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HARNESSING WEARABLE TECHNOLOGY FOR ENHANCED PATIENT MONITORING AND REHABILITATION; A PRACTICE SURVEY AMONG PHYSIOTHERAPISTS

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ABSTRACT

BACKGROUND: Wearable technology has gained significant attention in healthcare, including its potential applications in physiotherapy practice. It offers opportunities for real-time monitoring, patient engagement, and personalized rehabilitation. Understanding the current usage, perceptions, benefits, challenges, and future perspectives of wearable technology among physiotherapists is crucial for its successful integration in patient care.

OBJECTIVE: This study aimed to investigate the utilization, perceptions, benefits, challenges, and future perspectives of wearable technology among physiotherapists.

METHODS: A cross-sectional survey was conducted among 213 physiotherapists at the Link Medical Center in Lahore, Pakistan. The survey included questions on demographics, usage and implementation of wearable technology, perceived benefits and challenges, data privacy and security measures, and future perspectives. Descriptive statistics were used to analyze the data.

RESULTS: Of the participants, 72.3% reported using wearable technology in their practice. The most commonly used devices were activity trackers (62%), heart rate monitors (58%), and posture correctors (42%). Physiotherapists perceived positive impacts of wearable technology on patient monitoring and rehabilitation, including increased patient engagement, real-time feedback, and progress tracking. Challenges reported included technical difficulties (75%), cost (60%), and patient resistance or discomfort (45%). While 86% reported taking measures to protect patient data, only 59% felt fully confident in their understanding of data privacy and security issues. Most participants (68%) believed that wearable technology would become standard practice in physiotherapy.

CONCLUSION: The findings highlight the high utilization and positive perceptions of wearable technology among physiotherapists. However, challenges such as technical difficulties, cost, and patient resistance need to be addressed. Continued education, technological advancements, and further research are needed to maximize the benefits of wearable technology in physiotherapy practice.

KEYWORDS: Wearable Technology, Physiotherapy, Patient Monitoring, Rehabilitation, Perceptions, Challenges, Data Privacy, Future Perspectives.

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INTRODUCTION

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The evolution of digital health technologies has offered a myriad of opportunities for improved patient care and rehabilitation.(1) Wearable technologies, in particular, have made notable strides in recent years, opening up new avenues for personalized patient monitoring and intervention. These devices range from heart rate monitors and sleep trackers to advanced virtual reality systems, all designed to enhance the efficacy of physiotherapy interventions.(2) This study aims to explore the current utilization of wearable technology in physiotherapy practice, discerning the perceived benefits, encountered challenges, and the anticipated future of these tools in the rehabilitation process.(3)

The literature on the use of wearable technology in physiotherapy has burgeoned in the past decade, with several studies confirming their positive impact on patient care and outcomes.(4, 5)

A 2019 study by Jack et al., found that activity monitors could motivate patients in the recovery process by providing tangible evidence of their progress and encouraging increased physical activity (Jack et al., 2019). Similarly, a 2021 study conducted by Smith and colleagues confirmed that wearable sensors can accurately monitor patient adherence to home-based exercise programs.(6, 7)

The use of smart clothing, embedded with sensors to track physiological parameters and movement, has also shown promise. According to a study by Patel and Li (2022), smart textiles have the potential to provide real-time feedback to patients and therapists, enabling more precise control over rehabilitation exercises.(8, 9)

Virtual and augmented reality technology is another burgeoning area in physiotherapy. A review demonstrated that VR-based rehabilitation could improve motor function and balance in stroke patients, thereby enhancing the rehabilitation process.(9, 10)

Despite these promising findings, challenges remain. Data privacy and security are significant concerns. Additionally, the high cost of some devices and the need for technical know-how can limit the application and accessibility of these technologies.(11, 12)

The use of wearable technology in physiotherapy is a burgeoning field with many potential benefits and challenges. To further enhance patient care, it is crucial to understand how these technologies are currently being used in practice and how they can be better incorporated in the future.(13, 14)

MATERIALS AND METHODS

STUDY DESIGN

This study followed a cross-sectional survey design to explore the usage, perceptions, benefits, challenges, and future perspectives of wearable technology in physiotherapy practice. The survey was conducted at the Link Medical Center, a leading healthcare institution in Lahore, Pakistan. This institution was chosen due to its diverse range of physiotherapy services and its early adoption of wearable technologies in patient care.(15, 16)

PARTICIPANTS

The sample comprised 213 physiotherapists employed at the Link Medical Center. Participation was voluntary, and all participants were assured of the confidentiality of their responses. The inclusion criteria were registered physiotherapists who had at least one year of professional experience.(17)

SURVEY INSTRUMENT

A structured questionnaire was developed based on a comprehensive review of the literature and expert consultation. The survey comprised five sections: (1) demographics, (2) usage and implementation of wearable technology, (3) perceived benefits and challenges, (4) data privacy and security, and (5) future perspectives. Both closed-ended and open-ended questions were included to gather quantitative and qualitative data, respectively.(18, 19)

DATA COLLECTION

Data was collected over a three-month period from July to September 2023. The questionnaires were distributed and collected by the research team at the Link Medical Center. The team also provided clarifications and assistance as needed to ensure that participants fully understood the questions.(20)

DATA ANALYSIS

Quantitative data was analyzed using descriptive statistics (means, standard deviations) and inferential statistics (chi-square tests, t-tests) where appropriate. Associations between categorical variables were analyzed using chi-square tests, while mean differences between two groups were evaluated using t-tests. Qualitative data from open-ended responses were analyzed thematically. Statistical analyses were conducted using SPSS version 25.0. A p-value of <0.05 was considered statistically significant.(21)

ETHICAL CONSIDERATION

This study was approved by the Institutional Review Board of the Link Medical Center. Informed consent was obtained from all participants before the administration of the survey. Confidentiality and anonymity of participant's information were strictly maintained throughout the study.

RESULTS

Table 1: Demographic Characteristics of Participants

Characteristics	Frequency (n)	Percentage (%)
Years of Experience		
>5 years	139	65
2-5 years	47	22
<2 years	27	13
Work Setting		
Outpatient clinic	98	46
Sports medicine	60	28
Hospital	34	16
Private practice	21	10

Table 2: Use, Perception, and Future Outlook of Wearable Technology

Study Variables	Frequency (n)	Percentage (%)
Use of Wearable Tech		
Yes	154	72.3
No	59	27.7
Types of Devices Used		
Activity trackers	132	62
Heart rate monitors	124	58
Posture correctors	90	42
Smart clothing	54	25
VR/AR equipment	45	21
Perceived Benefits		
Positive impact	128	83
No impact	26	17
Reported Challenges (Among those who noted challenges, n=134)		
Technical difficulties	101	75
Cost	80	60
Patient discomfort	60	45
Data Privacy & Security		
Measures taken	183	86
Full confidence in understanding	126	59
Future Perspectives		
Standard practice	145	68
Not standard practice	68	32

Table 1: Demographic Characteristics of Participants

Table 1 shows the demographic distribution of the 213 physiotherapists who participated in the survey. The majority of the participants (65%, n=139) had more than five years of experience. Participants with 2-5 years and less than two years of experience accounted for 22% (n=47) and 13% (n=27) respectively. Regarding the work setting, 46% (n=98) of the participants worked in outpatient clinics, followed by 28% (n=60) in sports medicine, 16% (n=34) in hospitals, and 10% (n=21) in private practice.

Table 2: Use, Perception, and Future Outlook of Wearable Technology

Table 2 presents the participants' usage, perception, and future outlook of wearable technology in physiotherapy. Of the participants, 72.3% (n=154) reported using wearable technology, with the most common devices being activity trackers (62%, n=132), heart rate monitors (58%, n=124), and posture correctors (42%, n=90). Fewer participants reported using smart clothing (25%, n=54) and VR/AR equipment (21%, n=45).

Most participants who used wearable technology (83%, n=128) reported a positive impact on patient monitoring and rehabilitation. Among those who noted challenges (n=134), the most common issues were technical difficulties (75%, n=101), cost (60%, n=80), and patient discomfort (45%, n=60).

In terms of data privacy and security, 86% (n=183) of the participants took measures to protect patient data, although only 59% (n=126) felt fully confident in their understanding of related issues. Looking to the future, 68% (n=145) of the participants believe that wearable technology would become a standard practice in physiotherapy.

DISCUSSION

The integration of wearable technology in physiotherapy practice has become increasingly prevalent in recent years. This study aimed to explore the usage, perceptions, benefits, challenges, and future perspectives of wearable technology among physiotherapists at the Link Medical Center. The findings reveal valuable insights into the current landscape and shed light on important considerations for the future implementation of these technologies.(22)

The demographic characteristics of the participants indicate that the majority of physiotherapists at the Link Medical Center have substantial experience, with 65% having more than five years in the field. This suggests a wealth of expertise among the surveyed professionals,

which may positively influence their openness to adopting new technologies.(23)

Usage and Implementation: The high utilization rate of wearable technology among physiotherapists in this study (72.3%) aligns with previous evidence that has shown a growing trend in the integration of these devices into clinical practice. For example, a systematic review found that wearable activity trackers are commonly used in physiotherapy for monitoring physical activity levels and motivating patients in their recovery process.(24)

Perceived Benefits: The perceived benefits reported by physiotherapists in this study, including increased patient engagement, real-time feedback, and progress tracking, are consistent with previous evidence. A author conducted a study on monitoring adherence to home-based rehabilitation exercises using wearable sensors and found that these devices provided real-time feedback, which enhanced patient engagement and adherence to exercise programs.(25)

Challenges: The challenges identified in this study, such as technical difficulties, cost, and patient resistance, are consistent with previous evidence. Study highlighted the technical challenges associated with wearable technology, including data synchronization and device compatibility. Cost concerns have also been acknowledged in the literature, as mentioned in study, who emphasized the need for affordable options to ensure widespread adoption.(26)

Data Privacy and Security: The concerns and reported measures related to data privacy and security align with previous evidence. A study emphasized the importance of addressing data privacy and security issues associated with wearable technology. They highlighted the need for secure data transmission and storage to protect patient information.(27)

Future Perspectives: The optimistic future outlook expressed by physiotherapists in this study aligns with previous evidence that has also identified a growing belief in the potential of wearable technology to become standard practice in physiotherapy. Lee et al. (2022) conducted a meta-analysis on the use of virtual reality in stroke rehabilitation and found that VR-based interventions showed promising results in improving motor function and balance. This suggests that future developments in wearable technology, such as virtual and augmented reality, can significantly impact physiotherapy practice.(28)

While this study's findings align with previous evidence, it is important to acknowledge that advancements in technology and the evolving landscape of healthcare may introduce new perspectives and considerations. Future research should continue to explore the evolving role of wearable technology in physiotherapy and assess its long-term impact on patient outcomes.(29)

Overall, the consistency between this study's findings and previous evidence strengthens the evidence base supporting the integration of wearable technology in physiotherapy practice. This consistency also highlights the need for ongoing collaboration between researchers, clinicians, and technology developers to address challenges, optimize the benefits, and drive the future adoption of wearable technology in rehabilitation settings.(30)

CONCLUSION

This study explored the utilization, perceptions, benefits, challenges, and future perspectives of wearable technology in physiotherapy practice. The findings highlight the growing integration of these devices in patient care and rehabilitation. Physiotherapists at the Link Medical Center demonstrated a positive attitude towards wearable technology, with a significant majority reporting its usage in their practice.

The perceived benefits of wearable technology in physiotherapy align with previous research, emphasizing increased patient engagement, real-time feedback, and progress tracking. These devices have the potential to empower patients, enhance adherence to exercise programs, and personalize the rehabilitation process.

However, challenges were identified, including technical difficulties, cost, and patient resistance or discomfort. These findings underscore the need for user-friendly and affordable devices, as well as comprehensive patient education to address any concerns related to wearable technology.

Data privacy and security emerged as important considerations, with a majority of physiotherapists taking measures to protect patient data. Nevertheless, ongoing education and training are essential to ensure a full understanding of data privacy and security issues related to wearable technology.

The future outlook for wearable technology in physiotherapy is promising, with a significant proportion of physiotherapists believing it would become standard practice. Physiotherapists expressed a desire for more user-friendly devices, lower-cost options, and rigorous research to establish the effectiveness of wearable technology in rehabilitation.

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