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ORIGINAL RESEARCH

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Adherence to physical activity guidelines associated with self-care management and self-regulatory efficacy for type 2 diabetes among Black/African American men

Jeong-Hui Park[1,2,3], Tyler Prochnow[1,2,3,*], Ledric D. Sherman[1,2], Matthew Lee Smith[1,2,3], Meg Patterson[1], Yunlin Zhou[1]

[1]School of Public Health, Texas A&M Health Science Center, College Station, TX 77843, USA
[2]Center for Health Equity and Evaluation Research, Texas A&M University, College Station, TX 77843, USA
[3]Center for Community Health and Aging, Texas A&M University, College Station, TX 77843, USA

***Correspondence**
tprochnow@tamu.edu
(Tyler Prochnow)

Abstract

Background: Existing literature primarily focuses on predominantly Caucasian populations, creating a gap in understanding the factors influencing physical activity (PA) adherence and self-care behaviors specifically in Black/African American men with Type 2 diabetes (T2D), a group disproportionately affected by the condition. This study aimed to examine the relationship between adherence to PA guidelines, self-care management and self-regulatory efficacy for T2D among Black/African American men. **Methods**: Cross-sectional data from 1225 Black/African American men with T2D were analyzed, with adherence to PA guidelines defined as 450 Metabolic Equivalent of Task (MET)-minutes/week or more. Self-care management and self-regulatory efficacy were measured using validated questionnaires. **Results**: Descriptive statistics, bivariate analyses and logistic regression models were used to analyze the relationships between PA adherence, self-care management and self-regulatory efficacy. The average of participants' age was 41.9 years old ($\pm$14.5), and number of chronic conditions was 2.5 ($\pm$1.9). Participants who adhered to PA guidelines demonstrated significantly higher self-care management and self-regulatory efficacy compared to non-adherents. Younger participants (aged 21–40) reported an average of 4.33 days per week of self-care management, while middle-aged and older participants (aged 40 and above) reported 4.42 days. Non-adherents across all age groups reported lower self-care management and self-regulatory efficacy scores. Logistic regression analysis revealed that self-regulatory efficacy, age, Body Mass Index (BMI) and employment status were significant predictors of PA adherence. Higher self-regulatory efficacy is associated with improved confidence in managing T2D, making individuals more likely to engage in regular PA, which is essential for effective diabetes management. **Conclusions**: Targeted interventions to enhance self-regulatory efficacy and promote PA adherence, particularly tailored to address barriers faced by younger and unemployed individuals, could have substantial benefits for diabetes self-management.

Keywords

Physical activity; Type 2 diabetes; Self-care management; Self-regulatory efficacy; Black/African American men

1. Introduction

Type 2 diabetes (T2D) remains a significant public health concern globally, affecting millions of individuals [1]. As of 2021, the International Diabetes Federation (IDF) estimated that approximately 537 million adults worldwide were living with diabetes, with T2D accounting for about 90–95% of these cases [2]. In the United States, the prevalence of T2D is particularly alarming [3]. The Centers for Disease Control and Prevention (CDC) has indicated that approximately 34.2 million Americans or 10.5% of the population, have diabetes, with T2D being the most common form [4]. Among these, Black/African American adults are disproportionately affected. The prevalence of diagnosed diabetes is significantly higher among Black/African American adults compared to their white counterparts, with rates of 12.1% and 7.4%, respectively [5]. Additionally, several previous studies have highlighted that Black/African American men not only have higher rates of T2D but also face more severe complications and higher mortality rates compared to other demographic groups [6–9].

Physical activity (PA) is a critical component in both the prevention and management of T2D [10]. Regular participation in PA significantly improves insulin sensitivity, aids

in maintaining a healthy body weight, and plays a crucial role in the regulation of blood glucose levels [11, 12]. The World Health Organization (WHO) recommends that adults should engage in at least 150 minutes of moderate-intensity aerobic PA per week, such as brisk walking or cycling [13]. Additionally, muscle-strengthening activities, such as lifting weights or doing push-ups, should be included on two or more days a week [13]. Adherence to these PA guidelines has been shown to significantly reduce the risk of developing T2D [10, 14]. For individuals at high risk, lifestyle interventions that include increased PA can lead to a 58% reduction in the incidence of diabetes [15]. Furthermore, regular PA can enhance self-regulatory efficacy and the ability to manage daily T2D care. One previous study found that individuals who were more active reported better self-efficacy for managing their T2D, which led to more consistent engagement in self-care behaviors [16]. However, given that the participants in the study were composed of 65% women and 75% Caucasians, and the research focused on the relationship between self-efficacy and PA within a predominantly Caucasian sample, further studies that include diverse racial/ethnical and gender groups are still needed. Also, despite substantial evidence supporting the health benefits of PA and the American Diabetes Association's position that it is a cornerstone of treatment [17], epidemiological data indicate that the majority of individuals with or at risk for T2D do not adhere to recommended PA guidelines [18].

Self-regulatory efficacy, defined as the belief in one's ability to execute specific behaviors such as participation in PA regularly necessary to achieve desired outcomes, is a critical predictor of successful diabetes management [19]. Higher self-regulatory efficacy is associated with higher confidence in one's ability to adhere to self-management practices, including dietary control, medication adherence and participation in PA [20–22]. For instance, individuals who believe in their ability to follow a diabetes-friendly diet are more likely to make healthier food choices consistently [23]. Similarly, those confident in their ability to adhere to their medication regimen are less likely to miss doses, thereby maintaining better glycemic control [24]. This confidence also can be extended to participation in regular PA, which is a vital component of diabetes management. A study has demonstrated that individuals with T2D who participated in a structured exercise program reported higher self-efficacy for PA, which in turn led to increased levels of actual PA [25]. Furthermore, self-regulatory efficacy has been identified as a mediator in the relationship between the delivery of these interventions and objectively measured PA [26]. This means that the positive effects of exercise programs on PA levels are partly due to increases in self-regulatory efficacy.

Self-Determination Theory (SDT) can provide a comprehensive framework for understanding and improving diabetes management in this population. The theory is a well-established framework that examines human motivation and the psychological processes underlying behavior, positing that individuals have three fundamental psychological needs: autonomy, competence and relatedness [27]. When these needs are satisfied, individuals are more likely to exhibit intrinsic motivation and engage in behaviors that promote health and well-being, such as self-care management for T2D. For Black/African American adults with T2D, perceived autonomy in self-care activities, such as dietary and exercise choices, enhances intrinsic motivation and adherence to these regimens [28]. Competence, another core component of SDT, is crucial for self-regulatory efficacy, the confidence in one's ability to manage specific health-related behaviors, which is critical for adhering to PA guidelines [29, 30]. Additionally, fulfilling the need for relatedness, feeling connected and supported, mitigates mental health issues like stress, anxiety, depression and loneliness, which are prevalent among individuals with T2D and can adversely affect their self-care management [31]. Therefore, adherence to PA guidelines, driven by intrinsic motivation from satisfied psychological needs, may lead to better health outcomes, including improved self-care management, self-regulatory efficacy and mental health among Black/African American men with T2D.

Therefore, this current study will leverage the SDT framework to explore self-care management, and self-regulatory efficacy between Black/African American men with T2D who meet the WHO recommended PA guidelines and those who do not. The significance of this study lies in its comprehensive approach to understanding the interplay between psychological needs, motivational factors and health behaviors within this specific population, and this is the first study to specifically explore the relationship between adherence to PA guidelines and self-care management and self-regulatory efficacy among Black/African American men with T2D. Additionally, by identifying and analyzing the socioeconomic and demographic factors that might influence these relationships, this study will provide novel insights into the unique challenges and facilitators of diabetes management in Black/African American men. This approach has the potential to inform targeted interventions and policies aimed at improving health outcomes in this underserved and disproportionately affected group.

2. Methods

2.1 Participants and procedures

The present study utilized cross-sectional data collected from using a Qualtrics survey through Cloud Research between February and April 2024. The internet-based survey was designed to examine T2D-related attitudes and behaviors among Black/African American adult men with T2D. A nationally representative sample was achieved by effectively recruiting and enrolling participants from a typically hard-to-reach population using Cloud Research. Upon identification by Cloud Research, potential participants were directed to an internet-based Qualtrics survey link and provided with an Institutional Review Board of Texas A&M University-approved information sheet (IRB2023-1311M). Participation was entirely voluntary, and respondents were informed of their right to withdraw from the survey at any time. Out of 3965 potential respondents, 1225 individuals met the inclusion criteria of being Black/African American men (97.1% and 2.9% multiracial), aged 21 years or older and reporting T2D. Cloud Research ensured data integrity, and three quality/attention checks were included to improve the validity of responses.

2.2 Measures

2.2.1 Dependent variable

This study's dependent variable was adherence to PA guideline, measured through the International Physical Activity Questionnaire-Short Form (IPAQ-SF). The IPAQ-SF records activity across four intensity levels: (1) vigorous-intensity activity such as aerobics, (2) moderate-intensity activity such as leisure cycling, (3) walking, and (4) sitting. The original authors recommended the "last 7-day recall" version of the IPAQ-SF for PA surveillance studies, partly due to the minimal reporting burden on participants. Test-retest reliability indicated good stability and high reliability ($\alpha <$ 0.80) [32].

The present study quantified PA using the formula "MET level $\times$ minutes $\times$ number of activities per week" for each intensity level, assigning 6.0 METs for vigorous PA and 3.0 METs for moderate PA [33]. Since adults should engage in at least 150 minutes of moderate-intensity aerobic activity per week, such as brisk walking or cycling based on the WHO guidelines [13], this study used a threshold of 450 MET-minutes/week to differentiate between the two groups (adherence and non-adherence to PA guidelines groups).

2.2.2 Self-care management for T2D

To examine the self-care management for T2D, the study utilized the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire [34]. The questionnaire has been presented as a convenient instrument for researchers to assess diabetes self-care practices within a recent timeframe, spanning either the previous week or month. This questionnaire scrutinizes key domains of self-care such as dietary habits, glucose monitoring, foot care and adherence to self-care guidelines, evaluating the absolute frequency or consistency of engagements in these activities [34], and SDSCA has 10 items and has demonstrated adequate evidence of reliability across cultural backgrounds with a Cronbach's alpha value above 0.50 [35–40]. Utilizing an 8-point Likert scale (ranging from 0 to 7 days), respondents report the frequency of each self-care activity over the past 7 days. We calculated the average days per week for participating in self-care management for T2D.

2.2.3 Self-regulatory efficacy for T2D

The Self-regulatory Efficacy for T2D was measured by the Self-Efficacy for Diabetes (SED) Scale, which is a widely utilized instrument designed to assess diabetes-specific self-efficacy [41]. Originally developed and validated for the Diabetes Self-Management study, this 8-item scale employs a 10-point scale [41]. The endorsed items were then combined to calculate a composite score representing the total score of self-regulatory efficacy for T2D by each participant, with scores ranging from 8 to 80. Lower scores on the scale indicate reduced self-efficacy, while higher scores reflect increased self-efficacy. The SED scale demonstrated robust reliability, evidenced by strong internal consistency (Cronbach's α = 0.85) and test-retest reliability (intraclass correlation coefficient = 0.80) [42]. Additionally, the scale exhibited convergent validity, with item-scale correlations surpassing 0.50 [42].

2.2.4 Sociodemographic and anthropometric factors

Sociodemographic and anthropometric data were collected through various measures including age, sex, race/ethnicity, rurality, educational attainment, marital status, job status, annual household income and Body Mass Index (BMI). Specifically, these variables were defined as follows: (1) age (21 years old or older), (2) sex (limited to men), (3) race/ethnicity (restricted to Black/African American individuals), (4) rurality (categorized as rural, suburban, urban and other), (5) educational attainment (categorized as under high school graduate, some college/2-year degree/no degree and over 4-year degree), (6) marital status (classified as married/partnered, never married, divorced/separated and widowed), (7) job status (classified as a student, employed, unemployed, retired and disabled (individuals who are unable to work due to disability)), (8) annual household income (reported primarily in $25,000 USD increments), and (9) BMI (calculated by dividing the weight (kg) by the square of the height (m^2)).

2.3 Statistical analysis

All statistical analyses in this study were analyzed by using SPSS version 28 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were computed to summarize the characteristics of the participants and bivariate analyses, including *t*-tests and chi-square tests, were conducted to examine associations between variables. A binary logistic regression model was employed to explore the relationships between the independent and dependent variables, adjusting for potential confounding variables. Then, two-way Analysis of Variance (ANOVA) (Adherence PA or not $\times$ age) was customized to identify age factors associated with how moderate to vigorous PA were with the results of their self-care management and self-regulatory for T2D. Statistical significance was identified at $p < 0.05$.

3. Results

The study aimed to examine the relationship between adherence to PA guidelines and various factors among Black/African American men with T2D. See Table 1 for sample characteristics, Table 2 for regression analysis, and Table 3 for health outcome comparisons.

Among 1225 Black/African American men with T2D, those who adhered to PA guidelines were generally younger (39.6 years old $\pm$ 13.4), compared to non-adherents (45.9 years old $\pm$ 15.6) ($p < 0.001$). PA adherents also had a lower average BMI (21.5 kg/m^2 $\pm$ 5.9) compared to non-adherents (23.0 kg/m^2 $\pm$ 7.6) ($p < 0.001$). Most of the participants were Black/African American (97.1%) and household income was higher among PA adherents, averaging 4.0 ($\pm$2.1) on a scale representing ~$25K increments, while non-adherents averaged 3.8 ($\pm$2.3) ($p = 0.051$). The participants predominantly live in urban areas (52.4%), but there are no significant differences between the adherence PA group and non-adherence PA group ($p = 0.863$). Participants adhering to PA guidelines demonstrated higher educational attainment, with 36.2% having a 4-year degree or more than those who non-adhering to PA

TABLE 1. Sample characteristics.

Variables	Total (n = 1225) % or M (±SD)	Non-Adherence PA (n = 441) % or M (±SD)	Adherence PA (n = 781) % or M (±SD)	χ^2 or t	p
Age (yr)	41.9 (±14.5)	45.9 (±15.6)	39.6 (±13.4)	−7.38	<0.001***
Body mass index (kg/m^2)	22.0 (±6.6)	23.0 (±7.6)	21.5 (±5.9)	−3.89	<0.001***
Race/Ethnicity					
Black/African American	97.1%	96.7%	98.0%	2236.19	0.194
Multiracial	2.9%	3.3%	2.0%		
Household income (~$25K increments)	3.9 (±2.2)	3.8 (±2.3)	4.0 (±2.1)	1.95	0.051
Rurality					
Rural	11.1%	10.2%	11.7%		
Suburban	36.1%	37.2%	35.6%	820.36	0.863
Urban	52.4%	52.4%	52.3%		
Other	0.3%	0.2%	0.4%		
Education level					
High school or less	23.1%	24.3%	22.6%		
Some high school/2-Year degree/No degree	42.9%	45.6%	41.3%	71.49	0.074
4-Year degree or more	34.0%	30.2%	36.2%		
Marital status					
Married/Partnered	61.1%	54.0%	65.0%		
Never married	27.6%	31.1%	25.7%	1018.35	<0.001***
Divorced/Separated	8.8%	11.8%	7.1%		
Widowed	2.5%	3.1%	2.2%		
Employment					
A student	1.9%	1.8%	1.9%		
Employed	78.2%	65.3%	85.4%		
Disabled	4.4%	8.2%	2.3%	2601.97	<0.001***
Retired	9.7%	16.3%	5.9%		
Not Employed	5.9%	8.4%	4.5%		
Number of chronic conditions	2.5 (±1.9)	2.9 (±2.1)	2.3 (±1.7)	−5.41	<0.001***
Moderate to vigorous PA (METs)	1224.0 (±1855.4)	140.0 (±139.5)	1836.2 (±2082.9)	17.08	<0.001***
Self-care management for T2D (d)	4.0 (±1.4)	3.4 (±1.5)	4.4 (±1.3)	11.49	<0.001***
Self-regulatory efficacy for T2D (point)	55.7 (±16.3)	50.1 (±16.7)	58.9 (±15.1)	9.41	<0.001***

Note. M: Mean; SD: Standard Deviation; PA: Physical Activity; T2D: Type 2 Diabetes; METs: Metabolic Equivalent of Tasks. Non-Adherence PA means under 450 METs/per week and Adherence PA means 450 METs or above per week.
****$p < 0.001$.*

TABLE 2. Factors associated with the physical activity by using a binary logistic regression.

Variable	Non-adherence PA					
	β	S.E.	Exp (β)	p	OR (95% CI)	
					Lower	Upper
Age (yr)	0.023	0.006	1.023	<0.001***	1.011	1.036
Body mass index (kg/m^2)	0.023	0.010	1.023	0.030*	1.002	1.044
Household income (~$25K increments)	−0.043	0.030	0.958	0.156	0.903	1.017
Rurality						
Rural	−0.381	0.225	0.683	0.091	0.439	1.063
Suburban	−0.095	0.145	0.910	0.513	0.685	1.208
Other	−0.355	1.189	0.701	0.765	0.068	7.216
Urban			Ref. (1.000–1.000)			
Education level						
High school or less	0.075	0.190	1.078	0.694	0.742	1.565
Some high school/2-Year degree/No degree	0.145	0.157	1.156	0.355	0.850	1.572
4-Year degree or more			Ref. (1.000–1.000)			
Marital status						
Never married	0.357	0.158	1.429	0.024*	1.049	1.947
Divorced/Separated	0.291	0.241	1.338	0.226	0.835	2.146
Widowed	−0.564	0.433	0.569	0.193	0.244	1.330
Married/Partnered			Ref. (1.000–1.000)			
Employment						
A student	0.149	0.484	1.161	0.758	0.449	3.001
Disabled	0.581	0.284	1.787	0.041*	1.025	3.115
Retired	0.485	0.277	1.624	0.080	0.944	2.797
Not employed	0.884	0.352	2.421	0.012*	1.214	4.831
Employed			Ref. (1.000–1.000)			
Number of chronic conditions	0.026	0.038	1.026	0.498	0.952	1.105
Self-care management for T2D (d/wk)	−0.361	0.059	0.697	<0.001***	0.621	0.783
Self-regulatory efficacy for T2D (point)	−0.016	0.005	0.984	0.001**	0.974	0.994

*Note. Reference group: Adherence PA group (450 METs or above per week). S.E.: Standard Errors; OR: Odd Ratio; CI: Confidence Intervals; PA: Physical Activity; T2D: Type 2 Diabetes; METs: Metabolic Equivalent of Tasks; Exp: Exponential value. Non-Adherence PA means under 450 METs/per week. ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.*

TABLE 3. Comparison of outcome variables in adherence to physical activity and age (Mean ± SD).

Variable	Non-Adherence PA		Adherence PA		F-value	*Post-hoc*
	(A) Young men (n = 190)	(B) Middle-aged and older men (n = 250)	(C) Young men (n = 450)	(D) Middle-aged and older men (n = 330)		
Self-care management for T2D (d/wk)	3.61 ± 1.35	3.28 ± 1.58	4.33 ± 1.27	4.42 ± 1.30	46.72***	A, B < C, D
Self-regulatory efficacy for T2D (point)	51.12 ± 16.04	49.25 ± 17.16	58.20 ± 14.91	59.88 ± 15.20	31.24***	A, B < C, D

*Note. Young men mean 21 to under 40 years old, and middle-aged and older men mean 40 years old and older. SD: Standard Deviation; PA: Physical Activity; T2D: Type 2 Diabetes. Non-Adherence PA means under 450 Metabolic Equivalent of Tasks (METs)/per week and Adherence PA means 450 METs or above per week. ***$p < 0.001$. All variables were analyzed by ANOVA.*

(30.2%), however, education levels were no significant differences between the two groups ($p = 0.074$). In addition, while more than half of each group was a married or partnered status similarly, participants who did not adhere to PA guidelines tended to be more likely to be single, divorced/separated or widowed compared to those who adhered to PA guidelines ($p < 0.001$). In employment status, 85.4% of employed individuals adhered to PA guidelines, significantly higher than the non-adherence PA group's individuals (65.3%) ($p < 0.001$). Adherents reported fewer chronic conditions, with an average of 2.3 (±1.7) compared to 2.9 (±2.1) among non-adherents ($p < 0.001$). Adherents also had significantly higher levels of moderate to vigorous PA, averaging 1836.2 METs (±2082.9) compared to non-adherents at 140.0 METs (±139.5) ($p < 0.001$). Additionally, participants who meet PA guidelines showed better self-care management for T2D, averaging 4.4 days per week (±1.3) compared to non-adherents at 3.4 days per week (±1.5) ($p < 0.001$), and higher self-regulatory efficacy, with PA adherents averaging 58.9 points (±15.1) compared to 50.1 points (±16.7) among non-adherents ($p < 0.001$). See Table 1 for a detailed breakdown of the sample characteristics.

A binary logistic regression analysis revealed several factors associated with adherence to PA guidelines among Black/African American men with T2D. Age was a significant predictor, with older individuals being less likely to adhere to PA guidelines (Odd Ratio (OR) = 1.023, $p < 0.001$). The higher the BMI, the higher the likelihood of not meeting the criteria for PA guidelines (OR = 1.023, $p = 0.030$), and employment status also influenced adherence, as unemployed individuals were more likely to be non-PA adherent (OR = 2.421, $p = 0.012$). Additionally, participants who did not meet PA guidelines are associated with lower self-care management for T2D (OR = 0.697, $p < 0.001$) and lower self-regulatory efficacy (OR = 0.984, $p = 0.001$). See Table 2 for detailed statistical analysis and associated factors.

Among Black/African American men with T2D, the comparison of self-care management and self-regulatory efficacy for T2D based on adherence to PA guidelines and age demonstrated significant differences. Specifically, both younger men (21 to under 40 years) and middle-aged and older men (40 years and older) who adhered to PA guidelines exhibited higher self-care management days (younger: 4.33 ± 1.27; middle-aged and older: 4.42 ± 1.30) compared to participants who non-adhering to PA guideline (younger: 3.61 ± 1.35; middle-aged and older: 3.28 ± 1.58) ($p < 0.001$). Also, PA adherents had better self-regulatory efficacy (younger: 58.20 ± 14.91; middle-aged and older: 59.88 ± 15.20) compared to non-PA adherents (younger: 51.12 ± 16.04; middle-aged and older: 49.25 ± 17.16) ($p < 0.001$). See Table 3 for a comprehensive comparison of outcome variables.

4. Discussion

This current study examined the relationship between adherence to PA guidelines, self-care management and self-regulatory efficacy among Black/African American men with T2D. The findings indicate that adherence to PA guidelines is significantly associated with better self-care management and higher self-regulatory efficacy in managing T2D. Specifically, those who adhered to the PA guidelines engaged in self-care management activities more frequently and demonstrated greater confidence in their ability to manage their condition. Furthermore, key factors such as age, BMI and employment status were identified as significant predictors of PA adherence. Younger participants and those with lower BMI were more likely to adhere to PA guidelines. Additionally, employed individuals showed higher adherence compared to their unemployed counterparts.

Participants who adhered to PA guidelines reported better self-care management for T2D, averaging 4.4 days per week compared to 3.4 days per week for non-adherents. Participants with better self-care management engaged in more vigorous PA, while non-adherents reported lower levels of moderate PA. Similarly, individuals with fewer chronic illnesses tended to follow PA guidelines more closely compared to those with a greater number of illnesses. An argument could be made that there is a positive linkage between complying with the recommended PA guidelines, illness management and the number of illnesses requiring self-management. In a previous study consisting of 500 patients living with T2D, approximately 105 patients had low adherence to PA compared to 395 patients [43]. One possible explanation for this could be the growing awareness of patients with diabetes which has contributed to reducing the frequency of sedentary lifestyles in the last decade. Likewise, a systematic review of the literature on adherence to PA among patients with chronic illnesses identified several key factors that can improve adherence to PA including characteristics of the exercise program, supervision, technology, self-efficacy and competence, exploration of patient's characteristics, barriers and facilitators, and social support and relatedness [44]. Previous work incorporating couple-based PA and exercise interventions conducted in other populations (*e.g.*, multiple varieties of clinical patients and their partners) show promising results with significant improvements in PA that were maintained over time [45, 46].

Our findings also demonstrated that higher self-regulatory efficacy for managing T2D was strongly associated with adherence to PA guidelines. Participants who adhered to PA guidelines reported significantly higher self-regulatory efficacy scores compared to those who did not meet the guidelines. This result aligns with previous research that indicates self-regulatory efficacy is critical in supporting consistent health behaviors, including PA, among individuals with chronic conditions such as diabetes [47]. Higher self-regulatory efficacy has been linked to better self-management practices, including regular PA, which is essential for maintaining glycemic control and preventing diabetes-related complications [16]. The current study supports these findings by showing that individuals with greater confidence in their ability to manage their diabetes through regular PA are more likely to adhere to recommended PA guidelines. Additionally, self-regulatory efficacy emerged as a significant predictor of PA adherence, with participants who did not meet the PA guidelines exhibiting lower self-regulatory efficacy. This finding highlights the importance of interventions that focus on enhancing self-regulatory efficacy to improve PA adherence among Black/African American men with T2D.

In addition, this study presented detailed results regarding

the differences in self-care management and self-regulatory efficacy based on age groups and PA adherence. Younger participants (aged 21 to under 40) who adhered to PA guidelines reported engaging in more days of self-care management activities compared to their non-adherent counterparts, consistent with a study that highlight the positive impact of PA on self-management behaviors in younger adults [48]. Similarly, middle-aged and older participants (aged 40 and older) adhering to PA guidelines demonstrated a higher frequency of self-care management activities compared to non-adherents. These results are also in line with research suggesting that regular PA improves self-care behaviors across age groups by enhancing individuals' perceived ability to manage their condition [49, 50]. Furthermore, adherence to PA guidelines was associated with higher self-regulatory efficacy scores across both age groups, indicating that PA plays a key role in boosting confidence in diabetes self-management. Notably, middle-aged and older adults who adhered to PA guidelines reported higher self-regulatory efficacy than younger non-adherents, further emphasizing the benefits of PA for sustaining effective self-management behaviors, regardless of age. These findings suggest that promoting PA adherence can lead to better self-care management and higher self-regulatory efficacy across diverse age groups in individuals with T2D.

This study has several notable strengths that enhance its validity and relevance in the field of diabetes management among Black/African American men. First, it utilized a large, nationally representative sample drawn from a cohort of Black/African American men with T2D. This contributes to the generalizability of the findings, addressing the historical underrepresentation of minority groups in diabetes research [5, 51]. The focus on Black/African American men with T2D highlights significant health disparities and provides insights that could inform tailored interventions aimed at improving health outcomes for this underserved population. Additionally, the study applied validated instruments for measuring key variables, including the SDSCA for self-care management [34] and the SED scale for assessing diabetes-specific self-efficacy [41]. The use of validated instruments ensures the reliability and validity of the collected data, allowing for more accurate results regarding the relationships between PA adherence, self-care management and self-regulatory efficacy. Despite its strengths, the study has limitations that may impact the interpretation of its findings. The cross-sectional design limits the ability to draw causal conclusions. The use of self-reported measures could contribute to recall bias, as participants may overestimate or underestimate their behaviors and practices. Another limitation is the absence of longitudinal data, which restricts the analysis of how self-care management and self-regulatory efficacy change over time, particularly in response to interventions aimed at increasing PA adherence. Without this perspective, the long-term effects of these interventions on T2D management remain unclear. Future research may consider evaluating the effectiveness of targeted interventions over extended periods to assess sustainability and impacts on health outcomes.

5. Implications

The findings of this study have significant practical implications for improving health outcomes among Black/African American men with T2D. Interventions aimed at increasing adherence to PA guidelines should prioritize enhancing self-care management and self-regulatory efficacy, as these factors are strongly associated with PA adherence [16, 52]. Healthcare providers and public health professionals should consider integrating comprehensive PA assessment and counseling into routine diabetes care, with a focus on building self-management skills and fostering self-efficacy. Moreover, tailored approaches may be necessary for different age groups to address specific challenges and behaviors. For instance, interventions for middle-aged and older men might focus on overcoming age-related barriers to PA and enhancing self-regulatory skills, while programs for younger men could emphasize the long-term benefits of establishing healthy PA habits early in their diabetes management journey [53].

Future research directions should include longitudinal studies to confirm these findings and assess the long-term impact of PA adherence on T2D management among Black/African American men. Such studies could provide valuable insights into the causal relationships between PA adherence, self-care management, and self-regulatory efficacy over time. Additionally, researchers should explore additional factors that may influence self-care management and self-regulatory efficacy in this population, such as cultural beliefs, social support systems and access to healthcare resources [5]. This comprehensive understanding could inform the development of more effective, culturally tailored interventions. Finally, future research should focus on developing and evaluating targeted interventions and policies specifically designed to improve health outcomes in this underserved and disproportionately affected group, potentially incorporating elements of self-determination theory to foster intrinsic motivation for PA and diabetes self-management [54].

6. Conclusions

This study highlights the critical role of PA adherence in promoting better self-care management and self-regulatory efficacy among Black/African American men with T2D. The findings underscore the need for targeted interventions that consider age, employment status and other sociodemographic factors in promoting PA adherence and improving diabetes outcomes in this population. By addressing these factors through tailored interventions and policies and by conducting further research to deepen our understanding of the complex relationships between PA, self-care and self-efficacy, healthcare providers and public health professionals can work towards reducing the disproportionate burden of T2D in this underserved population. Future efforts should focus on translating these findings into actionable strategies that can make a meaningful impact on the health and well-being of Black/African American men living with T2D.

AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

AUTHOR CONTRIBUTIONS

JHP and TP—led the study's design and conception, conducted the data analysis, and wrote and reviewed the manuscript. JHP—drafted the manuscript and participated in its review and editing. TP, LDS, MLS, MP and YZ—offered valuable feedback on the manuscript. All authors have read and approved the final version of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The protocol for this study was approved by the Institutional Review Board at Texas A&M University (IRB2023-1311M). Informed consent was obtained from all respondents before participation.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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