevention. (2019). The Behavioral Risk Factor Surveillance System (BRFSS). https://www.cdc.gov/brfss/annual_data/2018/pdf/overview-2018- 508.pdf

Center for Disease Control and Prevention. (2020). Physical activity and health: A Report of the Surgeon General. https://www.cdc.gov/nccdphp/sgr/index.htm

Chan, D. S. M., Abar, L., Cariolou, M., Nanu, N., Greenwood, D. C., Bandera, E. V., McTiernan, A., & Norat, T. (2019). World Cancer Research Fund International: Continuous Update Project—systematic literature review and meta-analysis of observational cohort studies on physical activity, sedentary behavior, adiposity, and weight change and breast cancer risk. Cancer Causes & Control, 30(11), 1183–1200. https://doi.org/10.1007/s10552-019-01223-w

Crespo, C. J., Garcia-Palmieri, M. R., Smit, E., Lee, I., McGee, D., Muti, P.,

Figueroa-Valle, N. R., Ramirez-Marrero, F. A., Freudenheim, J. L., & Sorlie, P. (2008). Physical activity and prostate cancer mortality in Puerto Rican men. Journal Of Physical Activity & Health, 5(6), 918-929. https://doi.org/10.1123/jpah.5.6.918

Cruz, S.Y., Fabian, C., Pagan, I., Ríos, J.L., Gonzalez, A.M., Betancourt, J., Gonzalez, M.J.,Rivera-Soto, W.T., Palacios, C., (2013). Physical activity and its associations with sociodemographic characteristics, dietary patterns, and perceived academic stress in students attending college in Puerto Rico. P. R. Health Sci. J. 32, 44–50.

Demetriou, C., Ozer, B. U., & Essau, C. A. (2015). Self-Report Questionnaires. The Encyclopedia of Clinical Psychology, 1–6. https://doi.org/10.1002/9781118625392.wbecp507

Harvard T. H. Chan. (2017). Examples of Moderate and Vigorous Physical Activity. Obesity Prevention Source. https://www.hsph.harvard.edu/obesity-prevention-source/moderate-and-vigorous-physical-activity/

Feliciano-Guitiérrez, D. (2014). Actividad física durante la vida en mujeres con cancer de mama en Puerto Rico [Unpublished master's thesis]. University of Puerto Rico, Río Piedras.

Foster, C., Hillsdon, M., Thorogood, M., Kaur, A., & Wedatilake, T. (2005). Interventions for promoting physical activity. Cochrane Database of Systematic Reviews. Published. https://doi.org/10.1002/14651858.cd003180.pub2

González, K., Fuentes, J., & Márquez, J. L. (2017). Physical Inactivity, Sedentary Behavior and Chronic Diseases. Korean Journal of Family Medicine, 38(3), 111. https://doi.org/10.4082/kjfm.2017.38.3.111

González-Otero, W. I. (2019). Evaluación de la capacidad funcional, nivel de actividad física y composición corporal en pacientes con diagnóstico de diabetes mellitus tipo 2 y disfunción renal crónica [Unpublished master's thesis]. University of Puerto Rico, Río Piedras.

González-Rodríguez, A. (2016). Características de actividad física y salud general en pacientes con Apnea Obstructiva del Sueño en Puerto Rico: Un estudio piloto [Unpublished master's thesis]. University of Puerto Rico, Río Piedras.

Hernández-Soto, O. J., & Ramírez-Marrero, F. A. (2016). Physical activity, sitting time and anthropometric and general health characteristics among older persons in Puerto Rico. Anales en Gerontología, 8(8), 1-18. https://dialnet.unirioja.es/servlet/articulo?codigo=6140282

Hernández-Soto, O. J., & Ramírez-Marrero, F. A. (2018). Physical activity and fitness among older people participants in centers for the elderly in Puerto Rico. Anales en Gerontología 10, 121-144.

Hibbert, C. (2016). 8 Keys to mental health through exercise. W. W. Norton.

Kubota, F. I., Cauchick-Miguel, P. A., Tortorella, G., & Amorim, M. (2021). Paper-based thesis and dissertations: analysis of fundamental characteristics for achieving a robust structure. Production, 31. https://doi.org/10.1590/0103-6513.20200100

Marrero-Colón, S. (2016). Actividad física, Índice de Masa Corporal y control de glucosa en adultos con sobrepeso y obesidad que viven con Diabetes Mellitus Tipo 2 en Puerto Rico: Un estudio piloto [Unpublished master's thesis]. University of Puerto Rico, Río Piedras.

Mattei, J., Tamez, M., Ríos-Bedoya, C. F., Xiao, R. S., Tucker, K. L., & Rodríguez-Orengo, J. F. (2018). Health conditions and lifestyle risk

factors of adults living in Puerto Rico: a cross-sectional study. BMC Public Health, 18(1). https://doi.org/10.1186/s12889-018-5

Morales-Cruz, J. (2016). Activación conductual mediante actividad física: Impacto en la sintomatología psicológica en mujeres de cáncer de mama (ProQuest Number: 10141250). [Doctoral dissertation, University of Puerto Rico, Río Piedras]. ProQuest dissertation and Theses Global.

Morales-Cruz, J., Bernal, G., & Amaral-Figueroa, M. (2017). Impacto y viabilidad de una intervención con activación conductual mediante actividad física para sobrevivientes de cáncer de mama. Revista puertorriqueña de psicología, 28(1), 116-132. https://www.redalyc.org/pdf/2332/233255999008.pdf

Mulero-Portela, A. L., Santaella, C. L., & Gómez, C. C. (2012). Development of a questionnaire to assess the determinants of exercise among breast cancer survivors in Puerto Rico. Physiotherapy Theory and Practice, 29(5), 379-392. https://doi: 10.3109/09593985.2012.746763

Otto, M., Smits, J., & Smits, J. A. (2011). Exercise for mood and anxiety: Proven strategies for overcoming depression and enhancing well-being. Oxford University Press.

Pacheco-Parés, M. C. (2019). Actividad física, tiempo sedentario y sueño en adultos con Artritis Reumatoides en Puerto Rico [Unpublished master's thesis] University of Puerto Rico, Río Piedras.

Paffenbarger, R, S., Blair, S, N., & Lee, I. M. (2001). A history of physical activity, cardiovascular health and longevity: The scientific contributions of Jeremy N Morris. International Journal of Epidemiology, 30(5), 1184-1192. doi:10.1093/ije/30.5.1184

Rebar, A. L., Stanton, R., Geard, D., Short, C., Duncan, M. J., & Vandelanotte, C. (2015). A meta-meta-analysis of the effect of physical activity on depression and anxiety in non- clinical adult populations. Health Psychology Review, 9(3), 366-378. http://doi:10.1080/17437199.2015.1022901

Research Institute in Behavioral Sciences. (2016). Preliminary case statistics suicide in Puerto Rico. http://www.salud.gov.pr/Estadisticas-Registros-y-Publicaciones/Estadisticas%20Suicidio/Enero%202019.pdf

Serrano-Goytía, J. (2003). El psicoballet como modalidad terapéutica para jóvenes puertorriqueños/as con Síndrome de Down (UMI3110940). [Doctoral dissertation, University of Puerto Rico, Río Piedras]. ProQuest dissertation & Thesis UPRRP.

Silva, L. R. B., Seguro, C. S., de Oliveira, C. G. A., Santos, P. O. S., de Oliveira, J. C. M., de Souza Filho, L. F. M., de Paula Júnior, C. A., Gentil, P., & Rebelo, A. C. S. (2020). Physical Inactivity Is Associated with Increased Levels of Anxiety, Depression, and Stress in Brazilians During the COVID-19 Pandemic: A Cross-Sectional Study. Frontiers in Psychiatry, 11. https://doi.org/10.3389/fpsyt.2020.565291

Thivel, D., Tremblay, A., Genin, P. M., Panahi, S., Rivière, D., & Duclos, M. (2018). Physical Activity, Inactivity, and Sedentary Behaviors: Definitions and Implications in Occupational Health. Frontiers in Public Health, 6. https://doi.org/10.3389/fpubh.2018.00288

Tirado-Gómez, M., Hughes, D. C., González-Mercado, V., Treviño-Whitaker, R. A., & Basen- Engquist, K. (2016). Physical activity in Puerto Rican cancer survivors. Puerto Rico Health Science Journal, 35(2), 62-68.