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Swimming pool accessibility

An analysis of not-for-profit community recreation facilities and collegiate recreational facilities

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Abstract: Accessibility of fitness center swimming pools is of great importance as individuals with disabilities seek greater fitness levels and healthier lifestyles. This study assessed swimming pool facility accessibility according to Americans with Disabilities Act (ADA) guidelines utilizing Section L of the Accessibility Instruments Measuring Fitness and Recreation Environments (AIMFREE) survey. Direct site visits were conducted for 118 swimming pools located in community-based and university-based fitness facilities across eight U.S. states. ANOVA analysis revealed significant differences in mean pool accessibility for facility age. Pairwise comparisons with Bonferroni adjustments of the significant main effects indicated that pools built after the ADA implementation were significantly more accessible compared to those constructed before the ADA, as well as those originally built pre-ADA but renovated afterwards. These results demonstrate relative levels of ADA compliance for these collegiate and not-for-profit community recreation swimming pools and provide initial descriptive and analytical data that can impact pool accessibility.

Keywords: AIMFREE survey, Americans with Disabilities Act, aquatics, compliance

1. Introduction

Swimming pools serve as important components of fitness and recreation facilities, offering substantial health and wellness benefits for participants. To promote inclusivity and equitable access to exercise and recreation, these aquatic facilities must be designed and maintained to be accessible to all users. However, inadequate accessibility remains a persistent barrier across settings, including university campuses and not-for-profit community centers. Individuals with mobility challenges often encounter barriers such as poorly designed entrances, inaccessible changing areas, and the absence of necessary assistive equipment, including pool lifts or sloped entries. These barriers limit opportunities for regular aquatic exercise and undermine the inclusive purpose of facilities intended to support health and well-being.

2. Literature Review

Numerous studies have highlighted that individuals with disabilities often forego physical activities for various reasons, but one specially identified is the lack of access to facilities, sometimes expressed as oppressive messages from the built environment (Nikolajsen et al., 2021; Richardson et al., 2017, Rimmer et al., 2008). Additionally, the maturation or aging process often leads to increased rates of hearing, vision, ambulatory, self-care, and independent living disorders, as discussed by Kraus (2015). Of particular concern is the reduced ambulatory ability, which includes walking and balance tasks, as it is closely linked to cardiovascular fitness that illuminates the potential deficits in physical activity across an individual's lifespan (Michael et al., 2005). By improving the accessibility of swimming pools and fitness facilities for individuals with disabilities, their specific needs are addressed and inclusivity and support for overall health and wellbeing is promoted. While research and attention to the issue of facility accessibility for fitness centers in general has been fairly well established (Cardinal & Spaziani, 2003; Figoni et al., 1998; Johnson et al. 2012; Nikolajsen et al., 2021; Piletic et al., 2013 Rogers & LaRue, 2019), the body of research focusing specifically on pool settings within fitness facilities is severely underdeveloped, with the literature reflecting a significant gap in this area. To date, there has been a conspicuous scarcity of extensive investigation, evidenced by the mere presence of a singular published study by Pike et al. in 2008. This lack of comprehensive research not only highlights a critical oversight in understanding the unique challenges and opportunities presented by aquatic environments but also underscores an urgent need for more thorough scholarly exploration to inform best practices and improve accessibility in these essential fitness amenities.

Approximately 13.5% of the United States' (U.S.) population has a documented disability (Houtenville et al., 2023). Within that population, Rimmer et al. (2005) noted that the significantly low physical activity level among individuals with disabilities may be connected to environmental barriers such as facility architecture, design, or accessibility. Engagement in physical activity for people with disabilities declines during adolescence, with the most rapid decline noted during the college years (Yoh et al., 2008). For these reasons, swimming pool access for individuals with disabilities remains important in all settings, especially within the college or university setting.

Swimming pools have been shown to be the most popular activity in recreation facilities, and those with disabilities were more likely to swim compared to their non-disabled peers in England (Kung & Taylor, 2014). A survey of 458 public facilities using National Benchmarking Services for a seven-year period, comprising more than 150,000 participants from various demographic backgrounds found white females aged 60 and up with a disability were more likely to engage in swimming compared to their male counterparts who used other fitness equipment (Kung & Taylor, 2014). Additionally, this study found that people with disabilities were more likely to participate in a fitness class led by an instructor compared to their non-disabled peers.

The use of swimming pools for exercise or therapy for individuals with disabilities has proven to be beneficial for numerous conditions. Conatser (2007) has summarized prior research indicating the benefits of swimming pool use for adapted aquatics and other services for a multitude of disabilities and conditions including Angelman syndrome (Rider & Modell, 1996), arthritis (Archer, 2002), asthma (Rosimini, 2003; Weisgerber et al., 2003), autism (Martinez, 2006; Yilmaz et al., 2004), cerebral palsy (Hutzler et al., 1998), multiple sclerosis (Broach & Dattilo, 2001), quadriplegia (Lieberman, Lytle, & Irwin, 2003), Rett syndrome (Bumin et al., 2003), spinal muscular atrophy (Figuers, 1999), along with cardiac rehabilitation (Cider et al., 2005), and orthopaedic rehabilitation (Koury, 1996). The swimming pool can provide a beneficial exercise environment for many individuals with disabilities as the aquatic setting can create a reduction in

stress on muscles and joints due to reduced gravitational forces as well as thermal advantages like reducing body heat during exercise (Archer, 2002; Darby & Yaekle, 2000). Given these noted benefits and therapeutic treatments within the swimming pool setting, it is increasingly important to consider ways to maximize access for all individuals.

Barriers to swimming pool use include a lack of physical access to transportation services for getting to the facility (pool) and overall facility accessibility; the competence and schedule of staff members; and policy implementation (French & Hainsworth, 2001; Kung & Taylor, 2014). Pool usage in the disabled community may also be informed by considering the intersection of race, culture, socioeconomic status, gender identification, and other demographic factors as well as their perceptions of exercise and leisure.

The Americans with Disabilities Act (ADA) of 1990 is the primary federal law governing accessibility in public and private facilities, with enforcement and related litigation further shaping compliance expectations (Robledo, 2013). The ADA was built on earlier civil rights legislation, particularly the Civil Rights Act of 1964 and Section 504 of the Rehabilitation Act of 1973 (Anderson et al., 1995). Together, these statutes established a stronger legal framework for equitable access, increasing accountability for public institutions, including collegiate and community aquatic facilities. Title III of the ADA requires access to public accommodations and applies to key elements of the built environment, including parking, accessible routes, restrooms, signage, exercise equipment, and swimming pools (Anderson et al., 1995). For aquatic facilities, compliance is particularly significant because it often requires specialized infrastructure, accessibility features, and associated costs (Caden, 2014).

Although the Americans with Disabilities Act (ADA) establishes minimum accessibility requirements, scholars have argued that accessibility should be viewed through the broader framework of Universal Design (UD), which seeks to create environments, products, and services that are usable by the widest range of individuals without specialized adaptation (Connell et al., 1997; Steinfeld & Maisel, 2012). Recent accessibility scholarship has increasingly emphasized user-centered design, disability inclusion, and the evaluation of environments based on actual participation experiences rather than regulatory compliance alone (Watchorn et al., 2023). Within sport and recreation contexts, Universal Design has been advanced as a framework for moving organizations beyond minimum ADA compliance toward more meaningful inclusion of athletes, spectators, employees, and community members with disabilities (Hums et al., 2016). Consistent with this perspective, Universal Design scholars argue that sport and recreation facilities should be designed to maximize usability, access, and inclusion for diverse populations while minimizing the need for specialized accommodations (Sholanke & Eleagu, 2024). Recreation and disability researchers have likewise highlighted the continuing influence of environmental barriers on participation among individuals with disabilities despite decades of legislative protections and accessibility standards (Carbone et al., 2021). Together, these developments reflect a shift from viewing accessibility primarily as a compliance issue toward understanding accessibility as both a regulatory and experiential dimension of inclusion. It should be noted that consistent with contemporary disability scholarship, this study primarily uses person-first language (e.g., individuals with disabilities). However, the authors recognize that some members of the disability community prefer identity-first language (e.g., disabled individuals) as an expression of disability identity and culture.

The purpose of this study was to examine the effects of facility setting and construction period on swimming pool accessibility. Using Section L of the AIMFREE Fitness Center and Swimming Pool Accessibility Professional Version survey (Rimmer et al., 2004), the study assessed ADA-

related accessibility in collegiate and community recreation pools and identified priority areas for improvement in facility design and management.

3. Methods

3.1. Research Questions

The following research questions guided this investigation:

1. What is the level of ADA accessibility for not-for-profit community recreation centers and collegiate swimming pools, and do any differences in overall accessibility rating exist in these two categories of pool facilities?
2. What differences in overall accessibility ratings exist in ADA accessibility for not-for-profit community recreation centers and collegiate swimming pools used in the recreation setting based upon the date of facility construction or renovation?
3. Which accessibility elements regarding the swimming pool facilities on the AIMFREE assessment survey are identified to have the highest or lowest levels of ADA compliance?
4. Which elements of swimming pool accessibility from the AIMFREE assessment survey using an item analysis perspective are different based upon factors of organization type or construction/renovation era?

3.2. Study Design

The methodology employed in this research was an observational study design, structured to assess the accessibility of swimming pool facilities. This evaluation was anchored upon the utilization of the Accessibility Instrument for Measuring Fitness and Recreation Environments (AIMFREE) assessment tool. The AIMFREE is a comprehensive survey instrument devised with 37 items categorized into 12 distinct domains. These domains encompass critical elements of pool accessibility including but not limited to, modes of pool access, texture, and safety features of deck surfaces, as well as the readiness and accommodations provided by lifeguard services. Each item in the AIMFREE instrument was designed to capture discrete accessibility attributes of the facilities under scrutiny. Based on the accumulation of positive responses to these items, each facility was scored and assigned a scaled summary score. This score was indicative of the facility's overall accessibility, providing a quantifiable measure that reflects the extent to which it complies with inclusive design principles. Complementing the subjective assessments of the AIMFREE survey, the research protocol incorporated the precise acquisition of physical measurements of the facilities. To achieve a high degree of measurement accuracy that is crucial for the validity of the study, the latest technology in laser measurement was engaged, using Leica DISTO devices. During site evaluations, the research team employed these highly accurate instruments to measure distances and dimensions within pool facilities that are pivotal in determining adherence to accessibility standards. Prior to the commencement of data gathering, an ethical review process was undertaken. Approval was secured from the designated Institutional Review Boards (IRBs), ensuring that the study's conduct adhered to the highest ethical standards, safeguarding participant and facility confidentiality, and compliance with relevant regulatory and ethical guidelines for research. This step was vital not just for the integrity of the study but also to uphold the trust and cooperation of the participating facilities and their staffs.

3.3. Instrumentation

The researchers utilized the swimming pools portion (Section L) from the 16 sections included in the full AIMFREE survey professional version (Rimmer & Riley, 2004). The 37 items from Section L relate to the physical aspects of the pool facility. These items were grouped into 12 areas including the following: doors, pool ledge, deck surface, pool access, pool lift, pool ramp, pool perimeter to accessible entry, transfer wall, entry area clear space, slow swimming area, depth markers, and lifeguards. Each item within the survey included a “yes”, “no”, or “not applicable” response, with the positive response indicating “meeting accessibility standards” for the item. Consistent with AIMFREE scoring procedures, criteria designated as "not applicable" were excluded from summary score calculations. Facilities were therefore evaluated only against criteria relevant to their specific design configuration and were not penalized when alternative compliant accessibility features were present.

A scaled summary score of this section was determined for each facility based on the standardized scoring procedures summarizing all of the items contained within the AIMFREE instrument. The AIMFREE survey has demonstrated excellent content validity along with good internal consistency, good Item Response Theory (IRT), and fair structural validity (Calder & Mulligan, 2014). Additionally, Rimmer et al. (2004) reported excellent test-retest reliability with an intraclass correlation score of 0.97 for the swimming pools section of AIMFREE.

3.4. Data Collection

This study included an analysis of 118 college and not-for-profit community recreation centers in order to assess pool facility accessibility in these settings and to compare the impact of construction or renovation date on accessibility levels. A stratified sampling approach was used to ensure representation across facility type (collegiate and not-for-profit community recreation facilities), geographic region, and construction era. Facilities were first categorized according to these characteristics before selection to provide a more representative sample of aquatic facilities. To assess the first research question, the responses for each of the 37 AIMFREE items were tabulated for each facility and a scaled score from 0-100 was determined for each pool based upon a standardized system, with points determined by positive accessibility attributes. This scoring system allows for the creation of a raw score, a scaled score, and a percentile for the overall pool accessibility (Rimmer & Riley, 2004). An overall mean score was determined for the sample as a whole and a comparison of mean scores based on facility type was determined via a one-way ANOVA analysis.

To assess the second research question, the scaled scores for the pool facilities based upon the survey input of the 37 items were compared via a 3 X 2 ANOVA (facility construction/renovation date, facility type) analysis, and any significant main effects were further assessed with Bonferroni adjusted pairwise comparisons. The construction/renovation date category included three groups: 1) Pre-ADA construction (prior to 1990), 2) Pre-ADA construction with facility renovation post-ADA (after 1990), or 3) Post-ADA construction (after 1990). The facility type included either the collegiate fitness facility setting or the not-for-profit community recreation center setting. The collegiate setting included public and private colleges and universities, and the not-for-profit community recreation facilities included both YMCA/YWCA or Y Center venues along with other community recreation centers.

The third research question was assessed using a rank order of the top-to-bottom survey items based on ADA-compliant responses. Those items with the highest level of positive responses of

"yes" for the AIMFREE represented the facility trait or attribute that was most compliant with accessibility standards. Those survey items with the lowest levels of positive responses represent the facility trait or attribute that was least compliant with accessibility standards.

The fourth research question was assessed via an item analysis for the 37 questions from Section L of the AIMFREE survey instrument. This included an analysis of positive responses related to ADA compliance with comparisons made via Pearson chi-square analyses for facility type (collegiate and not-for-profit community recreation) and construction/renovation date (pre-ADA construction, pre-ADA construction with post-ADA renovation, and post-ADA construction).

Throughout the data collection, all physical measurements within the facilities were made via Leica DISTO laser measuring devices. The data collection protocols were reviewed and approved by the appropriate Institutional Review Boards to ensure the protection of all research subjects. All data was directly collected by members of the research team on-site at all the pool facilities.

3.5. Statistical Analysis

To analyse the data collected in this study, various statistical methods were utilized. Initially, descriptive statistics were computed to summarize and describe the key characteristics of the data. This involved calculating measures like the mean, standard deviation, range, and frequencies for each variable to gain an overview of the data distribution. To compare the mean scores of the pools based on facility type, the researchers conducted a one-way analysis of variance (ANOVA). To further examine the data, a 3 X 2 ANOVA analysis was performed to compare scaled scores based on facility construction/renovation date and facility type. To assess significant main effects, Bonferroni-adjusted pairwise comparisons were conducted. This type of comparison helps determine if there are significant differences among multiple groups after considering the probability of making Type I errors. For evaluating the 37 items on the AIMFREE, Pearson chi-square analyses were used. These analyses tested for significant differences in response distributions for categorical variables. The statistical analyses were performed using SPSS version 24.0 software, with the alpha level for significance set at the .05 level.

4. Results

A stratified sample of 118 university and not-for-profit community recreation facilities across eight states (IA, IL, IN, MI, MO, OH, TX, & WI) provided ample data for analysis. The demographic characteristics of this sample included a range of facility construction from 1916 to 2010, and 45.5% of these facilities had undergone renovation since initial construction. These renovations included 42 projects completed after 1990 when the ADA was enacted. The fitness center-based swimming pools included 51 located within college or university settings and 67 located in not-for-profit community recreation center settings.

The first research question was assessed via one-way ANOVA analysis with accompanying descriptive statistics. For the sample population, the mean percentile score for the 118 pools assessed was 44.17 (SD = 23.5) with a range of 7.0 to 96.0. ANOVA analysis determined no significant difference, $F(1,116) = 0.143$, $p = .706$, between the mean percentile score for university pools ($M = 45.12 \pm 25.64$) and the mean percentile score for not-for-profit community recreation pools ($M = 43.46 \pm 21.91$). In general, these mean percentile scores would be noted as low, with all mean values reported falling below the 50th percentile. Pool accessibility is grounded in many factors, but first and foremost would be the provision for direct access to the swimming pool via one of five primary modalities. The survey identified five methods for water entry access in the

following rank order of prevalence: stairs with handrails (84.7%), seated lift/hoist (63.6%), zero depth entry (16.9%), ramp with handrails (11.9%), and transfer wall (2.5%).

The second research question was assessed via a 3 X 2 ANOVA (facility age, facility type) analysis that revealed significant differences in mean pool accessibility for facility age [$F(2, 112) = 7.12$, $p = .001$]. The significant main effects of facility construction/renovation era were further analysed by Bonferroni adjusted pairwise comparisons. The mean accessibility percentile score for swimming pools constructed post-ADA ($M = 52.77$, $SE = 3.03$) was significantly greater than pools constructed pre-ADA ($M = 38.28$, $SE = 5.16$) $p = .017$, and for pools constructed pre-ADA but renovated post-ADA ($M = 36.41$, $SE = 3.50$) $p < .001$.

University pools constructed post-ADA ($M = 57.57$, $SE = 4.68$) were significantly more accessible than pools constructed pre-ADA ($M = 33.90$, $SE = 7.10$, $p = .003$), and university pools constructed post-ADA were also significantly more accessible than university-based pools that were built pre-ADA but renovated post-ADA ($M = 35.44$, $SE = 2.68$, $p = .012$). No main effects were determined for facility type (community-based to university-based). Table 1 displays a summary of mean total pool accessibility percentile scores comparing collegiate and not-for-profit community recreation pools constructed or renovated pre-ADA and post-ADA, and Figure 1 graphically illustrates these findings.

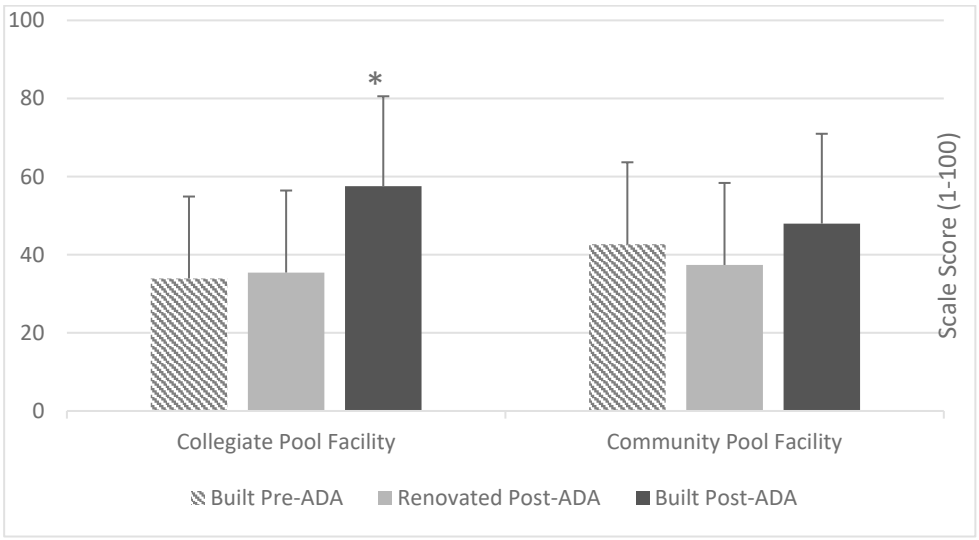
Table 1. Means Summary of 3 X 2 ANOVA (facility age, facility type)

Construction Timing	Stats.	University	Not-for-Profit Community
Built Pre-ADA (1990)	Mean	33.90	42.67
Built Pre-ADA (1990)	SD	22.73	21.81
Built Pre-ADA (1990)	N	10	9
Renovated Post-ADA (1990)	Mean	35.44	37.38
Renovated Post-ADA (1990)	SD	22.09	20.30
Renovated Post-ADA (1990)	N	18	24
Built Post-ADA (1990)	Mean	57.57*	47.97
Built Post-ADA (1990)	SD	24.71	22.57
Built Post-ADA (1990)	N	23	34

**Built Post-ADA for universities significantly more accessible ($p < .05$) than universities Built Pre-ADA or universities Renovated Post-ADA.*

The third research question was assessed via an item analysis of the 37 content items of the swimming pool section of the AIMFREE survey that aligned within the 12 item areas. The complete results of this item analysis for the full sample are displayed in Table 2 in the order of the survey instrument. It is of interest to consider both the items of the survey with the highest levels (an 80% or higher positive response) of compliance with accessibility standards including items with 1) Lifeguards present to assist at 95.8%, 2) Each accessible means of pool entry/exit connected to an accessible route at 93.2%, 3) Paths leading to and around the pool deck with a width of at least 3 feet at 89%, 4) Pool with a ledge to hold onto when entering the water at 88.1%, 5) Door entering the pool have a threshold of 0.5 inches or less at 86.4% 6) Clear space of at least 5’-0” x 5’-0” adjacent to each pool entry at 85.6%, and 7) Pool depth markers visible outside the pool and presence of pool stairs with railings both tied at 84.7%.

Figure 1. Mean percentile AIMFREE scores for fitness center pool facilities with SD



**Built Post-ADA for universities significantly more accessible ($p < .05$) than universities Built Pre-ADA or universities Renovated Post-ADA.*

The overall sample of pools also provided multiple items with very low levels of positive responses (below 10%) from an accessibility perspective including the following: 1) Access to the pool on a path without doors at 1.7%, 2) Presence of a transfer wall for pool entry at 2.5% along with the three transfer wall characteristics sub-items, 3) Presence of power assist features for door opening at 3.4%, and 4) Pool ramp landing length at least 5'-0" long at 9.3%. In total, there were 16 of 37 items in the survey with positive accessibility responses below 20%.

For research question four, item analyses were further reviewed based on two key study variables: (a) organization type (college/university or not-for-profit community recreation), and (b) construction/ renovation era (built pre-ADA, built pre-ADA but renovated post-ADA, built post-ADA. Table 3 summarizes the positive responses for each of the two organization types. The levels of positive responses were quite similar across the two organization types for the 37 items as would be expected given that this factor did not have a significant main effect as noted in research question 2. However, it should be noted that Pearson chi-square analyses did reveal three significant differences in the distribution of positive and negative responses amongst this sample. While 70.6% of the collegiate facilities had a detectable warning texture surrounding the pool, only 50.7% of the not-for-profit community recreation facility pools had warning textures, $\chi^2 = 4.72$, $p = .030$. A total of 80.6% of not-for-profit community recreation center pools for providing at least one accessible means of entry/exit for smaller pools (< 300' of linear pool wall) compared to 58.8% of collegiate pools, $\chi^2 = 6.76$, $p = .034$. Additionally, transfer walls as a means of pool access were significantly more prevalent in collegiate pools at 5.9% compared to the nonprofit community pools at 0%, $\chi^2 = 4.04$, $p = .044$.

The data for the variable of construction era was also compared, and Table 4 provides summary data for an item analysis of the AIMFREE swimming pool survey based upon the factor of construction/renovation era. Again, it should be noted that the chi-square survey item analyses indicated two areas of significant differences. Given the significant main effect of the construction/renovation era of the facilities noted in research question two, there appears to be more general variation in the percentage of positive responses amongst the three groups.

Table 2. AIMFREE Section L Item Analysis – Swimming Pools (N = 118)

Item Area	Item Content	Positive Response	Negative A or Missing Response	Response
Doors	Access without Doors	1.7%	98.3%	0%
Doors	Power Assist	3.4%	94.1%	2.5%
Doors	Threshold Height < 0.5”	86.4%	11.0%	0.8%
Pool Ledge	Present for Holding	88.1%	9.3%	2.5%
Deck Surface	Warning Texture at Edge	59.3%	40.7%	0%
Deck Surface	Clear Space 3’	89.0%	9.3%	1.7%
Pool Access	Pool lift/Hoist	63.6%	35.6%	0.8%
Pool Access	Wet/Dry Ramp	11.9%	88.1%	0%
Pool Access	Zero Depth Entry	16.9%	83.1%	0%
Pool Access	Transfer Wall	2.5%	97.5%	0%
Pool Access	Stairs with Rails	84.7%	14.4%	0.8%
Pool Access	Single Access Means	53.4%	23.7%	22.9%
Pool Access	Dual Access Means	66.1%	7.6%	26.3%
Pool Access	Access on Accessible Route	93.2%	2.5%	4.2%
Pool Lift	Lift Present	63.6%	35.6%	0.8%
Pool Lift	Descent Depth	62.7%	0%	37.2%
Pool Lift	Seat with Armrests	43.2%	19.5%	37.2%
Pool Lift	Footrest	32.2%	30.5%	37.2%
Pool Lift	Controls Accessible on Deck	59.3%	1.7%	38.9%
Pool Lift	Operation w/o Grasping	50.8%	11.0%	38.1%
Pool Ramp	Ramp Present	11.9%	88.1%	0%
Pool Ramp	Ramp Width 3’	11.0%	0.8%	88.1%
Pool Ramp	Ramp Slope less than 8.3%	10.2%	1.7%	88.1%
Pool Ramp	Ramp Landings Level	11.0%	0.8%	88.1%
Pool Ramp	Ramp Landing Width	11.0%	0.8%	88.1%
Pool Ramp	Ramp Landing Length	9.3%	1.7%	88.9%
Pool Ramp	Handrails Present	10.2%	1.7%	88.1%
Pool Perimeter to Accessible Entry	< 300’ with 1 Accessible Entry	71.2%	5.1%	23.7%
Pool Perimeter to Accessible Entry	> 300’ with 2 Accessible Entries	55.1%	15.3%	29.7%
Transfer Wall	Transfer Wall Present	2.5%	97.5%	0%
Transfer Wall	Width 12-16”	2.5%	0%	97.5%
Transfer Wall	Height 16-18” above floor	2.5%	0%	97.5%
Transfer Wall	Surface Non-abrasive	2.5%	0%	97.5%
Entry Area Clear Space	5‘x 5’	85.6%	7.6%	6.8%
Slow Swimming Area	Area Provided	62.7%	36.4%	0.8%
Depth Markers	Visible Outside the Pool	84.7%	14.4%	0.8%
Lifeguards	Present & Able to Assist	95.8%	3.4%	0.8%

Table 3. AIMFREE Section L Item Analysis – Swimming Pools by Organization Type

Item Area	Item Content	CollegeUniversity Positive Response n = 51	Not-for-Profit Community Positive Response n = 67
Doors	Access without Doors	2.0%	1.5%
Doors	Power Assist	3.9%	3.0%
Doors	Threshold Height < 0.5”	84.3%	88.1%
Pool Ledge	Present for Holding	88.2%	88.1%
Deck Surface	Warning Texture at Edge*	70.6%	50.7%
Deck Surface	Clear Space 3’	92.2%	86.6%
Pool Access	Pool lift/Hoist	68.6%	61.2%
Pool Access	Wet/Dry Ramp	15.7%	9.0%
Pool Access	Zero Depth Entry	9.8%	22.4%
Pool Access	Transfer Wall	5.9%	0%
Pool Access	Stairs with Rails	78.4%	89.6%
Pool Access	Single Access Means	52.9%	53.7%
Pool Access	Dual Access Means	60.8%	70.1%
Pool Access	Access on Accessible Route	90.2%	95.5%
Pool Lift	Lift Present	68.6%	61.2%
Pool Lift	Descent Depth	66.7%	059.7%
Pool Lift	Seat with Armrests	47.1%	40.3%
Pool Lift	Footrest	33.3%	31.3%
Pool Lift	Controls Accessible on Deck	58.8%	59.7%
Pool Lift	Operation w/o Grasping	52.9%	49.3%
Pool Ramp	Ramp Present	15.7%	9.0%
Pool Ramp	Ramp Width 3’	13.7%	9.0%
Pool Ramp	Ramp Slope less than 8.3%	13.7%	7.5%
Pool Ramp	Ramp Landings Level	13.7%	9.0%
Pool Ramp	Ramp Landing Width	13.7%	9.0%
Pool Ramp	Ramp Landing Length	11.8%	7.5%
Pool Ramp	Handrails Present	11.8%	9.0%
Pool Perimeter to Accessible Entry	< 300’with 1 Accessible Entry*	58.8%	80.6%
Pool Perimeter to Accessible Entry	> 300’with 2 Accessible Entries	58.8%	52.2%
Transfer Wall	Transfer Wall Present*	5.9%	0%
Transfer Wall	Width 12-16”	5.9%	0%
Transfer Wall	Height 16-18” inches above floor	5.9%	0%
Transfer Wall	Surface Non-abrasive	5.9%	0%
Entry Area Clear Space	5‘x 5’	84.3%	86.6%
Slow Swimming Area	Area Provided	66.7%	59.7%
Depth Markers	Visible Outside the Pool	80.4%	88.1%
Lifeguards	Present & Able to Assist	96.1%	95.5%

**Pearson chi-square significant difference in response distribution, p < .05*

However, the Pearson chi-square analyses for these 37 items revealed only two individual items with positive and negative response distributions that were significantly different than expected. This included pool access via a zero-depth entry that was significantly greater for post-ADA construction at 29.8% compared with both pre-ADA construction at 5.3% and pre-ADA construction with post-ADA renovation at 4.8%, $\chi^2 = 12.99$, $p = .002$. The presence of at least two accessible entry modes for pools with over 300' of perimeter was the other identified item with significant differences, $\chi^2 = 9.78$, $p = .044$, with post-ADA construction yielding 63.2% positive response compared with pre-ADA construction at 42.1% and pre-ADA construction with post-ADA renovation at 50% positive responses.

Table 4. AIMFREE Item Analysis for Section L – Swimming Pools by Construction/Renovation Era

Item Area	Item Content	Pre-ADA Construction Positive Response n = 19	Pre-ADA Construction Post-ADA Renovation Positive Response n = 42	Post-ADA Construction Positive Response n = 57
Doors	Access without Doors	0%	0%	3.5%
Doors	Power Assist	0%	4.8%	3.5%
Doors	Threshold Height < 0.5"	73.7%	88.1%	89.5%
Pool Ledge	Present for Holding	78.9%	88.1%	91.2%
Deck Surface	Warning Texture at Edge	68.4%	45.2%	66.7%
Deck Surface	Clear Space 3'	89.5%	81.0%	94.7%
Pool Access	Pool lift/Hoist	63.2%	57.1%	68.4%
Pool Access	Wet/Dry Ramp	0%	9.5%	17.5%
Pool Access	Zero Depth Entry*	5.3%	4.8%	29.8%
Pool Access	Transfer Wall	0%	0%	5.3%
Pool Access	Stairs with Rails	73.7%	90.5%	84.2%
Pool Access	Single Access Means	52.6%	57.1%	50.9%
Pool Access	Dual Access Means	57.9%	59.5%	73.7%
Pool Access	Access on Accessible Route	84.2%	88.1%	100%
Pool Lift	Lift Present	63.2%	57.1%	68.4%
Pool Lift	Descent Depth	63.2%	54.8%	68.4%
Pool Lift	Seat with Armrests	42.1%	31.0%	52.6%
Pool Lift	Footrest	26.3%	19.0%	43.9%
Pool Lift	Controls Accessi-ble on Deck	57.9%	50.0%	66.7%
Pool Lift	Operation w/o Grasping	47.4%	40.5%	59.6%
Pool Ramp	Ramp Present	0%	9.5%	17.5%
Pool Ramp	Ramp Width 3'	0%	7.1%	17.5%

Item Area	Item Content	Pre-ADA Construction Positive Response n = 19	Pre-ADA Construction Post-ADA Renovation Positive Response n = 42	Post-ADA Construction Positive Response n = 57
Pool Ramp	Ramp Slope less than 8.3%	0%	9.5%	14.0%
Pool Ramp	Ramp Landings Level	0%	9.5%	15.8%
Pool Ramp	Ramp Landing Width	0%	9.5%	15.8%
Pool Ramp	Ramp Landing Length	0%	7.1%	14.0%
Pool Ramp	Handrails Present	0%	9.5%	14.0%
Pool Perimeter to Accessible Entry	< 300' with 1 Accessible Entry	73.3%	80.5%	61.7%
Pool Perimeter to Accessible Entry	> 300' with 2 Accessible Entries*	42.1%	50.0%	63.2%
Transfer Wall	Transfer Wall Present	0%	0%	5.3%
Transfer Wall	Width 12"-16"	0%	0%	5.3%
Transfer Wall	Height 16"-18" above floor	0%	0%	5.3%
Transfer Wall	Surface Non-abrasive	0%	0%	5.3%
Entry Area Clear Space	5' x 5'	89.5%	81.0%	87.7%
Slow Swimming Area	Area Provided	57.9%	64.2%	63.2%
Depth Markers	Visible Outside the Pool	78.9%	78.6%	91.2%
Lifeguards	Present & Able to Assist	100%	95.2%	94.7%

**Pearson chi square significant difference in response distribution, p < .05*

5. Discussion

The present findings suggest that the ADA has contributed to meaningful improvements in swimming pool accessibility, particularly among facilities constructed after its enactment. Consistent with prior research, the ADA appears to have served as an important catalyst for accessibility improvements across built environments (Vierling, 2005). However, the findings also indicate that compliance-driven progress has not eliminated significant accessibility barriers. Although post-ADA facilities generally demonstrated stronger accessibility outcomes than facilities constructed prior to 1990, accessibility remained inconsistent across many evaluated features. As a result, accessibility should be viewed not as a completed regulatory objective, but

as an ongoing component of inclusive facility design and management that better aligns with Universal Design principles.

Since its passage, the ADA has evolved through regulatory refinements, culminating in the 2010 Standards for Accessible Design, which provided more specific guidance regarding aquatic accessibility requirements (Long, 2012). While these standards established clearer expectations for facility operators and designers, the present findings suggest that implementation remains uneven. Thus, continued assessment of aquatic facilities remains important to determine not only regulatory compliance but also the degree to which facilities facilitate equitable participation and inclusion (French & Hainsworth, 2001).

The first research question examined whether accessibility differed between university pools and not-for-profit community recreation pools. Although no significant differences were identified, the practical implication is that accessibility challenges appear to be widespread across both sectors rather than concentrated within a particular organizational setting. These findings are consistent with previous literature documenting persistent accessibility barriers in recreational and sport environments (Arbour-Nicitopoulos & Ginis, 2011; Cardinal & Spaziani, 2003; Rimmer et al., 2017). Consequently, accessibility improvement should be viewed as a shared responsibility among aquatic facility providers regardless of organizational type.

The findings further suggest that many facilities continue to rely on a limited range of accessibility features rather than offering multiple avenues for independent participation. Greater implementation of zero-depth entries, ramps with handrails, transfer systems, and other inclusive access modalities may better accommodate the diverse mobility needs of users while advancing the broader objectives of accessibility standards. Taken together, these results underscore the need to move beyond minimum compliance toward more comprehensive and user-centered accessibility planning.

The second research question explored the influence of facility age and organizational type on swimming pool accessibility. Facility age emerged as a more influential factor than facility type, with post-ADA facilities generally demonstrating stronger accessibility outcomes than pools constructed before the legislation. This finding supports earlier work by Pike et al. (2008), which similarly identified accessibility advantages among post-ADA facilities. However, the continued presence of accessibility deficiencies in newer facilities suggests that compliance with evolving standards has not consistently translated into comprehensive accessibility.

One of the most meaningful findings was the limited accessibility advantage observed among pre-ADA facilities that underwent renovation after ADA implementation. Although renovation is frequently assumed to improve accessibility, these results suggest that retrofitting may be constrained by financial resources, existing structural limitations, and competing priorities. Renovation projects often focus on infrastructure upgrades, aesthetics, spectator amenities, or competitive enhancements rather than comprehensive accessibility improvements. As a result, accessibility outcomes may be influenced more strongly by inclusive design principles incorporated during original construction than by subsequent retrofit efforts. These findings reinforce the importance of integrating accessibility considerations during initial planning rather than relying on corrective modifications after construction.

Similarly, the stronger accessibility demonstrated by post-ADA university pools relative to older university facilities further supports the importance of designing for accessibility from the outset. Taken together, these findings suggest that construction era exerts a greater influence on accessibility outcomes than organizational setting. In practical terms, accessibility appears most

effective when embedded in original facility design rather than addressed through piecemeal renovation efforts.

For facility managers, these findings highlight the continued importance of aligning both facility design and operational practices with ADA expectations. While accessibility regulations provide an essential framework for equitable access, the observed gaps between regulatory standards and actual facility conditions suggest a need for stronger implementation, monitoring, and accountability. Accessibility should therefore be viewed as both a design objective and an ongoing management responsibility.

The third research question examined item-level performance across the 37 AIMFREE accessibility indicators. A consistent pattern emerged in which basic accessibility features were more frequently present than features intended to provide independent and varied forms of access. High-performing items generally reflected fundamental compliance-related requirements, whereas low-performing items were concentrated among features that facilitate autonomy and flexibility. This pattern suggests that many facilities have successfully addressed baseline accessibility expectations while falling short of broader inclusive design objectives.

One particularly noteworthy finding involved the near absence of door-free routes to pool areas. Although unrestricted access paths may provide the least restrictive environment for individuals with mobility impairments, aquatic facilities must simultaneously address legitimate safety and security concerns. Consequently, this finding highlights an important tension between accessibility and risk management. Controlled access points are often used to prevent unauthorized facility use and reduce drowning risks; however, excessive reliance on manual doors may unintentionally restrict independent access. Emerging technologies, including automated access systems, proximity-activated doors, wearable-access devices, and monitored entry controls, may provide opportunities to improve user autonomy while maintaining appropriate safety considerations.

The findings also illustrate that accessibility is influenced by both facility design and day-to-day management practices. Some AIMFREE indicators assess structural characteristics determined during construction, whereas others reflect ongoing operational decisions involving staffing, equipment placement, circulation routes, and facility maintenance. For example, accessible deck space may be reduced through the placement of starting blocks, benches, or storage equipment even when the original design met accessibility standards. Consequently, accessibility in aquatic settings should be considered an ongoing operational responsibility rather than solely an architectural concern.

Analysis of pool-entry modalities further reinforced this conclusion. Although stairs with handrails and seated lifts were relatively common, several alternative entry options, including zero-depth entries, ramps with handrails, and transfer walls, were substantially less prevalent. These findings support previous recommendations advocating for a more diverse range of aquatic access options to accommodate varying functional abilities and user preferences (Butzer et al., 2021; Rimmer et al., 2017). Collectively, the item-level findings suggest that many facilities continue to emphasize a narrow set of accessibility solutions rather than providing multiple pathways to participation.

The fourth research question examined item-level accessibility differences according to organizational type and construction or renovation era. Although overall accessibility patterns were broadly similar across facility settings, several item-level differences emerged. These findings suggest that organizations may achieve accessibility through different approaches even

when overall accessibility outcomes are comparable. Thus, evaluating facility accessibility solely through overall scores may obscure important differences in the specific features that facilitate or constrain participation.

More broadly, the findings indicate that accessibility should not be evaluated solely through the presence or absence of specific physical features. Rather, accessibility reflects the cumulative effect of design decisions, operational practices, and organizational priorities. Continued collaboration among facility operators, designers, accessibility specialists, and users with disabilities will be necessary to develop more comprehensive strategies for enhancing aquatic accessibility (Arbour-Nicitopoulos & Ginis, 2011; Archer, 2002; Becker, 2009; Borson, 2010; Broach & Dattilo, 2001; Calder & Mulligan, 2014; Conaster, 2007). Ongoing assessment and monitoring will likewise remain important for promoting continuous improvement and ensuring that accessibility efforts evolve alongside changing standards and user needs.

Overall, the findings suggest that swimming pool accessibility has improved during the ADA era but remains incomplete across both collegiate and community recreation settings. Future progress will depend not only on compliance with minimum standards, but also on greater attention to design quality, operational practices, and proactive accessibility planning. By emphasizing inclusion as well as compliance, aquatic facilities can better support equitable participation for individuals with disabilities. Viewed from a Universal Design perspective, these findings suggest that many facilities have successfully implemented baseline accessibility features while failing to provide the broader range of access options needed to accommodate diverse user preferences and abilities. Universal Design principles in general emphasize flexibility, equitable use, and independence, all of which remain areas for continued improvement within aquatic environments.

Several limitations should be considered when interpreting these findings. First, the study employed a cross-sectional observational design and therefore cannot establish causality. Second, facilities were sampled from eight states and may not represent aquatic facilities across the United States. Third, assessments relied on evaluator observations and did not include formal inter-rater reliability testing for the present study. Fourth, the investigation focused on environmental accessibility and did not incorporate direct perspectives from individuals with disabilities. Finally, actual user experiences were not assessed. Future research should incorporate mixed-method approaches and stakeholder perspectives to provide a more comprehensive evaluation of aquatic accessibility. Consistent with Watchorn et al. (2023), the present findings suggest that environmental audits alone may not fully capture the lived experiences of individuals with disabilities, underscoring the value of incorporating user-centered assessments within future aquatic accessibility research.

6. Conclusion

The inclusion of individuals with disabilities in physical activity is widely recognized as both a matter of equity and an important contributor to health and well-being (Petersen & Piletic, 2006; Riley et al., 2008). Regular physical activity plays a well-established role in disease prevention, functional health, and quality of life, and swimming pools are especially valuable because they provide an adaptable setting for rehabilitative and recreational exercise. For individuals with disabilities, the aquatic environment offers distinct advantages, including buoyancy, support, and reduced mechanical stress on the body.

This study contributes descriptive and analytical evidence on swimming pool accessibility across collegiate and not-for-profit community recreation facilities and highlights the continued relevance of ADA-related accessibility standards in aquatic settings. Although significant differences were observed by construction and renovation era, overall accessibility scores remained only moderate to low, indicating substantial room for improvement. Future efforts should focus on the specific barriers identified in the 37 items of Section L of the AIMFREE instrument, including door accessibility, deck space for transfer and circulation, and accessible pool entry and exit modes. Future investigations should also seek to incorporate the perspectives of aquatic facility users with disabilities to better understand how observed accessibility features influence participation, independence, and overall recreational experiences. As this may reveal accessibility barriers not identified through environmental audits alone.

While ADA standards provide an important regulatory baseline, Universal Design offers a broader framework for creating aquatic environments that support participation, independence, and inclusion for individuals with diverse abilities. Future facility construction and renovation projects should seek to move beyond minimum compliance toward more comprehensive inclusive design practices. Future research should also continue to incorporate the voices of individuals with disabilities and members of the disability community to better understand how accessibility features influence lived experiences and participation.

As a whole, these findings underscore the need for targeted strategies in facility design, renovation, and operational management to reduce barriers to aquatic participation. Expanding pool accessibility is essential to promoting more equitable access to the physical, rehabilitative, and psychosocial benefits of aquatic exercise.

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