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Article *in* Technology and health care: official journal of the European Society for Engineering and Medicine · September 2012

DOI: 10.3233/THC-2012-0678

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Technology and Health Care 20 (2012) 297–304
DOI 10.3233/THC-2012-0678
IOS Press

Knowledge and use of Transcutaneous Electrical Stimulation (TENS) among Nigerian physical therapists

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Received in final form 4 May 2012

Abstract. *Aims and objective*: The purpose of this study was to evaluate the knowledge and the use of Transcutaneous Electrical Nerve Stimulation (TENS) by Nigerian physical therapists.

Methods: A cross sectional study design was carried out among Nigerian physical therapists. Eighty-six physical therapists participated in this study and data were collected using a structured and validated questionnaire. Copies of the questionnaires were distributed by hand and by mail (with self addressed envelopes) to various hospitals, clinics, universities that offer physical therapy services/programmes across Nigeria. Data were analyzed using descriptive statistics.

Results: Academic staff constituted 10.5% while 89.5% were clinicians. First degree holders constituted 61.6% while 38.4% had postgraduate degrees. Majority of physical therapists, 90.7% use TENS, 83% of those who use TENS are aware of the different types of TENS; 98.72% use TENS for 30 minutes or less, 48.7% use it for 15 minutes or less. The frequency commonly use is between 1–30 Hz and about 12.8% of those using this frequency believed that TENS relieves pain through the pre-synaptic inhibition, endogenous pain control, and direct inhibition of abnormally excited nerve and restoration of afferent input. Furthermore, 12.8% calibrated their TENS devices. Only 6.4% have published TENS related papers in the last five years while 29.5% have attended TENS related seminar in the past. Majority, 88.5% considered TENS to be cost effective.

Conclusion: This study concluded that TENS is widely used among Nigerian physical therapists and tend to have adequate knowledge of TENS and its application in the management of pain.

Keywords: Knowledge, TENS use, physical therapist

1. Introduction

Transcutaneous Electrical Nerve Stimulation (TENS) is a simple non-invasive electroanalgesic technique that is used extensively by health care professionals through application of battery powered device and electrodes which deliver electric current across the intact surface of the skin [1,12]. This is to provide

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a degree of pain relief (symptomatic) by specifically exciting sensory nerves and thereby stimulating either the pain gate mechanism and or the opoid system [14]. There are various types of TENS described in literature, namely, Conventional TENS, Acupunture-like TENS and Intense TENS. Conventional TENS is the most commonly used of all different types [6]. The distinguishing parameters are the frequencies, pulsed width and duration of usage, with patient's tolerance, comfort and rate of result expectation being some of the factors that decide the choice of the type of TENS to be used [3].

The use of TENS in a variety of medical conditions reports a wide range of outcomes, from very positive to negative effectiveness. Currently, there is an overall consensus supporting the use of TENS, with authorities differing on its values in different clinical situations [2,3]. According to Kaye and Brandstarter [3]; Johnson [9] there has been ongoing debate about the degree to which TENS is more effective than placebo in relieving pain and the percentage of patients who obtained pain relief vary, but typically in the region of 65% for acute pain and 50% or more for chronic pains.

A paramount area where there have been various contributions and debate is on the dosage of TENS. Many authors seem not to be specific on exact duration of TENS application and frequency use but seem to favour specified frequencies while some researchers seem to have supported frequencies of about 20–80 Hz or more, with statistics favouring 80 Hz [6]. An author has advocated for frequency range of 90–130 Hz [14]. There have been divergent views on various aspects regarding TENS, just as there are also focal points of views on the same TENS with reference to literature on results of researchers' postulations and assertions. However, the degree of familiarity with the TENS device physical therapists use today is one facet of many aspects regarding TENS that has yet to be given the attention it deserves.

The Nigerian physical therapists are not practicing in isolation as paucity of information on the use of TENS invoke challenging questions such as; how familiar are they with TENS? is TENS being used for placebo? is their choice of TENS parameters evidence based? how upstream are they with the ongoing trends as regards TENS? The aim of this study was to assess the knowledge and the use of TENS among Nigerian physical therapists.

2. Materials and methods

Eighty-six (86) physical therapists participated in this study. They were drawn from the six geopolitical zones across Nigeria. Data were collected using a structured and validated questionnaire.

2.1. Instrument

The questionnaire was self-developed. The content validity of the questionnaire was done by the panel of experts who are experienced in the field. Based on their comments, some questions were either restructured or expunged. The questionnaire was divided into two sections. The first section assessed socio-demographic information on age, gender, job nature, qualification, year of experience, provision for TENS device, effects of some external factors on physical therapists' use of TENS while the second section was on their involvement in TENS related seminar/researches, knowledge about TENS and their opinion about its effectiveness.

2.2. Procedure

Ethical approval from the Ethics and Research Committee of the Obafemi Awolowo University Teaching Hospitals Complex was sought and obtained. Then pilot study was carried out with 10 physical

Table 1
Socio-demographic characteristics of physical therapists

Characteristics	F	%
Gender		
Male	46	53.5
Female	40	46.5
Age		
< 25 years	25	29.1
26–40 years	45	52.3
41 – Above	16	18.6
Qualification		
First degree	53	61.3
Masters	26	30.2
Doctorate	7	8.5
Cadre		
Clinician	77	89.5
Lecturer	9	10.5
Work experience		
< 10 years	49	56.9
11–20 years	32	37.2
20 – Above	5	5.9

therapists and based on their responses and comments on the questionnaire, ambiguous questions were removed or modified and some other pertinent questions were added. Copies of the questionnaire were distributed to physical therapists via the heads of physical therapy departments by hands in some places while others were mailed to selected establishments with accompanying self-addressed envelopes. Those delivered by hand were collected on spot while majority were collected within two weeks of distribution. Those that were mailed to other regions of the country were received within two months of mailing dates.

2.3. Data analysis

Descriptive statistics of frequency, mode, range and percentages were used to summarize the data.

3. Results

Eighty-six Nigerian physical therapists participated in this study with 53.5% being males while 46.5% were female. Clinicians made up of 89.5% while 10.5% were lecturers in various higher institutions in Nigeria. About half of the respondents were within the age bracket of 26–40 years as shown in Table 1. More than one-third (37.2%) of the participants had work experience of 11 years and above while those with more 20 years experience were (4.6%) being the least. Two-thirds (61.3%) of the participants had first degree qualification with 38.7% having postgraduate qualifications.

Of all subjects, 90.7% reported using of TENS regularly while 9.3% who do not use as at the time of this study was as a result of non-availability and 12.5% attributed the cost of purchasing TENS as constraint. Access to TENS use was mainly through employer's provision which constituted 96.2% while 69.2% also claimed to have personal TENS devices. Physical therapists differed in their choice of frequencies for stimulation, with 67.7% of users of TENS, the frequency commonly used is between 1–30 Hz and about 12.8% of those using this frequency believed that TENS relieves pain through the pre-synaptic inhibition, endogenous pain control, and direct inhibition of abnormally excited nerve. About 50.0% of

Table 2
Knowledge, use and views of TENS by physical therapists

	Yes f (%)	No f (%)	Undecided f (%)
Use TENS ($n = 86$)	78 (90.7)	47 (52.6)	
Available patient and manpower affects use of TENS ($n = 78$)	41 (47.4)	47 (52.5)	
TENS can be combined with other treatment means ($n = 78$)	74 (94.9)	4 (5.1)	
There are different types of TENS ($n = 78$)	65 (83.3)	5 (6.4)	8 (10.8)
Same treatment duration effective for all indicated conditions ($n = 78$)	49 (62.8)	25 (32.1)	4 (5.1)
Recommend personal TENS for patient ($n = 78$)	50 (44.1)	28 (35.9)	
Access to updated literatures on TENS ($n = 78$)	25 (29.5)	53 (70.5)	
Calibrated TENS device(s) used ($n = 78$)	10 (12.8)	68 (87.2)	
Attend TENS-related seminar(s) before ($n = 78$)	23 (29.5)	55 (70.5)	
Published/presented in TENS-related research/seminar in 5 years ($n = 78$)	5 (6.4)	73 (93.6)	
Presently involve in TENS-related research ($n = 78$)	4 (5.1)	74 (94.9)	
TENS cost effective	69 (88.5)	6 (7.7)	3 (3.9)

Table 3
Frequency of TENS use, indications, contraindications and side effect of TENS

	F	%
Use TENS		
Daily	12	15.4
Weekly	27	34.6
Monthly	3	3.9
Occasionally	36	46.2
Indication for TENS	44	56.1
Symptomatic pain	10	12.8
Palliative care	1	1.3
Antimetic and tissue healing	19	24.4
All of the above	4	5.1
Contraindication to TENS		
Pregnancy	4	5.1
Pacemaker	35	44.9
Allergy	0	0.0
Dermatological effects	9	11.5
Anterior neck electrode placement	0	0.0
All of the above	5	6.4
None of the above	25	32.1
Side effect of TENS	11	14.1
Burns increased pain	4	5.1
Neurological effects	4	5.1
Allergy	29	37.2
All of the above	7	8.9
Others	0	0.0
Undecided	7	8.9

the respondents indicated that they have not read TENS related articles for over a year as at the time this survey was conducted. Only 12.8% of users of TENS indicated that they calibrate their TENS devices while only 50.0% who calibrated their TENS devices did so within six months. Of all users of TENS, 93.3% indicated that they explained mechanism of action of TENS to all patients before treatment.

4. Discussion

This study was conducted to evaluate the knowledge of physical therapists in Nigeria about TENS operation. The study revealed that there is a wide spread use of TENS in Nigeria among physical

Table 4
Knowledge about electrodes placement, duration of stimulation, frequency of stimulation, mechanism of action of TENS and determinants of choice of TENS parameters

	F	%
Electrode placement		
Nerve root	13	16.7
Dermatome/Myotome/Sclerotome	4	5.1
Trigger/Acupunture points	4	5.1
All of the above	52	66.7
None of the above	0	0.0
Undecided	3	3.8
Duration of stimulation		
01–5 minutes	38	48.7
15–30 minutes	39	50.0
30–40 minutes	0	0.0
45–60 minutes	1	1.3
Hours	0	0.0
Frequency of stimulation (Hz)		
01–30	25	32.1
31–60	15	19.2
61–90	12	15.4
91–120	7	9.0
120– above	2	3.9
Undecided	16	20.5
Mechanism of action of TENS		
Presynaptic inhibition	24	30.1
Endogeneous pain control	22	28.2
Direct inhibition of abnormally excited nerve	8	10.3
Restoration of afferent input	0	0.0
All of the above	10	12.8
None of the above	0	0.0
Others	1	1.28
Undecided	13	16.7
Determinants of choice of TENS parameters		
Patient's tolerance	14	18.0
Types of TENS	3	3.9
Experience	5	6.4
Condition	30	38.5
Physical effects of TENS	2	2.6
All of the above	23	29.5
None of the above	1	1.3

therapists. Although, majority of therapists that use TENS devices have access to it through provision by the employers. This corroborated the assertion of Robertson and Spurrit [13], Johnson [8], Reeve et al. [12] and Pope et al. [11] that physical therapists use TENS devices more regularly compared to other health professionals in the management of pain and other disease conditions indicated for. However, the study revealed that as against wide-spread reports in literature that TENS should be used as frequently as possible, majority of respondents in Nigeria uses it occasionally (46.2%) compared with those that use it on daily basis (15.4%).

Few physical therapists believe that TENS achieves its effect through presynapic inhibition mechanism (Pain Gate Theory) as explained by Melzack and Wall [10]. This may indicate that some physical therapists may not be aware that the 'Gate theory' is only an explanation of a mechanism for pain relief. Small percentage of respondents is aware of endogenous pain control explanation and direct inhibition of

Table 5
Types of TENS, effectiveness of TENS results usage rating

	F	%
Types of TENS ($n = 65$)		
Conventional	44	68.0
Intense	0	0.0
Acupuncture-like	3	4.6
Burst mode	11	16.9
All of the above	7	10.8
Others	0	0.0
TENS results are effective ($n = 78$)		
Strongly disagree	5	6.4
Moderately agree	4	5.1
Agree	31	39.7
Strongly agree	19	24.4
Undecided	4	19.2
TENS usage rating ($n = 78$)	11	14.1
Least used electrotherapeutic modality	34	43.6
Moderately used electrotherapeutic modality	22	28.2
Widely used electrotherapeutic modality	7	9.0
Most used electrotherapeutic modality	4	5.1
Undecided		

abnormally excited nerve mechanisms but they are unaware of restoration of afferent input mechanism.

This study revealed that most choices of TENS parameters by respondents are hardly backed by literature. Many respondents use duration of 30 minutes or less for stimulation. Johnson [8] reported that 20 minutes dosing regimen at daily, weekly or monthly intervals is likely to be ineffective. Frampton [2] suggested that TENS should be used for a minimum of 8 hours initially and reduced gradually. A study by Johnson [5,6] among patients, who were long-term users of TENS revealed that 75% experienced pain relief within 30 minutes while 95% experienced relief within 1 hour. More than 51% of patients had less than 30 minutes analgesia post TENS but only 30% had 1 hour of analgesia post TENS. Of all the patients, 75% had used TENS daily while 30% used TENS for more than 49 hours a week. Many respondents favour 15 minutes of TENS use because they choose conventional TENS as the only TENS type they are aware of. There appears to be contradiction because 15 minutes TENS stimulation is a characteristics of intense TENS, while limitless stimulation (pain threshold dependent) is a characteristics of conventional TENS [8]. Of interest, is that none of the respondents who use TENS indicated intense as the only TENS type they are aware of, but 10% indicated it along with conventional, acupuncture and burst mode TENS as the TENS type available which is in accordance with available literature.

Choice of frequencies treatment varies among physical therapists as revealed by this study. This is supported by studies that patient's tolerance is significant in parameter selection. Although a study by Johnson et al. [6] revealed that 20–80 Hz frequency produced the best analgesia of various frequencies tested, 80Hz producing greatest statistically reliable analgesia. Furthermore, Johnson et al. [4] reported variations in frequencies among different users. However, Frampton [2], suggested that the frequencies chosen by individual might be the comfortable frequencies which the patients could tolerate.

There may be some good understanding of TENS mechanism of pain relief by patients, but many may not have personal TENS to continue treatment at home because a significant number of physical therapists do not recommend personal TENS for patients. This may cause delay in the recovery process as various suggestions from various studies indicated that longer periods of stimulation and frequent stimulation using TENS creates better analgesia [7]. It may be difficult to achieve this aim considering the time spent by patients in outpatient clinics.

Worthy of note from the results of this study is that high majority of Nigerian physical therapists may not be current about latest developments on TENS and its related conditions as many do not have access to updated literature and research on TENS. This survey further revealed that there may be wide spread use of non standard TENS device and/or no-longer-standard TENS devices as overwhelming majority of respondents of users of TENS do not calibrate the TENS devices they use at all. Even those who calibrate their TENS devices hardly do so in every six months.

This study further revealed that there may be a dearth of TENS related research in Nigeria by physical therapists. This is because overwhelming majority of the respondents among TENS users have not published article in this area or engage in any research activities. This study also showed that majority of Nigerian physical therapists considered TENS to be effective in pain management. However, there seems to be variations in their views on how effective and how popular TENS is.

Experience is an important factor in clinical practice and this is applicable to the use of TENS as revealed in literature; however there was no clear cut inference that can be made on the effect of experience on the decision of the respondents in this study. For instance, experience determines the choice of parameters of TENS to be used while its effect was either latent or non-existent on the selection of the duration of stimulation. Only a respondent among TENS users used TENS up to an hour despite having respondents with 20 years of experience. This result negates finding from literature which identified experience and research as factors responsible for longer duration of stimulation and the choice of frequency selection using TENS. However, most respondents in the current study use frequencies within the range of 1 and 30 Hz contrary to that of 20–80 Hz reported by Johnson [4] and that of 90–120 Hz by Watson [14].

5. Conclusion

This study concluded that TENS is widely used among physical therapists in Nigeria and they have good knowledge about the electro-analgesia. Most of them uses a duration of 30 minutes or less and the choice of frequency of stimulation ranges between 1–30 Hz.

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