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ORIGINAL STUDIES

Development, validation and reliability of the Smith Toolkit for Integrated Health Related Quality of Life (STI-HRQoL)

Lynn Smith, Heather Morris-Eyton

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Abstract

Background. The current burden on the public healthcare system in South Africa has been exacerbated by a shortage of medical staff, insufficient consultation time and patients' inability to have regular health screenings due to financial constraints and logistical challenges. An integrated toolkit assessing health-related quality of life would be useful in identifying the areas that need improvement in disease management, enabling patients to reach their full potential.

Aims. This study aimed to develop a valid and reliable toolkit to assess the health-related quality of life of patients with hypertension, type 2 diabetes and cardiovascular disease in South Africa.

Methods. The study followed a sequential and exploratory mixed method research design. An expert panel of healthcare practitioners ($n_1=12$) and pilot group ($n_2=14$) underwent focus group discussions and semi-structured interviews. Test-retest was conducted on patients with hypertension, type 2 diabetes and/or cardiovascular disease ($n_3=257$). Principle component analysis was performed on all items. The Pearson and Spearman correlation coefficients, interclass correlation coefficient (ICC) and the coefficient of repeatability (CR) were computed to determine the relative and absolute reliability of the items.

Results. The long form (37 items) and short form (25 items) make up the final toolkit. Each questionnaire yielded an excellent Pearson's r (0.89*; 0.89*), Spearman's ρ (0.88*; 0.89*), and ICC (0.94; 0.94). The CR was considered acceptable, at $\pm 12.04\%$ for the long form and $\pm 12.50\%$ for the short form.

Conclusions. Both forms of the toolkit are highly reliable and provide healthcare practitioners with a comprehensive and cost-effective tool to assess and manage noncommunicable diseases.

Keywords: Assessment tool, chronic disease, disease management.

Introduction

The growing interest in the assessment of health-related quality of life (HRQoL) in patients with noncommunicable diseases (NCDs) has been highlighted in a study conducted amongst a Belgian population in 2020 (Van Wilder et al., 2020). In that study, HRQoL was referred to as “a key health outcome indicator”, which has resulted in the treatment of NCDs shifting from a problem-centred approach to a goal-oriented approach (Van Wilder et al., 2020). Although NCDs are not curable, the goals of such treatment should focus upon early detection and effective management (Luna & Luyckx, 2020). However, in addition to the current absence of a complete cure, HRQoL has shown to be significantly low in patients with NCDs and has been considered “an important predictor of morbidity and mortality” (Van Wilder et al., 2020). The current gap in assessing HRQoL across various diseases lies in the interpretation of the information and decision-making regarding treatment, based on the results of the assessment.

Not all healthcare practitioners are able to assess and treat patients holistically owing to the limitations of their scopes of practice. Limitations of assessment and treatment include time constraints during consultation, insufficient patient finances and the presence of comorbid chronic conditions (Torres et al., 2018; Eriksson et al., 2018).

A HRQoL toolkit that assesses all the dimensions of health and wellness would be ideal in offering patient-centred healthcare delivery and guiding the referral process. This toolkit would encourage a multidisciplinary team approach to healthcare, resulting in the comprehensive treatment and management of a patient. Since HRQoL is derived from the patient's own subjective views and experiences, the results can either be used as a starting point for treatment or can be integrated into existing therapy. It also poses benefits for disease management and decision-making at a health-policy level, especially with the inception of the National Health Insurance (NHI) initiative.

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The purpose of this research was thus to develop a toolkit that could assess the HRQoL of patients with hypertension, type 2 diabetes and cardiovascular disease (CVD). These three conditions were selected by the researcher as they are prevalent in South Africa and often coexist with each other (Mutymbizi et al., 2017). The novelty of this toolkit lies in its ability to assess three different NCDs. The toolkit consists of two questionnaires, a long form (37 items) and a short form (25 items). While attempting to eradicate the important factors contributing to morbidity and poor quality of life that are overlooked in the current literature, this research will supplement the attempts to prevent and adequately treat NCDs, which is in alignment with the United Nations Sustainable Development Framework, which aims to reduce the NCD epidemic on a global scale (Dugani & Gaziano, 2016). The short-form questionnaire was designed with the intention of screening patients in settings where assessment time is a major limitation. Within the South African context, it attempts to address the inequalities of the healthcare system stemming from the historic discrimination based on race and gender (Maphumulo & Bhengu, 2019).

Materials and methods

Research protocol

This study followed a sequential exploratory mixed method design. Quantitative and qualitative data were collected. Methods of data collection included focus group discussions, semi-structured interviews and questionnaire dissemination.

a) Period and place of the research

Data were collected at various healthcare facilities as well as online by means of a link to the questionnaire.

b) Subjects and groups

The Delphi technique was used with experts in healthcare disciplines ($n_1=12$) to ensure the rigour of the study. Patients recruited to complete the questionnaire were diagnosed with hypertension, type 2 diabetes and/or CVD ($n_3=257$). This group were required to complete the questionnaire over two-time intervals, three weeks apart. A sample of 14 participants took part in the pilot study and provided recommendations on the questionnaire.

c) Applied tests

Development of the long form

There were initially 61 items in the questionnaire before analysis. A total of 40 items were negatively worded to ensure that participants read each question. The negatively worded items were reverse scored. The Wilcoxon signed-rank test and test for marginal homogeneity were applied to all dimensions of the questionnaire (Physical, Mental and Socioeconomic Health Dimensions) to measure the level of agreement between test-retest items (King & Eckersley, 2019). Where no significance differences were found between the test and retest, it was assumed that stability over time was achieved. In borderline cases, where the p-value was close to 0.05, the crosstabulations were analysed to determine the of -diagonal cases.

The Kaiser-Meyer-Olkin (KMO) tests and Bartlett's test for sphericity were calculated to determine if a data reduction technique, such as principal component analysis, could be applied on the data collected. The KMO test was

utilised to determine if the data could be used for factor analysis and whether there were sufficient items for each factor (Glen, 2016). Values between 0.8 and 1 indicated sampling adequacy, while values below 0.6 required remediation (Glen, 2016). Bartlett's test for sphericity was calculated to determine if there was significance of correlations amongst all items in the questionnaire (Shrestha, 2021). Values greater than 0.05 showed statistical significance and demonstrated that factor analysis could be done (Shrestha, 2021; Ayuni & Sari, 2018).

Principal component analysis was done, and the communalities of each item were analysed for loadings of 0.3 or more (Field, 2017; Tan et al., 2015). Factor loadings larger than 0.3 signified reasonably high correlations between individual items and delineated factors, and were retained in the questionnaire (Field, 2017).

Cronbach's alpha and intercorrelations of the test-retest data were calculated to determine the internal consistency of the questionnaire. For internal consistency, the most agreed on minimum coefficient for new scales is 0.70 (Taherdoost, 2016). The Inter-item correlation was calculated to determine unidimensionality of a scale (Clarke & Watson, 2019). To assume this, a value between 0.15 and 0.50 was considered optimal (Clarke & Watson, 2019).

The relative reliability was calculated by means of the Pearson, Spearman and intraclass correlation coefficients (ICC). The coefficient of repeatability (CR) was calculated to determine absolute reliability (Chiwariidzo et al., 2017; Vaz et al., 2013). Test-retest reliability was calculated for each subscale that emanated from factor analysis, as well as for the long- and short-form questionnaires. When interpreting the Pearson, Spearman and ICC, agreement was measured on a scale of 0 to 1. The closer the value was to 1, the higher the reliability was said to be (Vaz et al., 2013).

Although reporting the Pearson's r , Spearman's ρ and ICC demonstrated the rigour of the test-retest scores, it had limited applicability in a clinical setting (Vaz et al., 2013). The CR determined the absolute reliability of the scale, as it takes measurement error into consideration (Vaz et al., 2013). The CR is useful as it was calculated on a 95% probability in both directions and reported a value that was in the same unit in which the scale was being measured (Vaz et al., 2013). In the context of this study, the unit of measurement was percent. In addition to the above motivation for the incorporation of CR into reliability studies, the CR is also particularly useful in clinical settings - not only because it reports more accurate results but also because it can detect modest changes over time (Vaz et al., 2013). Limits of agreement (LoA) between the test-retest of the same sample, as proposed by Bland-Altman, provide upper (UB) and lower boundaries (LB) within which the 95% probability falls between (Bland & Altman, 1986; Vaz et al., 2013). The upper and lower limits of agreement were calculated as below and plotted on scatterplots to understand the dispersion of the responses to the scale (Bland & Altman, 1986; Doan, 2018).

95% LoA (95% CI) UB = mean difference + 1.96 x standard deviation (differences)

95% LoA (95% CI) LB = mean difference - 1.96 x standard deviation (differences).

For interpretation, it should be expected when using the

same scale for repeated measures that the values obtained typically fall within the interval of the upper and lower boundaries of the LoA (Bartlett & Frost, 2008).

The mean difference (bias) between the test and retest was calculated by subtracting the mean test scores from the mean retest scores (Doan, 2018). A one-sample t-test was computed to determine if the biases differed significantly from zero (Guillén-Rogel et al., 2019). In cases where significant differences were observed, the effect size was determined. The following criteria were used for the interpretation of effect size: < 0.2 = trivial, $0.2 - 0.6$ = small, $0.6 - 1.2$ = moderate, and $1.2 - 2.0$ = large. The within-subject variance (WSV) was computed and reported the mean of the variance or difference of each individual participant in the sample, between the test and retest (Taylor, 2014). The square root of the WSV yielded the standard error of measurement (SEM) result (Samani et al., 2015). The SEM is an estimate of the range in which participants' true scores fall, denoted by \pm to reflect ranges (Jensen, 2015). To calculate the CR, the SEM was multiplied by 2.77 - derived from the square root of 2×1.96 (Vaz et al., 2013).

Development of the short form

Items with the highest inter-item correlations were selected to form part of the short-form questionnaire. The mean inter-item correlations and Cronbach's alpha were determined for each of the subscales. The bias between the test and retest was calculated and the correlation coefficients were computed. The correlation coefficients included the Pearson and Spearman coefficients, as well as the ICC. The WSV and SEM were calculated and the CR was determined.

The toolkit developed in this study consisted of a long form (37 items) and a short form (25 items). Each questionnaire had three dimensions, namely physical health, mental health and socioeconomic health. Both questionnaires were valid and reliable (Pearson's $r=0.89^*$; 0.89^* , Spearman's $\rho=0.88^*$; 0.89^* , ICC= 0.94^* ; 0.94^*). The coefficient of repeatability for the long form measure at ± 12.05 , while the short form yielded a repeatability of ± 12.50 .

d) Statistical processing

Audio recordings from focus groups and semi-structured interviews were transcribed and computed using Atlas.ti (8.4). In-vivo coding was used to analyse the transcribed data. Quantitative data were analysed using the Statistical Package for Social Science (SPSS) version 28.

e) Ethical considerations

The Institutional Research Ethics Committee (REC-01-04-2018) approved this study. Information letters were given to all participants, including the expert panel, pilot group and study sample. Consent was required from each participant prior to participation in the study.

Results

In Figure 1, it can be noted that the bias for the long form was 1.12. The upper and lower boundaries of the LoA were -10.75 and 13.00, respectively, and the CR was calculated as ± 12.04 . There were 15 participants (5.8%) of the sample who had a different response at the retest compared to the test.

Figure 2 demonstrates the bias, upper and lower

boundaries of the LoA, as well as the CR and outliers for the short form. The bias was 1.04 and the upper and lower boundaries of the LoA were 13.40 and -11.32, respectively. The CR was calculated as ± 12.50 , and there were 14 participants (5.4%) of the sample who fell outside of the 95% LOA.

Discussion

Long form

For the Physical Health, Mental Health and Socioeconomic Health Dimensions in the long form, the test-retest ICC and correlations are excellent (Koo & Li, 2016). The Physical Health and Mental Health Dimensions yielded excellent relative reliability owing to the high ICC and low CR. The ICC of both dimensions demonstrates 92% variance in the observed scores, attributed to variances in the true score and the remaining 8% of the variance of observed scores are attributable to error (Vaz et al., 2013). This result assumes that no changes in responses took place between the test and retest. It indicates that applying the same questionnaire over two time intervals in the future will yield the same results 92% of the time with a possible 8% error (Vaz et al., 2013). In the one-sample t-test for the Socioeconomic Health Dimension, the p-value was significant, reflecting that the difference between the test and retest results differed significantly from zero and therefore effect size was determined (Guillén-Rogel et al., 2019). The point estimate of the effect size is considered trivial. The ICC for the Socioeconomic Health Dimension means that there was 94% variance in the observed scores, which is attributed to variances in the true score and the remaining 6% of the variance of observed scores is attributable to error (Vaz et al., 2013). This position assumes that no changes in responses took place between the test and retest, which indicates that applying the same questionnaire over two time intervals in the future will yield the same results 94% of the time with a possible 6% error (Vaz et al., 2013). The SEM and CR for *relationships* subscale and the Socioeconomic Health Dimension are classified as acceptable (Ekstrand et al., 2015). If one were to apply the Socioeconomic Health Dimension in a clinical setting with an intervention, the patient would have to show an improvement of 16.31% or higher comparing test and retest for the improvement to be considered clinically significant (Vaz et al., 2013). Lastly, the *relationships* subscale and the Socioeconomic Health Dimension have high reliability owing to their high ICC (>0.81) and low CR ($<30\%$) (Chen et al., 2009).

When analyzing the long form with all 37 items, the p-value of the one-sample t-test was significant, which indicates that the difference between the test and retest results differed significantly from zero (Table I) (Guillén-Rogel et al., 2019). The effect size was considered trivial and the SEM and CR are considered acceptable (Ekstrand et al., 2015). In clinical practice with an intervention in place, patients would be required to demonstrate a change of $\pm 12.04\%$ for clinical significance (Vaz et al., 2013). The long form is classified as a highly reliable scale owing to the ICC of 0.94 being higher than 0.81, as well as the CR of 12.04% being below 30% (Chen et al., 2009; Koo & Li, 2016; Ekstrand et al., 2015).

Table I
Measures of relative and absolute reliability of the dimensions and the long form (n3=257).

Subscale	Test		Retest		Relative and absolute reliability indexes			
	Mean	SD	Mean	SD	r	ICC	Mean dif (Bias)	
Physical Health Dimension (13 items)	80.31	15.78	80.90	15.41	0.92	0.85* (0.88*)	0.92*	0.60
Mental Health Dimension (13 items)	72.02	17.19	73.52	16.86	0.92	0.86* (0.85*)	0.92*	1.50
Socioeconomic Health Dimension (11 items)	81.49	17.66	82.80	17.33	0.94*	0.89* (0.85*)	0.94*	1.31
Long form (37 items)	77.70	12.91	78.83	12.83	0.94*	0.89* (0.88*)	0.94*	1.12

Subscale	Relative and absolute reliability indexes							
	SD _{dif} between subject	t	p-value	95%LOA (95% CI) LB	95%LOA (95% CI) UB	Within-subject Variance (WSV)	SEM= (WSV)	CR
Physical Health Dimension (13 items)	8.68	1.11	0.27	-16.42	17.62	37.73	±6.14	±17.02
Mental Health Dimension (13 items)	9.00	2.67	0.01*	-16.15	19.14	41.49	±6.44	±17.84
Socioeconomic Health Dimension (11 items)	8.24	2.55	0.01*	-14.84	17.46	34.68	±5.89	±16.31
Long form (37 items)	6.06	2.97	0.00*	-10.75	13.00	18.91	±4.35	±12.04

SD = Standard deviation

r = Pearson's correlation coefficient (Spearman's rho); *Correlation is significant at the 0.01 level (2-tailed)

ICC = Intraclass correlation coefficient: two-way random effect model (absolute agreement definition)

t = t-statistic

95% LOA LB (95% CI of the LOA) = Bland and Altman 95% Limits of agreement Lower Boundary (95% Confidence intervals of the limits of agreement) = Mean(Dif) - 1.96 x SD(Dif) (Bland & Altman, 1999; De Vet, Terwee, Mokkink & Knol, 2011; Geerinck, Alekna, Beaudart, Bautmans, Cooper, De Souza Orlandi, Konstantynowicz, Montero-Erasquin, Topinková, Tsekoura & Reginster, 2019).

95% LOA UB (95% CI of the LOA) = Bland and Altman 95% Limits of agreement Upper Boundary (95% Confidence intervals of the limits of agreement) = Mean(Dif) + 1.96 x SD(Dif) (Bland & Altman, 1999; De Vet, Terwee, Mokkink & Knol, 2011; Geerinck, Alekna, Beaudart, Bautmans, Cooper, De Souza Orlandi, Konstantynowicz, Montero-Erasquin, Topinková, Tsekoura & Reginster, 2019).

SEM = Standard error of measurement

CR = 2.77 x SEM (Vaz et al., 2013).

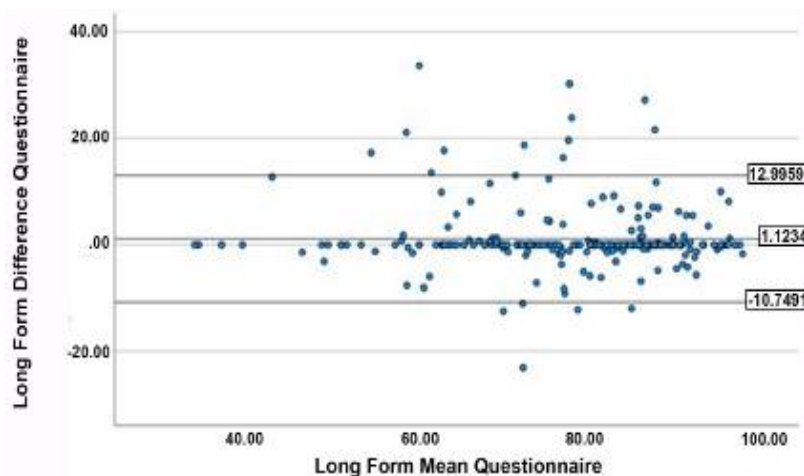


Fig. 1 – Bland-Altman difference plot for the long form.

Table II
Measures of relative and absolute reliability of the dimensions and the short form ($n_3=257$).

Subscale	Test		Retest		Relative and absolute reliability indexes			
	Mean	SD	Mean	SD	r	ICC	Mean dif (Bias)	
Physical Health Dimension (10 items)	77.23	16.42	77.81	16.45	0.92*	0.85*(0.87*)	0.92*	0.57
Mental Health Dimension (9 items)	73.14	17.29	74.68	16.66	0.90*	0.82*(0.83*)	0.90*	1.55
Socioeconomic Health Dimension (6 items)	81.47	19.93	82.47	19.67	0.94*	0.88*(0.86*)	0.94*	0.99
Short form (25 items)	77.28	13.75	78.32	13.41	0.94*	0.89*(0.89*)	0.94*	1.04

Subscale	Relative and absolute reliability indexes							
	SD _{dif} between subject	t	p-value	95%LOA (95% CI) LB	95%LOA (95% CI) UB	Within-subject Variance (WSV)	SEM= (WSV)	CR
Physical Health Dimension (10 items)	9.03	1.02	0.31	-17.12	18.27	40.75	±6.38	±17.68
Mental Health Dimension (9 items)	10.12	2.45	0.02*	-18.29	21.38	52.20	±7.23	±20.01
Socioeconomic Health Dimension (6 items)	9.76	1.63	0.10	-18.13	20.12	47.92	±6.92	±19.17
Short form (25 items)	6.31	2.64	0.01*	-11.32	13.40	20.35	±4.51	±12.50

SD = Standard deviation

r = Pearson's correlation coefficient (Spearman's rho); *Correlation is significant at the 0.01 level (2-tailed)

ICC = Intraclass correlation coefficient: two-way random effect model (absolute agreement definition)

t = t-statistic

95% LOA LB (95% CI of the LOA) = Bland and Altman 95% Limits of agreement Lower Boundary (95% Confidence intervals of the limits of agreement) = Mean(Dif) - 1.96 x SD(Dif) (Bland & Altman, 1999; De Vet, Terwee, Mokkink & Knol, 2011; Geerinck, Alekna, Beaudart, Bautmans, Cooper, De Souza Orlandi, Konstantynowicz, Montero-Erasquin, Topinková, Tsekoura & Reginster, 2019).

95% LOA UB (95% CI of the LOA) = Bland and Altman 95% Limits of agreement Upper Boundary (95% Confidence intervals of the limits of agreement) = Mean(Dif) + 1.96 x SD(Dif) (Bland & Altman, 1999; De Vet, Terwee, Mokkink & Knol, 2011; Geerinck, Alekna, Beaudart, Bautmans, Cooper, De Souza Orlandi, Konstantynowicz, Montero-Erasquin, Topinková, Tsekoura & Reginster, 2019).

SEM = Standard error of measurement

CR = $2.77 \times \text{SEM}$ (Vaz et al., 2013).

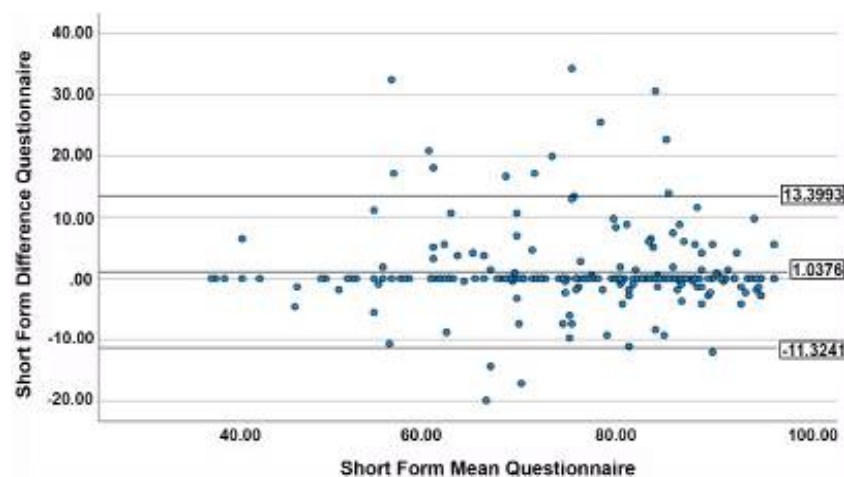


Fig. 2 – Bland-Altman difference plot for the short form.

Short form

According to Koo and Li (2016), the test-retest ICC for the Physical Health, Mental Health and Socioeconomic Health Dimensions of the short form can be considered excellent. Excellent relative reliability was yielded for all dimensions.

The ICC of 0.92 and 0.94 for the Physical Health and Socioeconomic Health Dimensions, respectively, means that there was 92% and 94% variance in the observed scores, which is attributed to variances in the true score (Vaz et al., 2013). The remaining 8% and 6% of the variance of observed scores is attributable to error (Vaz et al., 2013). Applying the same questionnaire over two time intervals in the future will yield the same results 92% and 94% of the time with a possible 8% and 6% error (Vaz et al., 2013). The SEM and CR of both scales was considered acceptable (Ekstrand et al., 2015). If one were to apply the Physical Health and Socioeconomic Health Dimensions of the short form in a clinical setting with an intervention, the patient would have to show an improvement of $\pm 17.68\%$ and $\pm 19.17\%$ when comparing test and retest results for the improvement to be considered clinically significant (Vaz et al., 2013). The Physical Health and Socioeconomic Health Dimension has high reliability due to its high ICC (>0.81) and low CR ($<30\%$) (Chen et al., 2009).

Computing the one-sample t-test for the Mental Health Dimension yielded a significant p-value, reflecting that the difference between the test-retest result differed significantly from zero (Guillén-Rogel et al., 2019). However, the effect size is trivial. The bias also lies within the confidence interval, which is the range in which would expect a patient to fall for 95% of future measurements (Bartlett & Frost, 2007). The SEM and CR are classified as acceptable (Chen et al., 2009). If one were to apply the Mental Health Dimension in a clinical setting with an intervention, the patient would have to show an improvement of 17.84% or higher comparing test and retest results for the improvement to be considered clinically significant (Vaz et al., 2013). The Mental Health Dimension is considered highly reliable due to its high ICC (>0.81) and low CR ($<30\%$) (Chen et al., 2009).

When analysing the short form with all 25 items, the p-value for the one-sample t-test was significant, and therefore indicates that the difference between the test and retest results differed significantly from zero (Table II) (Guillén-Rogel et al., 2019). The effect size is considered a trivial effect size. Although the bias was significantly different from zero, it falls within the confidence interval of -11.32 and 13.40, which is the range in which one would expect a patient to fall for 95% of future measurements (Bartlett & Frost, 2007). The SEM and the CR are considered acceptable as they are lower than 10% and 30%, respectively (Ekstrand et al., 2015). In clinical practice with an intervention in place, patients would be required to demonstrate a change of $\pm 12.50\%$ for clinical significance (Vaz et al., 2013). The short form is classified as a highly reliable scale owing to the ICC being higher than 0.81 and the CR of 12.04% being below 30% (Chen et al., 2009).

Conclusions

1. The diversity of the sample in this study revealed

a broad perspective of patients' needs and emphasised the urgency of equal and quality healthcare access to patients across all socioeconomic groups.

2. There is a need to improve and increase facilities, essential medication and equipment, and the resources available to healthcare practitioners.

3. Training programmes must be introduced to healthcare practitioners to ensure that they are better equipped to adequately assist, treat and educate patients. Understanding these challenges and how they can be compounded is vital for informing policy and the equal distribution of resources, especially with the enactment of NHI in South Africa.

4. The toolkit developed in this study, named the Smith Toolkit for Integrated HRQoL (STI-HRQoL), would be an ideal assessment tool for the South African population. Both the long and short forms were proven to be highly reliable scales.

5. The incorporation of Physical, Mental and Socioeconomic Health Dimensions into the toolkit not only provides a comprehensive overview of a patient's health and well-being, but also offers a cost-effective means of assessment.

6. In its current form, by means of paper and digital dissemination, the STI-HRQoL developed in this study requires minimal resources and can be completed while in the waiting area of a healthcare facility. Prospective methods of dissemination could include application and software development, with the inclusion of algorithms for easier scoring and interpretation of results.

Conflict of interests

None to declare

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Relationship between the posttraumatic stress disorder, nurses and fear, a PubMed approach

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Abstract

Background. Posttraumatic stress disorder (PTSD) is a serious syndrome that can occur in people who have experienced a traumatic event. Nurses are repeatedly exposed to stress and events of high psychological intensity. Fear is a state of tension proportional to the intensity of the danger and which disappears once the danger has been overcome.

Aims. Although studies so far prove interest in the relationship between PTSD and the field of nurses, in general, the relationship between these two fields and fear has been rarely investigated

Methods. In order to highlight the relationship between PTSD in nurses and fear, the keywords stress disorders and fear (PTSD+N+F) were selected for analysis. The time periods analyzed were from 1960 in 2018. The PubMed filters analyzed were: Sex (Gender) and Age.

Results. There is a increasing tendency of the number of publications, especially in 2018. The difference was significant between: B and Nr/year; B and B+F; Nr/year and 0-18, 19-44, 45-64, > 65 and > 80. Referred to the periods of time, the biggest increases were between 2015-2018 for both filters like and age.

Conclusions. The interest in the PTSD+N+F relationship is real and important, presenting a constantly evolving over time.

Keywords: post-traumatic stress disorder, nursing, fear, PubMed.

Introduction

Posttraumatic stress disorder (PTSD) is a serious and often invalid syndrome characterized by the recurrent re-experience of trauma in the sensory memory (Miller et al., 2018). The PTSD can occur in people who have experienced or witnessed a trauma, event, a natural disaster, a serious accident, a terrorist act, war or fight, rape or other violent personal attack (Mealer et al., 2007). The medical assistance system in the world is currently facing a critical deficit of competent nurses to meet the increasing needs of the patients (Chan et al., 2013). Repeated exposure to extreme stressors and the inability to adapt to this challenge can lead to the development of psychological disorders, such as the symptoms of post-traumatic stress disorder (PTSD) (Yehuda, 2002). Factors that contribute to the incidence of PTSD include the nurses' age, years in practice and level of authority (Garcia et al., 2014). In studies comparing NSA assistants with general nurses, the incidence of PTSD has decreased as the age of assistants has increased and there was an inverse relationship between years, experience as a medical assistant and the incidence of PTSD (Colville et

al., 2017). The nurses reporting PTSD are more likely to report burnout (Maslach et al., 1996). There was a positive correlation between medical errors and the patient's compromised safety when the assistant had symptoms of stress (Colville et al., 2017). PTSD is correlated with learning and fear (Van Etten & Anthony, 2001).

Hypothesis

Although studies so far prove interest in the relationship between PTSD and the nursing profession in general, the relationship between these two and fear is still little investigated.

Objectives

The objective of this study was to evaluate the interest in the relationship between post-traumatic stress disorder (PTSD) in nurses (= N) and fear (Fear = f), through an assessment of PubMed studies.

Material and methods

The information was retrieved from the PubMed database. The search was filtered as to include as the most

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recent the year 2019, until the pandemic, without limit in time backwards.

Keywords

In order to highlight the relationship between PTSD in nurses and fear, the keywords stress disorders and fear (PTSD+N+F) were selected for analysis.

Periods of research

The periods of time analyzed were the following: 1960-1969, 1970-1979, 1980-1989, 1990-1999, 2000-2009 and 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018.

PubMed filters

The PubMed filters chosen for analysis were: Sex and Age. Within each verified filter, a few sub-filters were analyzed:

a) For the "Sex" filter, the selected sub-filters were: male (M), female (F), male+female (M+F).

b) For the "Age" filter, the selected sub-filters were: birth-18 years (0-18); 19-44 years (19-44); 45-64 years (45-64); 65 years and over (> 65); 80 years and over (> 80).

Study design

The organization was carried out based on the following criteria:

- Analysis of the chosen keywords, in relation to the total number of publication (N).

- Analysis of the chosen keywords, in relation to the sub-filters and the average number of publication per year (N/Y).

Statistical evaluation

- The results obtained were analyzed using SPSS 19.0. statistical package.

- For continuous data examination, Student's t test was used.

- The differences were considered significant at a $p < 0,05$.

Results

1. Analysis for PTSD+N+F, related to the average number of publications per year (Fig. 1)

The highest number of publications was registered in 2018 (11); The smallest number of publications was registered in 2012, 2013 (4); From the beginning of the announcement of these publications on PubMed and until 2018, there is an increasing tendency of the number of publications, especially in 2018.

2. Analysis for PTSD+N+F, related to chosen filters

a) The sex filter (Table I)

The period of publications being 1985-2018, it is noted that the difference was significant between: B and N/year (0.006366), B and B+F (0.009231). All other differences were insignificant.

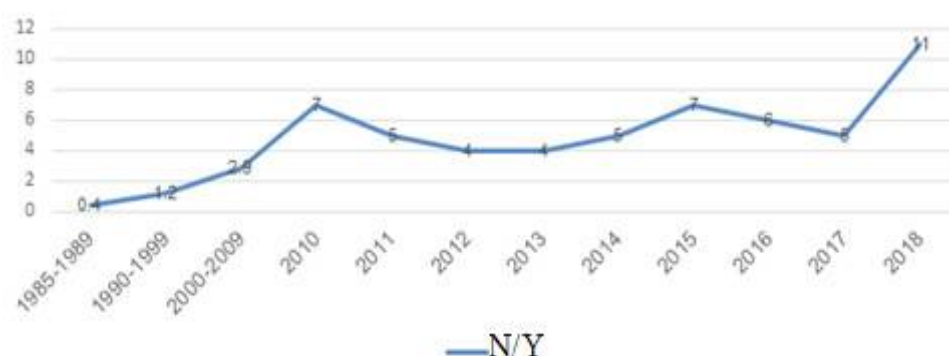


Fig. 1 – Analysis for PTSD+N+F, related to the average number of publications per year.

Table I

Statistical analysis for PTSD+N+F, regarding gender filter.

Period 1985-2018	N/Y	M	F	M+F
Mean	4.875	–	–	5.8
Standard derivation	2.68983426	–	–	4.4981478
p value related to N/Y	–	0.006366	0.203846	0.282132
p value related to M+F	0.282132	0.009231	0.121745	–

Table II

Statistical analysis for PTSD+N+F, regarding the age filter.

Period 1985-2018	N/Y	0-18	19-44	45-64	>65	>80
Mean	4.875	–	2.55	–	–	–
Standard derivation	2.6898343	–	2.3935678	–	–	–
p value related to N/Y	–	0.000327	0.021775	0.001457	0.000017	<0.00001
p value related to 19-44	0.021775	0.06637	–	0.151438	0.006732	0.000934

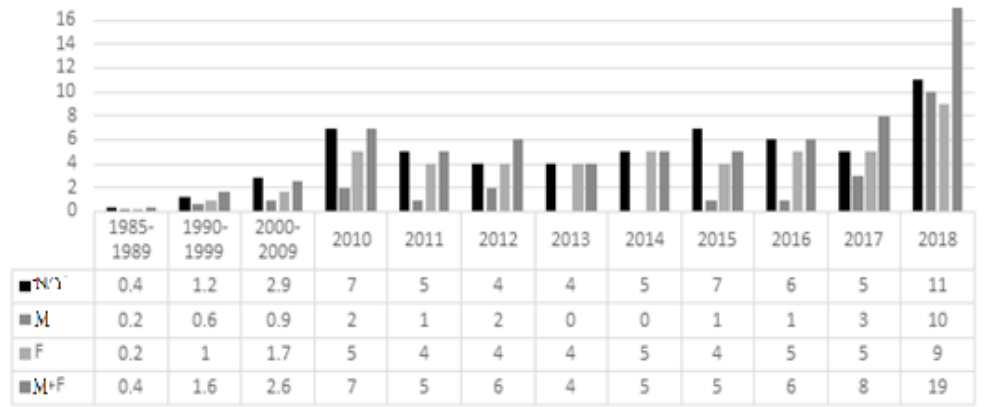


Fig. 2 – Analysis for PTSD+N+F, related to time periods, for sex filter.

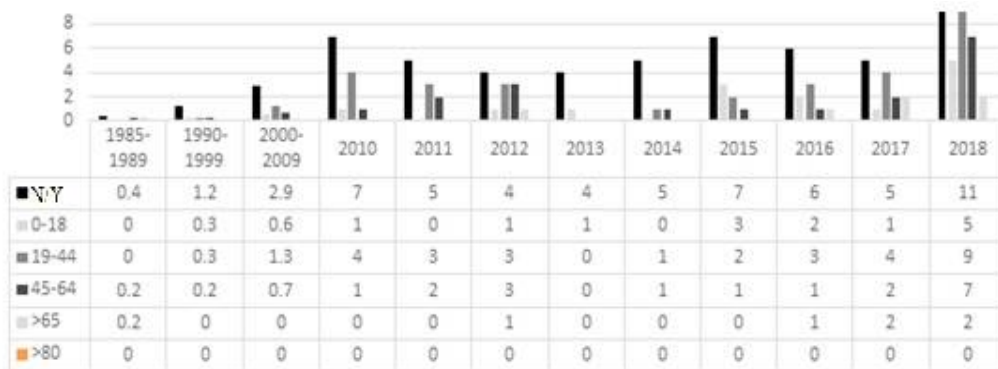


Fig. 3 – Analysis for PTSD+N+F, related to time periods, for the age filter.

b) Age filter (Table II)

The differences were significant: for all age intervals, related to n/year: 0-18 (0.000327), 19-44 (0.021775), 45-64 (0.001457), > 65 (0.000017), > 80 (<0.00001); Reported on 19-44, for > 65 (0.006732), > 80 (0.000934).

3. Analysis for PTSD+N+F, related to time periods

a) The sex filter (Fig. 2)

From the analysis of the graph it is found that: for B, F and B+F, n/year in the periods 1985-2009 it was the lowest and began to grow continuously after 2009, registering the largest increases in 2015 and 2018. Throughout the analyzed time interval, for B+F were the most publications, and the number of publications for F was constantly higher than for B.

b) Age filter (Fig. 3)

From the analysis of the graph it is found that: for 0-18, 19-44, 45-64, > 65, > 80, n/year in the periods 1985-2009 was the lowest and started to grow continuously after 2010, decreasing again in 2013, registering the biggest increases between 2015-2018. Throughout the analyzed time interval, for 19-44 were the most publications, and the number of publications for 45-64 was constant, higher than for 0-18 and > 65; > 80 having 0 publications.

Discussion

A. Research analysis

a) Analysis for keywords

An analysis was performed for the number of publications found in PubMed, analyzing the values on filters and subfilters, for PTSD, nurses and fear, using the keywords PTSD+N+F, for a total period of about 58 years.

For PTSD+N+F, the rhythm of publication has been progressive in time, proving that there has been an increasing interest for this subject, especially after 2017.

b) Analysis for Filters

Sex filter

The number of publications that mentioned both genders subjects was generally higher than the one in which male or female were mentioned. This aspect could be explained by the fact that the nurses are of both sexes, even if females predominate.

Age filter

The most numerous publications were for the 19-44 age, which shows the high interest for this age category. There are publication interests also for ages 0-18, 45-64 and >65 years, but not for >80 years. These results could be explained by the following: the active age of the nurses

is the young one, 19-44, but there are people who work before the age of 18, also many people are active between 45-64, and also after 65 years. Because the request for this profession is present regardless of age, the interest of research is understood for all age categories of nurses that are professionally active..

B. Literature analysis on the research topic

PTSD

PTSD appears in response to exposure to extreme stressor, being a very debilitating disorder, externalized by specific symptoms (Baxter, 2004). PTSD symptoms can occur years after exposure to trauma, and the duration of the illness can last a lifetime, affecting the patient's relationships with the family and the workplace (Olszewski & Varrasse, 2005). PTSD manifestations are due to the memory of a traumatic event of the past and are varied, among them being the sleep disorder, the threat sensation, the disposition disorders (Shalev et al., 2017). PTSD is triggered by distinct events and is therefore likely to studies on its early pathogenesis (Ben-Zion et al., 2019). The PTSD causes are varied, such as stressful events, in unique or multiple forms, isolated or repetitive, having consequences over long and debilitating that can lead to functional disturbances in the body (Kida, 2019). In the case of people with PTSD there is an intense conditional generalization in behavioral and cortical response, in several areas involved: the prefrontal dorsolateral and dorso-medial cortex, the left ventral hippocampus, the left and right island (Kaczurkin et al., 2017).

Fear and mechanisms involved

The hippocampus is involved in situations for conditioning fear, and the tonsil is involved in conditioning the fear of fear to simple or complex stimuli (Phillips & Ledoux, 1992). The hippocampal activity is developed during the acquisition of fear response, amygdala, being involved in processing changes in environmental relationships, has an activity that develops through experimentation (Knight et al., 2004). An important mechanism involved in the etiology of fear and anxiety is the classic conditioning, which also represents a method of regulating in anxiety disorders (Rachman, 1991; Dunsmoor & Paz, 2015). Another important mechanism for fear is the expression of the memory of fear, influenced by associative learning and which leads to the formation of new synapses in the adult brain (Yang et al., 2016).

PTSD and fear

People with PTSD suffer disorders in psychological processes: behavior, cognition, emotions, which in time cause adaptations of the function of the brain to maintain normality (Kida, 2019). PTSD is also defined in relation to fear: as a disorder of fear or, as an inhibition of it; thus, it is known that exposure to traumatic events that produce extreme fear and horror in military and civilian situations, but not all expositions of these kind are ended in PTSD (Jovanovic & Ressler, 2010). Patients with PTSD have a chosen response of fear, which is excessively generalized, and under safety conditions have an inability to inhibit the answers to fear, because at the base there is an inability to learn the safety signal and to modulate the answers of fear in a safety frame (Jovanovic et al., 2012). The response to trauma is related to the association of reactions to fear with

the initial trauma by conditioning the second order (Wessa & Flor, 2007).

PTSD and nurses

Nurses are often exposed to many stressors such as complexity and demands of the job, unrealistic expectations from patients and their families, ethical issues etc., due to which nurses may be predisposed to develop work-related psychological disorders (Mealer et al., 2009). Due to the stressful job characteristics, critical care unit nurses have an increased rate of absenteeism compared with general care nurses (Salmon & Morehead, 2019). Thus, critical care nurses exposure to traumatic events may be the source for the psychological distress, burnout syndrome and PTSD (Mealer et al., 2007; Mealer et al., 2017; Levi et al., 2021). Consequently, conditions in the intensive care unit can cause or aggravate PTSD, which are a potential risk for both nurse and patients health (Baxter, 2004). Another study has shown that after exposure to prolonged war stress, nurses had more PTSD symptoms compared to physicians (Ben-Ezra et al., 2007). It was also revealed that nurses who care for chronically ill children and do not express their grief, may develop symptoms of compassion fatigue (Meadors & Lamson, 2008). In their turn, nurses in various roles may encounter individuals with PTSD (Olszewski & Varrasse, 2005). As an advice, nurses should be able to identify signs of fatigue and to use coping strategies in order to revitalize themselves and minimize the risk of burnout (Maytum et al., 2003) and PTSD (Zhu et al., 2022).

Conclusions

1. Research on the combination of keywords chosen proves an increasing concern for the impact of PTSD in the life of the nurses, one of the consequences being fear.
2. Studies with subjects of both genres were preferred, and of these, the presence of women in studies predominated.
3. There was interest in most intervals corresponding to the professional active age of the nurses, but the interval between 19-44 years was predominant.
4. Research on PTSD, nurse and fear although it is reduced numerically proves a constantly growing interest of researchers for this subject.

Conflicts of interest

None to declare.

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Impact of free throws in basketball

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Abstract

Background. Basketball requires from specialists a complex approach to training through a harmonious and efficient combination of the skill related components that aim at a: physical, technical, tactical, theoretical and psychological preparation. The optimization of the technical and tactical performance of basketball players is conditioned by the implementation of an efficient and individualized game preparation process in relation to the age particularities and the level of specialized sports training.

Aims. The hypothesis of this preliminary study, started from the assumption that by applying some evaluation tests, one standardized and three designed by us, of the effectiveness of free throws at the basket, we would be able to demonstrate the effectiveness of implementing the innovative device in the specific process of sports training.

Methods. The evaluation was carried out by applying two categories: Category 1 – purpose, Category 2 – Disclosure of the standardized questionnaire called “Expert’s opinion template questionnaire on the impact of free throws in basketball”. The questionnaire was applied individually and completed using the Google Forms platform.

Results. The results show that the Cronbach’s indicator score is 0.982, which is one of the fundamental requirements for an assessment instrument to be reliable and consistent. The majority of coaches (85%) believe that free throw shooting can decide the success of a basketball game.

Conclusions. The overall conclusion is that by implementing the free-throw improvement device (“System and device for sport-specific motor learning and usage mode”) the result could be the standardization and improvement of sports training focused on free-throw improvement;

Keywords: communication, free-throwing, basketball, training, innovative device, motor learning.

Introduction

In basketball, which is a sport characterized by performing actions such as catching, shooting, passing, dribbling, etc., it is essential that players own excellent technical skills from an early age, which lowers the age selection (Guimarães et al., 2021).

The basketball game is subject to a continuous process of modernization both in terms of training, technique and specific tactics of attack and defense (Popescu, 2012). The performance level of basketball players is influenced and determined by the weight and quality of technical-tactical training, together with physical, psychological and theoretical training in all age-categories of children and juniors. The juniors’ technical training must focus on increasing the technicality level and efficiency of technical procedures in relations to multilateral sports training

(Badau, 2006).

A successful free-throw requires good concentration, but the most important element is proper biomechanics execution. However, a biomechanical movement alone may not be responsible for a successful free-throw shooting in a basketball game, admitting that the percentage of valid shots in training is significantly higher than in the official game (Kozar et al., 1995). Rist (2000) believes that there are two basic styles used in free-throw shooting:

- the throw that causes the ball to be pushed with the hand underneath it (overhand push shot);
- a two-handed shot with the ball supported from above (underhand loop shot).

The success of a free-throw is ensured by the coordination of specific movements in relation to the anthropometric aspects of the players, the posture during

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the throw, the trajectory of the throw and the different levels of consistency between the angle of the joints involved in the movement and the speed of the throw (Pakosz et al., 2021; Verhoeven & Newell, 2016; Badau et al., 2022).

The basketball game requires from the specialists a complex approach to training through the harmonious and efficient combination of the skill related components that aim at a: physical, technical, tactical, theoretical and psychological preparation. The optimization of the technical and tactical performance of basketball players is conditioned by the implementation of an efficient and individualized game preparation process in relation to the age characteristics and the level of specialized sports training.

The technical and sport performance is determined by an early initiation, but also by the duration and volume of specific training in basketball (Ghe u, 2012). Basketball is a sports game with a wide range of technical-tactical actions that contribute to the multilateral development of the players. The sequence and complexity of the basketball game phases stimulates the creativity of the players in terms of manifesting their physical, technical and tactical potential.

Free-throw success is considered a major cause in winning a basketball game. The dynamism of the game is determined by the requirements, the coaches' creativity, the dynamics of specific information technologies, the scientific and modern approach of the training methodology. Basketball is a sport, a team game, and in the course of the game there is frequent physical contact between players attacking and defending individually.

The analysis of the technical elements specific to basketball must be carried out in reference to the rules, the interrelated components of sports training and the dynamics of evolution and development of basketball technique and tactics (Ghi escu, 2016). The entire muscular system is involved in making free-throws in basketball, influencing the accuracy's power and effectiveness of the shot. The forces involved in the shot begin in the lower limbs, running through the whole body and ending in the arms, specifically the fingers, to determine the optimal speed and force for shooting the ball into the basket (Blazevich, 2013; Okubo & Hubbard, 2006).

The success rate of an individual and a team in a match decides its overall victory (Miftari et al., 2021; Palmer et al., 2018). The team attacking to form a good position for successful shooting uses different attack patterns (Ibáñez et al., 2018) in order to allow the player to make a successful shot at the basket and not miss. The shooter's position is basically stable to the point of pulling the ball to the shooting guard (Liu & Burton, 1999; Gablonsky & Lang, 2005).

Hypothesis

Based on the assumption that by implementing the innovative device designed and intended for the improvement of free-throw shooting, known as "System and device intended for sport-specific motor learning and usage mode - System and technical device intended for the motor learning process in the field of sport science and physical education with direct applicability in basketball-specific training - improvement of free-throw shooting", it

is possible to improve the technique and efficiency of free-throw shooting and implicitly of the sport training process in order to improve the specific free-throw finishing procedures in the game of basketball.

Material and methods

a) Period and place of the research

The preliminary study was conducted between 01.03.2019 - 10.05.2019 and was structured as follows: 01.-12.04.2019 questionnaire development; 14-30.03.2019 application of the questionnaire to the coaches; 01-03.04.2019 centralization of the results, 04-10.05.2019 processing and interpretation of the results of the questionnaire.

b) Subjects and groups

The specialist sample consisting of 20 subjects was made up of active coaches of basketball who informally agreed to participate. They were asked to give their opinion on the importance of free throws and the implementation of system and devices designed to improve technical execution and the rate of baskets scored from free throws.

c) Applied tests

In this study, a standardized questionnaire called "Model Questionnaire of Expert Opinion on the Impact of Free Throw Shooting in Basketball" was applied, consisting of 14 items with 5 response options, including a series of specific items addressing the motor learning process in the field of sport science and physical education with direct applicability in basketball specific training - free throw improvement.

Evaluation of the questionnaire - for the evaluation of each item of the questionnaire we used 4 levels of appreciation, where the score was: 1 point - total agreement, 2 points - partial agreement, 3 points - neither agreement nor disagreement, 4 points - disagreement, 5 points - total disagreement, which were managed and completed online using the Google Form platform.

d) Statistical processing

In the preliminary research we calculated the following statistical indicators: X - arithmetic mean of scores, SD - standard deviation, t - Student's t-test, p - level of probability, 95% CI - confidence coefficient with the lower and upper two levels, - Cronbach's Alpha; KMO-B - Kaiser-Meyer-Olkin test - to measure research's adjustment.

Results

The most relevant results and statistical processing of the coach group will be detailed in the following tables:

The internal consistency of the results was very good as shown by the Cronbach's Alpha value of 0.982, which gives us statistical validation of the questionnaire and item results.

The KMO and Bartlett's Test results show a normal distribution of the questionnaire results.

The results of the two statistical parameters in conjunction with the probability threshold values p 0.000 statistically validate the designed and implemented questionnaire and its results in the preliminary research.

Based on these results and the statistical processing, we considered the results and the questionnaire relevant for this preliminary study (Table I).

Table I

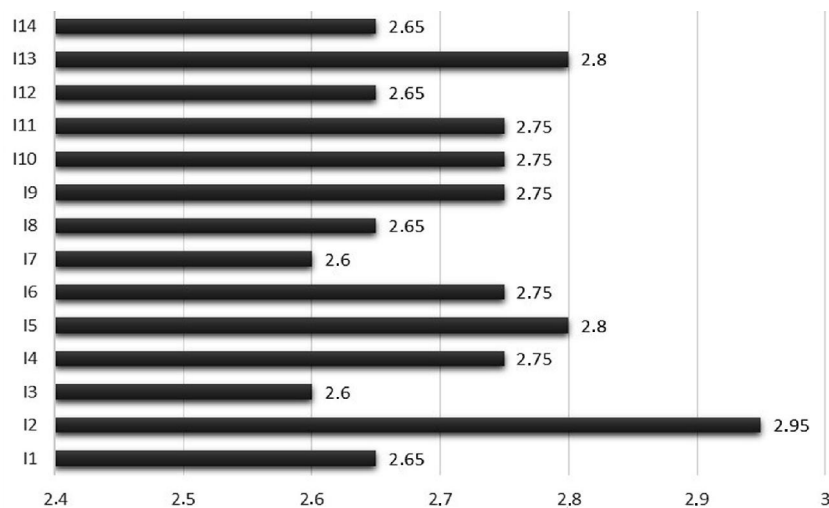
Rehabilitation and statistical normality results of the Model Expert Opinion Questionnaire on the impact of free-throws in basketball.

Statistical tests	Static reliability	KMO and Bartlett's Test		
Statistical parameters	Cronbach's Alpha	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Bartlett's Test of Sphericity - Chi-Square	P
Results	.982	.634	629.179	.000

Table II

Descriptive statistics of the Model Expert Opinion Questionnaire on the impact of free throws in basketball.

No. item	Items	X	SD	t	p	95% CI	
						Lower	Upper
1	Do you think free-throw is a crucial factor in the basketball's economy?	2.650	1.843	6.430	.000	1.787	3.512
2	Do you think that free-throw improvement needs to be implemented in the training of young players?	2.950	1.820	7.248	.000	2.098	3.801
3	Do you think free-throw shooting can influence technique in sports training?	2.600	1.788	6.500	.000	1.762	3.437
4	Do you consider it necessary to develop a device designed to improve free-throw shooting?	2.750	1.773	6.935	.000	1.920	3.579
5	Do you think that by implementing a device designed to refine the free throw, a dynamic automatism/stereotype can be achieved?	2.800	1.852	6.760	.000	1.933	3.667
6	Do you think real-time correction of free-throws during sports training is welcome?	2.750	1.888	6.513	.000	1.866	3.633
7	Do you think that by implementing this device, we can increase the visual stimulus rate?	2.600	1.698	6.847	.000	1.805	3.394
8	What percentage of the total points scored in a game do you think points scored from the free-throw line account for?	2.650	1.814	6.532	.000	1.800	3.499
9	Do you consider it necessary to apply this device also at senior level?	2.750	1.585	7.758	.000	2.008	3.491
10	How many times a week would you insert this device into your training plan?	2.750	1.996	6.159	.000	1.815	3.684
11	Do you find this device useful for perfecting free throw shooting in the basketball games?	2.750	1.773	6.935	.000	1.920	3.579
12	Is the free-throw success rate a deciding factor in the economics of basketball?	2.650	1.785	6.639	.000	1.814	3.485
13	Is free-throw one of the easiest ways to score in a basketball game?	2.800	1.641	7.628	.000	2.031	3.568
14	Do you think free-throws can be decisive in a game?	2.650	1.899	6.239	.000	1.761	3.539
	X	2.721	—	—	—	—	—

**Fig. 1** – Average arithmetic per items.

Representation of arithmetic means by items of the Model Questionnaire of Experts' Opinion on the impact of free throws in basketball.

Table III
Statistical processing of the Self-Assessment Questionnaire of the Model Questionnaire of Expert Opinion
on the Impact of Free Throw Shooting in Basketball.

	Items	Min	Max	Variation	Skewness
1	Do you consider free throw shooting to be a decisive factor in the economics of basketball?	1.00	5.00	53.00	3.397
2	Do you think that free throw improvement needs to be implemented in the training of young players?	1.00	5.00	59.00	3.313
3	Do you think free throw shooting can influence technique in sports training?	1.00	5.00	52.00	3.200
4	Do you consider it necessary to develop a device designed to improve free-throw shooting?	1.00	5.00	55.00	3.145
5	Do you think that by implementing a device designed to refine the free throw, a dynamic automatism/stereotype can be achieved?	1.00	5.00	56.00	3.432
6	Do you think real-time correction of free throws during sports training is welcome?	1.00	5.00	55.00	3.566
7	Do you think that by implementing this device, we can increase the visual stimulus rate?	1.00	5.00	52.00	2.884
8	What percentage of total points scored in a game do you think points scored from the free throw line account for?	1.00	5.00	53.00	3.292
9	Do you consider it necessary to apply this device also at senior level?	1.00	5.00	55.00	2.513
10	How many times a week would you insert this device into your training plan?	1.00	5.00	55.00	3.987
11	Do you find this device useful for perfecting free throw shooting in the basketball game?	1.00	5.00	55.00	3.145
12	Is the free-throw success rate a deciding factor in the economics of basketball?	1.00	5.00	53.00	3.187
13	Is free-throw shooting one of the easiest ways to score in a basketball game?	1.00	5.00	56.00	2.695
14	Do you think free-throws can be decisive in a game?	1.00	5.00	53.00	3.608
	X	–	–	762	–

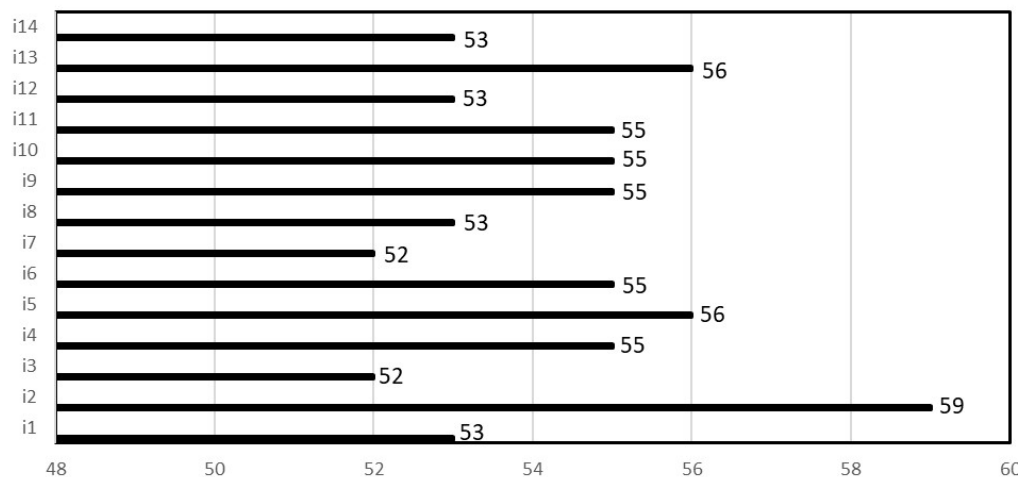


Fig. 2 – Sum of points per items.

Graphical representation of the amounts recorded per item of the Model Expert Opinion Questionnaire on the impact of free throws in basketball.

The analysis of the results of the Model Questionnaire of Experts' Opinion on the Impact of Free Throw Shooting in Basketball designed and applied during the preliminary research shows that the highest average scores were recorded by the items: 5- Do you think that by implementing a device designed to improve free throw shooting, a dynamic automatism/stereotype can be achieved? and item 13 - Is the free throw one of the easiest ways to score in a

basketball game? with 2.800 points (Table II). The lowest scores were recorded for the items: 3- Do you think free throw shooting can influence technique in sports training? And by item 7- Do you think that by implementing this device, we can increase the rate of visual stimulus? by 2.600 points.

The arithmetic mean recorded in the questionnaire was 2.7 points which is an average level score. All questionnaire

results for all items were statistically significant reported at significance threshold values whose limit was selected for $p < 0.05$. The arithmetic mean values for all items fell between the two levels of the 95% CI confidence coefficient (Fig. 1).

The results reflect realism in assessing the impact of free throws on the economics of the game of basketball and also highlight the importance of continuous improvement of free throws through the development and implementation of modern innovative or novel systems and devices adapted to the specifics of basketball.

The total amount of points recorded in the questionnaire was 762 points. The highest amounts recorded per item were recorded for: item 2 - Do you think that free throw improvement is necessary to implement in the training process of young players? with 59 points, in item 5 - Do you think that the implementation of a device designed to improve free-throw shooting can lead to a dynamic automatism/stereotype and item 13 - Is the free throw one of the easiest ways to score in a basketball game? with 56 points each (Table III).

The lowest summative values were recorded for items 3 - Do you think free throw can influence technique in sports training? and item 7 - Do you think that by implementing this device, we can increase the rate of visual stimulus? both with 52 points. Opinion on the impact of free throws in basketball (Table III).

The minimum values ranged from 1 to 2 points for most items, and the maximum values were 5 points for all items in the questionnaire.

The per item variance of the questionnaire ranged from 2.884 to 3.987, reflecting a normal spread of the distribution of arithmetic mean scores relative to standard deviations.

The values of the statistical parameter Skewness ranged between the values of 0.024 and 0.408, which shows a very good normality of the results per item - Model Questionnaire of Expert (Fig. 2)

Discussion

The applied questionnaire was statistically validated through the high value of Cronbach's Alpha statistical indicator, which shows a good and very good internal consistency of all the questions in the questionnaire, having 5 answer choices. For the implementation of free throw improvement in the training process of young players, the best result was recorded for the following item: 2- Do you think that free throw improvement is necessary to implement in the training process of young players?

The results of our study are in agreement with previous studies confirming the role of setting major objectives in the process of implementation of the *System and device intended for sport-specific motor learning and usage mode - System and technical device intended for motor learning process in the field of sport science and physical education with direct applicability in basketball game-specific training - perfecting free throw*.

Therefore, the results received from the coaches included in our study highlight the major impact that free-throws have in the economy of the basketball games.

The free throw is executed under specific conditions. The amount of objective and subjective factors, such as the quality of the training process (Pojskic et al., 2018), the

intensity and complexity of the training load (Okazaki & Rodacki, 2012), the shooting technique, mental stability, motivation and environment, are crucial. Implementing the device intended for free throw improvement ("System and device intended for sport-specific motor learning and mode of use") may result in standardization and improvement of sport training focused on free throw improvement. Research using different free-throw information systems and technologies has looked at: starting angle, ball trajectory, player body height, ball's angle and speed etc. (Rauch et al., 2020; Rafiee & Amir, 2019; Miller & Bartlett, 1996).

Basketball experts consider the free-throws as technical activities that facilitate success, requiring a specialized training program (Oancea, 2016; Turcu et al., 2022; Przednowek et al., 2018; Lin et al., 2021).

Conclusions

1. The overall conclusion is that the implementation of the free throw improvement device ("Sport-specific motor learning system and device and mode of use") can result in standardization and improvement of sport training focused on free-throw improvement;

2. After analyzing the answers given by the interviewees, we can say that coaches confirm the hypothesis of the preliminary research and implicitly the importance of implementing a System and device, a modern and innovative technological device aimed at improving free-throw shooting.

3. Seen from the point of view of an automatism or dynamic stereotype, the free throw can be seen as the easiest procedure for scoring points; the majority of coaches (85%) believe that the free throw can decide the success of a basketball game;

4. Those interviewed believe that it is beneficial to implement a device to strengthen and improve the basketball game, thus increasing the rate of visual stimulation;

5. Coaches believe that by implementing the device for perfecting the free-throw, a dynamic automatism/stereotype can be achieved, which results in real-time correction of the free-throw in sports training;

6. Specialists in the field consider it necessary to develop a device to strengthen and improve free-throw shooting and to implement it at the level of young players, some of whom also consider it useful for seniors.

Conflict of interests

None to declare.

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REVIEWS

A systematic review protocol for chronic low back pain subjects with respiratory muscle involvement

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Abstract

Background. Numerous studies have found that various core muscles are involved in subjects with chronic low back pain. The evidence for profiles of respiratory muscle involvement in normal low backache subjects has not been reviewed explicitly for low back pain.

Aims. The study's primary objective was to scientifically analyze, condense, and to evaluate the evidence for the involvement of respiratory muscles in subjects suffering from chronic low back pain.

Methods. This evaluation procedure will trail the guidelines of PRISMA and MOOSE. The assessors will use a custom-built tool to extract data from the studies, regardless of the methodology used. A modified Downs and Black index will be used to assess the superiority of the methods used in the selected studies.

Results. This index evaluates the characteristics of the subjects, the timing of the outcomes, and the characteristics of the interventions, and quantitative, formal analysis, so-called meta-analysis, is performed if necessary. The study's effect, including the evidence, will be determined using the GRADE a framework for a systematic approach. Earlier research has found that core muscles are involved, and the interventions are tailored to include deficiencies and intrusions that target specific muscle groups.

Conclusion. As an additional component that can be targeted by clinical practitioners in their day-to-day practice and added to rehab programmes, this systematic review protocol will summarise the list of evidence available for the rehabilitation of low back ache and highlight the involvement of respiratory muscles in lowback ache subjects.

Keywords: chronic low back pain, diaphragmatic breathing exercises, respiratory muscles.

Introduction

It is estimated that chronic low back pain (CLBP) contributes to a large amount of the societal illness burden and the number of years spent in disability (Vos et al., 2016; Vos et al., 2015). For more than three months, it is defined as lower back pain that occurs between the lower posterior rib edge and the horizontal gluteal fold (Deyo et al., 2015). A quarter of the world's population is affected by CLBP, and it recurs in 24-80% of persons within a year. CLBP is the primary cause of early retirement due to illness, and it is related to substantial economic losses and lowers the quality of life. Nonspecific low back pain has been linked to a variety of physical and behavioural factors, including obesity, depression, and poor living habits (Hoy et al., 2010; Maher et al., 2017).

According to the growing body of research on LBP, respiratory function plays a significant role and is linked

to the condition (Mohan et al., 2018); Boyle et al., 2010). The diaphragm is a dome-shaped muscle that descends during inhalation and contributes to spinal rigidity through intraabdominal pressure, mechanical action, and diaphragm crura attachments (Boyle et al., 2010). As a result, LBP is believed to be caused in part by quantifiable variability in diaphragm postural function (Kolar et al., 2012).

Data from an Australian longitudinal study on women's health suggests that breathing difficulties have a significant relationship with back pain when linked to physical inactivity and obesity (Smith et al., 2006). Since people with low back pain have shown an increased interest in studying breathing regulation, it has been assumed that those with lower back pain use more lung capacity than healthy participants (Hagins & Lamberg, 2011; Lamberg & Hagins, 2012).

It is difficult to make the link between LBP and a person's respiratory system. So as a result, it is necessary

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to find a suitable association between respiratory parts that are known to cause LBP. Studies comparing people with and without non-specific low back pain should pay close attention to the degree to which these interactions change from person to person. Because of this, new information about the respiratory characteristics of LBP patients will be gleaned from the findings of this study, opening up new possibilities for rehabilitation. In order to diagnose and treat NS-LBP, you'll need a reliable method for determining how well your brain functions (Beeckmans et al., 2016).

During normal tidal breathing, the diaphragm, the body's primary respiratory muscle, is responsible for about 80% of the total breathing effort. Other tissues in the human body serve multiple functions in a similar manner. Similarly, regulating intra-abdominal pressure aids the digestive process. Sphincter function, as well as heart and lymphatic function, are all enhanced by the sphincter mechanism.

For example, diaphragm stability and control of the trunk in monotonous actions are closely linked to its respiratory function. It is possible to keep the spine in a neutral posture with trunk bracing. Synergist and antagonist muscles are actively synchronized to precisely control extreme joint movements. The vertebral column is also stabilized by cumulative intra-abdominal pressure (IAP). Despite the fact that the diaphragm is unable to move the trunk independently, its contraction helps to stabilize the spine by increasing pressure in the abdomen. In chorus, the diaphragm performs a similar function (ventilation and posture) (Kocjan et al., 2017; Kocjan et al., 2018; Hodges & Gandevia, 2000).

A growing body of evidence suggests that spinal disorders associated with low back pain are caused by insufficient function and poor coordination of postural or stabilising muscles; however, the involvement of respiratory muscles is lacking, and recruitment patterns and breathing patterns of respiratory muscles in spinal disorders are altered, and the strategies utilized by the CNS to control the core stability is altered in painful conditions (Khadijeh et al., 2021; Mohan et al., 2020; Hyun et al., 2020).

At this time, our primary search in the global registry didn't bring up anything about individuals with chronic low back pain having respiratory involvement that was current or long-lasting. Chronic low back pain has been linked to core muscle involvement in previous studies. Despite this, there is insufficient evidence of such involvement in subjects with low back pain.

Objective

The main emphasis of the review procedure is to critically appraise and review the comprehensive involvement of respiratory muscles in subjects with chronic low backache.

Review question(s)

1. Is there any involvement of respiratory muscles in subjects with chronic low backache?
2. To which extent is there an involvement of respiratory muscles over core muscles?
3. Can respiratory interventions be used as an additional tool in rehabilitating chronic low backache?

Methods

Design and registration

Authentication of this practice was performed using the PRISMA-Protocol checklist (2015), which will be followed by the MOOSE guidelines as needed (Moher et al., 2015; Stroup et al., 2000). The National Institutes of Health Research have accepted a conditional protocol (International prospective register of systematic reviews -PROSPERO- CRD42022319337).

Inclusion criteria

Subjects: This review considered the studies with the age group of 30-60 years, analyzed clinically or through evidence of radiological findings with low backache.

The settings will encompass Chronic Low backache, Nonspecific low backache; there is no restraint for the length of low back pain (acute, subacute, or chronic).

Conditions such as SI Joint dysfunction, Lumbarization, Sacralization, and spinal fractures will not be included.

Exposure of interest:

This appraisal includes the revisions on primary and secondary muscles of respiration where the respiratory characteristics have been compromised due to low backache, Studies reporting Respiratory muscle changes, change in breathing patterns and any alteration in the mechanics of the ribcage associated with low backache are also included.

Outcomes / Effects

Primary outcomes: this protocol will review the studies about Chest diameter, Breathing patterns, Thoracic mobility, and Inspiratory capacity. Motor outcomes will include muscle activity using Real-time Ultrasound, movement excursion and thickness, and postural changes of the lumbar spine. Studies will be considered if anything related to an abnormality in breathing capacity due to back pain, any compromise in Motor control tests, and sensory changes related to tactile acuity and two-point discrimination, ultrasound measurements of the diaphragmatic muscle (Excursion & thickness), and changes in proximal and distal compartments of the thoracic and lumbar spine.

Categories of studies

The protocol will include both the available and unpublished literature to reduce bias and will be done in two stages: first, reviewing the title and abstracts, and the second stage contains the full-text screening. It includes all the studies ranging from level 1 to level 4 evidence; Studies should include respiratory characteristics and diaphragmatic movements in individuals with low backache. Most of the studies are taken in which partakers are gauged at single point in stage, which provides for (Observational Research, analytical studies & Ecological studies, and the study designs conducted over a particular period of time)

Exclusion criteria

Reviews, Editorials, letters, short communications, Expert opinions, and case studies are excluded if the sample size is small and the sampling method or an apt comparison in the group.

Search strategy

The resources will be selected for the coverage and reputation, including database-specific search terms by Key concepts, free-text terms, controlled vocabulary terms,

phrase searching, proximity operators, Boolean Operators, and search limits.

Searches are conducted using the following databases: PubMed; CINAHL; Embase; Medline; Web of Science; Scopus & Google Scholar; and Hand searching for selected journal titles for those with high impact factors in the concerned field.

Study selection

The records are identified through the database, the titles and abstracts are selected and reviewed, and full texts are scrutinized for selection following the search; the filtered articles are imported to a web-based data management application Rayyan a key for efficient reviews (Ouzzani et al., 2016). Multiple file searches are used to remove the duplicates, and then combined for final addition. The false negatives and false positives are resolved through discussion and agreement with a third reviewer. The protocol will follow PRISMA guidelines to synthesize and summarize the outcomes of the articles (Moher et al., 2009).

Assessment of methodological quality

Methodological issues in the studies can be measured by the judgment of the reviewers who share at least 80% agreement with the quality of methodology. The value of randomized and non-randomized studies is reviewed by using the Downs and Black index (Downs & Black, 1998; Arumugam et al., 2012).

For the existing review, 17 scale components will be used. Gender, age, and Errors for recording component number 5 will be centralization, peripheralization, and physical activity levels. Each study will be assigned to a scoring system ranging from high quality, moderate quality, and low quality, which highlights measurement errors, validity, internal consistency, and responsiveness of the study included (McLean et al., 2017). Data extraction and synthesis will be carried out regardless of methodological quality; reviewers will contact the third critic if there are discrepancies in methodological quality.

Data extraction

The available data and records from various databases will be extracted according to the review protocol (framework, research question, study characteristics). The entire data will be pulled at once and give unique methodology attention. The eligible studies will be extracted using data extraction forms based on these components: Type of study, Participants, Intervention, Outcomes, Organizational aspects, study intervention basics, Trial characteristics, patient flow, data (continuous & dichotomous data), the similarity of groups & transparency, and completeness.

Data synthesis

Synthesis of data can be intimidating due to the available large volume of data, and formulating a synthesis of records from multiple qualitative studies if the data is more mixed, then a narrative synthesis of review can be adopted as a review tool like RevMan is employed, statistical synthesis includes numerical and graphical presentations of the data by looking for strength and reliability of the evidence that is available and evaluate the data if there are any conflicts. To estimate the overall and combined effect, meta-analysis is preferred. A weighted mean will be estimated instead of a simple mean based on the effect sizes, with some studies

receiving a higher weight and others receiving a lower weight (Tufanaru et al., 2015).

In the summarized articles of the protocol, variability of the studies is identified by heterogeneity both clinically, methodologically, and statistically [36]. The reviewers will focus on data entry mistakes, random effect, and change in effect measures to address the heterogeneity. Each outcome drawn if meta-analysis does not favor will compute the mean differences between the groups with a 95% confidence interval.

The conclusion drawn will be tabulated with figures and tables as required. The treatment effect varies across the extracted studies; Subgroup analyses are performed where there is quantitative subgroup effect, unexplained heterogeneity, and covariate distribution. (Patient characteristics like age, gender, Chronic low backache (acute, subacute chronic), type of inferences, and classes of events. The results of the selected studies, which are positive and negative, will have implications for the review protocol. Funnel plots are used to examine the effect size and the precision to reduce the bias (Sterne et al., 2011). The certainty of the findings in the articles/studies ranging from very low, low, moderate, and high is evaluated using the GRADE approach which estimates the effect size for each outcome (Papola et al., 2018).

Discussion

Chronic low back ache constitutes a significant cause of disability, which might result in substantial limitation of low back function Movements are an essential part of the patients' rehabilitation. Existing rehabilitation routines for low back disorders include aerobic exercise, strength or stabilization exercise, and augmenting muscle performance of the lower back, analyses have summarized the role of movements in the low back (Paolucci et al., 2018).

There are currently interventions in musculoskeletal rehabilitation that are in line with the illness model where a physical/mechanical injury is solely responsible for a disorder; however, neurophysiological changes occur in altered regions of the peripheral and central nervous system, including the sensorimotor cortical areas, along with long-lasting musculoskeletal impairments (Pelletier et al., 2015).

The relation between the low backache and other respiratory disorders has a link in which during the stabilization tasks, there is an altered breathing pattern which shows that the diaphragm muscle is indirectly supporting the postural function, which may be a disadvantage for respiration (Roussel et al., 2009).

It is vital to develop novel rehabilitation programs for the low back to provide and promote well-being for individuals with low backache. Despite many guidelines with the similar recommendations for managing low backache have targeted core stabilization exercises, Manual therapies, pain neuroscience education, and biomedical models; however, these strategies have worked for a brief period for which there has been a recurrence of the gap between the evidence, and the clinical practice has been widespread.

Recent research suggests that high intra-abdominal pressure and increased pelvic floor and chest wall muscle

activation go hand in hand with weakening the pelvic floor, underscoring the significance of respiratory involvement (O'Sullivan & Beales, 2007; Roditi & Robinson, 2011). This analysis procedure will recapitulate the substantiation for the respiratory muscle involvement in low backache subjects, underline the importance of using breathing exercises with the traditional practices in the clinical settings, and gives an additional edge to the rehab practitioners while treating low back pain.

Conclusions

1. As an additional component that can be targeted by clinical practitioners in their day-to-day practice and added to rehab programmes, this systematic review protocol will summarize the list of evidences available for the rehabilitation of low back ache and highlight the involvement of respiratory muscles in lowback ache subjects.

2. Use of a respiratory muscles in the rehabilitation of chronic low back pain subjects will be of utmost importance because it will not only target the core muscles of the low back, but also involve respiratory muscles, which will be a huge change in the rehabilitation of low back ache subjects and further to it this review will highlight the importance of breathing mechanics and its role in the rehabilitation of low back ache.

Authors contributions

Nagaraj S – Designing the review and formulating the research question Prospero registration, the first critic - study selection and exclusion of duplications, data extraction and risk of bias assessment for the selected studies. Enrolling the original protocol.

As a second reviewer to ensure agreement and provide guidance for qualitative and quantitative synthesis, *Dr. Dhanesh Kumar K.U.* oversees the review process, document, and final draught intellectual content with a focus on critical evaluation.

Professor Pravin Aaron – An overview of the review's overall strategy, as well as a critical assessment of its rational content in the review protocol, manuscript, and final draught, are all included in the review's overall supervision.

Conflict of interests

None

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Sports-related concussion and strangulation

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Abstract

Background. Brain concussion is an immediate transient alteration of the neurological functions due to direct or indirect traumatic head injury followed by a post-concussion syndrome of variable duration. Concussion is included in the group of mild head injuries and is manifested in the form of immediate and transient changes in the central nervous system function caused by the brain's impact against the skull's bony wall. Strangulation is a strong compression around the neck. The damage is caused when pressure is applied to the front of the neck, preventing air and sometimes blood from passing to the brain. These phenomena can lead to short-term loss of consciousness

Methods. A bibliographic survey was done.

Results. In high-level sports, concussion is common and recurrent, especially in high-speed contact or collision sports such as boxing, rugby, American football, ice hockey, soccer and others. When concussion occurs, the athlete requires a recovery period during which he/she is unable to continue sports practice. Former elite athletes, who have suffered from repetitive concussion reported mental alterations such as headaches, anxiety, depression and sleep disturbances. The most common means used to assess the severity of sports concussion is the 5th version of the Sport Concussion Assessment Tool (SCAT5) which incorporates several tests. Strangulation usually occurs in mattress sports such as judo and wrestling. The management of concussion and strangulation by the medical staff must follow existing guidelines, beginning in the sports arena or ground immediately after occurrence, and continuing until the athlete is allowed to return to play.

Conclusions. 1) Concussion obliges medical staff to assess the athlete's level of consciousness immediately after the trauma and involves an incapacity to continue sport practice with a variable period of recovery. 2) Air choking, blood choking and vagal phenomenon probably explains most cases of loss of consciousness after strangulation.

Keywords: concussion, strangulation, athlete, clinical signs, neurological examination.

Introduction

Brain concussion on the sports arena usually occurs in contact sports where high-speed collisions between opponents are common, such as American football, ice hockey or rugby (Gouttebarger & Kerkhof s., 2021). Concussion and strangulation differ from injuries that occur in the body or extremities, as they involve the central nervous system and sometimes cause loss of consciousness even for a short time. Among Olympic sports, only in boxing is there intention to directly hit the opponent's head to knock him to the ground (knock out), while in the other sports, a blow to the head is random. Due to the range of injury the concussion or strangulation that can affect the athlete, the medical staff members must be aware of the possible scenarios to urgently diagnose the extent of damage and efficiently treat the injured athlete in the sports arena and in the dressing room during the window of opportunity immediately after occurrence of injury.

The concussion

Concussion is included in the group of mild head injuries (Vidalin et al., 2010) and is manifested in the form of immediate and transient changes in the central nervous system function caused by the brain's impact against the skull's bony wall (Radafy et al., 2018; Radafy et al., 2016). The same shock may occur as the result of jerking the head, face, neck and even other body parts that launch a blow to the brain (Mona & Bouziane, 2008; Decq et al., 2011; Herring et al., 2021). Concussion causes extended but mild and transient damage to central nervous function, and leaves no evidence of macroscopic damage that can be detected in imaging tests (Herring et al., 2021; Hinton-Bayre et al., 2004; Chermann et al., 2014). The phenomenon manifests itself occasionally by loss of consciousness, disorders in retrograde memory (forgetting details that immediately preceded the head trauma) and anterograde memory (forgetting details that occurred immediately after the

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head trauma), double vision (diplopia), and dizziness and equilibrium disorders (Chermann et al., 2014; Chermann et al., 2016). In addition, the athlete may suffer from confusion, disturbance in time and space orientation, difficulty in concentration and problems with visual and motor coordination (Vidalin et al., 2010). Sometimes, if not immediately removed from the playing field for observation, the affected athlete may exhibit unusual behavioral patterns later in the competition or in the dressing room, such as blackout or judgment disorders. Generally, the loss of consciousness lasts between a few seconds and one minute, rarely reaching five minutes or more (Radafy et al., 2016). When concussion occurs, the athlete's physical abilities may decrease in the hours after the event, increasing the risk of further injury during that time (Radafy et al., 2016; Gardner et al., 2010).

The medical staff at the sports stadium or arena should be aware of the concussion symptoms defined as "red flag" that require immediate intervention, either on the playing field itself or in the dressing room, immediately after injury. Among the same symptoms are (Radafy et al., 2016; Herring et al., 2021) neck pain, diplopia, weakness, or a sense of tingling/burning in the hands or legs; severe headache, convulsions, loss of or decrease in consciousness, vomiting, or restlessness. Goskiewicz et al. (2004) followed American football players who experienced concussion between the years 1999 and 2001, noting that the most common complaints were headache, followed by walking instability, and less frequently, memory disorders and loss of consciousness.

Concussion requires an immediate cessation of sports activity, evacuation of the athlete from the grounds and placement of a stabilizing collar around the neck, due to the risk of eventual vertebral damage, which will only become apparent in the subsequent imaging tests. It is crucial not to leave the athlete alone during the hours following head trauma, nor allow him to drive a vehicle during that time. A physician, neurologist or neurosurgeon must examine the injured athlete within 48 hours to assess whether damage has occurred to the nervous system. Although imaging tests such as brain CAT or MRI are not required except in special cases (Radafy et al., 2016), it is advisable to perform at least one of them for medico-legal reasons (Vidalin et al., 2010). After a concussion occurs in the sports stadium or arena, the medical staff is obligated to assess mind clarity according to Maddocks Score (Radafy et al., 2016) at the site of the event, presenting the injured athlete with five questions that are relevant to most ball sports:

- In which stadium/arena are we?
- Are we in the first or the second half of the game?
- Which team scored the last goal/point?
- Against which team did you play in the last game/match?
- Did your team win the last competition?

One wrong answer will be enough to raise the suspicion of concussion. If the medical personnel feel it necessary to continue the inquiry, the following questions may be asked (Vidalin et al., 2010):

- What is the name of your team or club?
- Which position do you play?

- What is the name of the opponent's team today?
- Are we at the beginning of the competition, in the middle or close to the end?

Later, to characterize the severity of the concussion that has occurred, the Cantu Scale (Cantu, 2001) is used:

- a) In grade 1, consciousness has been maintained and post-traumatic memory loss lasts less than one hour after injury.
- b) In grade 2, blackout lasts under 5 minutes and the memory loss less than 24 hours. In grade 3, blackout lasts more than 5 minutes and memory loss over 24 hours.

Nowadays, the most common means used to assess the severity of sports concussion is the 5th version of the Sport Concussion Assessment Tool (SCAT5) which incorporates several tests, some of them described above. The SCAT5, intended for athletes 13 years of age or older, should be executed no later than 3-5 days after the concussion has occurred. Child SCAT5 (Herring et al., 2021; Echemendia et al., 2017) is employed for children up to the age of 12. The same tests will be performed first on the sports field immediately after the head injury occurs, and a second time several days later, and must be fully documented in the child's medical record (Echemendia et al., 2017).

Concussion in child and adolescent athletes

There is a considerable risk of head injuries and concussion in children and adolescents. Between the years 2011 and 2017, Chun et al., (2021) surveyed 92,966 athletes ages 13 to 18, who took part in 14 different sports; of these, 5993 boys and girls experienced concussion. Obana et al., (2021) found that between the years 2009 and 2019, 4,983 high school students aged 14 to 18 were concussed while playing American football, 58.8% of them during competition and 41.2% during training. Concussion in young people and especially adolescents is nearly 5 times more common than in adults (Vidalin et al., 2010). The brain is particularly vulnerable during the growth period, and children tend to minimize symptoms and dismiss the severity of the damage. According to Campoletano et al., (2021), younger athletes are more susceptible to head injuries than older ones due to the incomplete myelination process in brain tissue, imperfect development of the neck muscles and a greater ratio between the size and structures of the head compared to the body. Repeated head injury can result in cognitive problems in children and adolescents, especially in memory (McClinchy, 2006) as the particularly sensitive hippocampus is related to learning and memory (Wall et al., 2006). When head trauma occurs in a child, all his/her sports activities should be stopped completely for a week, regardless of the severity of the injury and then, gradually returned to normal but with no contact during training. The child's return to competition will be possible only after at least 3 weeks from the day of injury and will depend on the disappearance of all symptoms caused by the head trauma. After concussion, it is necessary to examine the concentration, memory, learning and performance abilities of the young athlete, especially in the days following the traumatic event (Gouttebarga et al., 2021). Some researchers maintain

(Acerini et al., 2006; Tanriverdi et al., 2006; Behan et al., 2008) that concussion can cause damage to the hypothalamo-hypophyseal axis and disrupt the secretion of hormones, especially the growth hormone which affects body development in children and adolescents. In these circumstances, the recommendations indicate the need to monitor the child's growth curve. Tanriverdi et al., (2008) contended that in the boxing ring, where the competitor aspires to deliberately cause a concussion and knock out the opponent, the risk of damage to the pituitary gland and especially to the growth process, is much higher.

Return to the sports field after concussion

In most cases, recovery time from concussion for an adult athlete is about two weeks, while for children the recovery process may continue for up to 4 weeks Herring et al., (2021). An adult athlete who intends to return to physical activity at the same level as prior to the head injury, especially those who compete in contact sports, should do so only after fully adhering to all six stages required (Decq et al., 2011; Mona et al., 2008):

- The first - complete rest until all the symptoms subside.
- The second - moderate physical activity such as walking, static cycling and swimming.
- The third - return to activities such as running (for those involved in ball games) or skating (for those in ice hockey).
- The fourth - performing sport-specific exercises in training, but without contact.
- The fifth - participating in training that includes contact between the competitors.
- The sixth - return to competitive activity.

The athlete will move from one stage to the next only if no symptoms from the concussion arise, without using medications that can prevent their appearance. Returning to competitive activity will require the athlete to undergo a full medical examination that examines possible remaining symptoms of the concussion and damage caused by it. In case the concussion recurs during the same season of games and competition, the athlete will be assigned to complete rest for one month. If the concussion occurs the third time in the same season, the athlete should cease activity for the remainder of the sport's season. Physicians who promote a strict and rigorous approach will recommend performing neuropsychological tests at the beginning of the athlete's sports season activities in which head injuries occur from time to time. This would allow a comparison of results to those findings following the concussion and the take of necessary medical decisions (Vidalin et al., 2010).

Post-traumatic syndrome

Post-traumatic stress disorder may occur for an irregular period following concussion (Radafy et al., 2018), manifesting in headaches, fatigue, personality disorders and slowness (Chermann et al., 2016). post-traumatic syndrome, which can appear sometimes during the period after the concussion, clinically manifests in at least three of these symptoms:

1. Headaches, instability, intolerance to noise and light.
2. Changes in mood: restlessness, anxiety, sadness, lack of emotional stability.
3. Emotional and/or memory problems.
4. Weakness.
5. Sleep difficulties.
6. Decreased tolerance and even intolerance to alcohol.
7. Signs of hypochondria.

Over the years, chronic post-traumatic encephalopathy may develop in athletes who have often sustained head collisions, such as American football players, rugby players, ice hockey players, boxers, etc. This condition will be reflected in memory and language disorders, changes in mood and behavior, problems with balance and symptoms similar to those of Parkinson's disease (Radafy et al., 2016; Meehan et al., 2015). According to Gouttebarga et al., (2021), prolonged preoccupation with sports in which concussions occur can lead to the appearance of mental health-related symptoms in those elite athletes. American football players who suffered three or more concussions before retiring from competition were three times more likely to suffer from depression than those who did not incur head injuries. American football, ice hockey and rugby players who have suffered six or more concussions six, are at five-time greater risk for mental health problems than athletes who did not have head injuries. According to Chermann et al., (2016), other athletes who may have head injury during their careers are boxers, wrestlers, judoka, horseback riders and surfers in various sports – in snow, ice, and water. The same authors examined 211 athletes, 168 men and 43 women, from different sports who suffered head injuries, adding cyclists and taekwondo competitors to those athletes who had sustained head injury. Based on the findings of their study, post-traumatic stress disorder was more prolonged in women than in men.

Mackay et al., (2019) found that neurodegenerative diseases in the nervous system were a more common cause of death in 1180 former professional male footballers from Scotland who died over an 18-year period, compared to a control group of 3807 people. The consumption of medications for dementia was also higher in past footballers than in the control group of that study.

Brain damage following strangulation

The same damage is caused when pressure is applied to the front of the neck, preventing air and sometimes blood from passing to the brain (Radafy et al., 2018). This usually occurs in mattress sports such as judo and wrestling. In 2010, Michel et al. described the clinical stages of potentially fatal strangulation action (Michel et al., 2010):

1. A sense of heat in the head, accompanied by humming, beeping and glare.
2. Loss of consciousness and sometimes convulsions.
3. Halt in breathing movements.
4. Death.

Michel (2009) also described post-anoxic symptoms in young people:

1. Psychomotor slowness.
2. Headaches.
3. Disorders of attention deficit, concentration and memory.
4. Sleepiness.

Loss of consciousness due to strangulation may occur for several reasons, separately or together (Radafy et al., 2018):

1. Applying pressure at a load of 12-15 kg on the front of the neck, which crushes the trachea against the vertebrae of the spine to the point of blocking it and preventing the air from reaching the lungs (air choking).

2. Applying pressure and kicks to the cervical arteries, significantly slowing the flow of blood through them towards the brain (blood choking).

3. Applying pressure on the baroreceptors in the sinus of the carotid artery and activating the vasovagal reflex in athletes sensitive to that phenomenon. In mattress sports and others in which the athletes are exposed to the strangulation phenomenon such as wrestling, judo or jujitsu, this action is performed not to cause harm to the opponent but to subdue him.

Rodriguez et al. (1991) conducted electroencephalographic tests on several judokas who had suffered from asphyxia that caused blackout. They watched appearance of delta and theta waves that disappeared immediately after the athletes awoke. Similar changes in the EEG chart were diagnosed by Grossi et al., (1990) who tested 28 judokas who fainted due to the activation of the vasovagal receptors. In any case, the policy of handling the occurrence of strangulation is similar to that in traumatic concussion: immediately after an impairment of clarity of mind appears, the athlete is required to stop participation in the competition (Radafy et al., 2016).

Conclusions

1. Considering the aggression and attack required in certain sports activities to defeat the opponent, it would be almost impossible to fully prevent damage and concussion from head trauma or suffocation.

2. Thus, the medical staff on the field or in the arena must know how to deal with the phenomenon on the spot when head injury occurs, or sensory blurring appears following strangulation.

3. In most cases, it is necessary to evacuate the injured person immediately from the sports arena and treat him/her in a fully professional manner.

Conflict of interests

The authors declare that they have no conflict of interest.

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Molecular hydrogen, a therapeutic gas with antioxidant effects, general aspects and mechanisms

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Abstract

Background. There is an increasing scientific interest in molecular hydrogen (H₂) worldwide. Over the last 13 years, over 500 scientific articles have been published about molecular H₂.

Aims. The aim of this paper is to present some introductory information on H₂ from the perspective of its antioxidant mechanisms and actions.

Methods. The method is based on the structure of a mini narrative review.

Results. Research presents the physiological effects of H₂, with beneficial results on both animals and human subjects. Due to the rapid diffusion in the circulation of blood and cells, H₂ is a new type of natural antioxidant with potential therapeutic benefits.

Conclusions. H₂ could be considered the ideal antioxidant.

Keywords: Molecular hydrogen, therapeutic gas, antioxidant mechanisms, antioxidant effects.

Introduction – Features

Molecular H₂ is a colorless, insipid, odorless and minimal molecule, with high flammability (Huang et al., 2010), a non-polar and diatomic compound with low molecular weight, with strong cell protection effects both in plants and mammals (Iida et al., 2016).

H₂ can be explosive, but it does not explode if it is <10% when mixed with air or O₂ (Kurokawa et al., 2019). The chemical property of H₂ is that it burns with O₂ to form water.

It has been found that H₂ does not exist almost at all in arterial and venous blood, heart, liver and other tissues in normal rats (Chen et al., 2017). Mammal cells cannot produce H₂ due to the deficiency of hydrogenases, however human bacteria produce H₂ (Hylemon et al., 2018). It has been shown that exposure to H₂ gas for 72 hours does not affect any of the physiological parameters (Cole et al., 2021).

H₂ - Administration

There are several administration variants that can have different effects (Xin et al., 2014).

a) Inhalation H₂

H₂ inhalation is the simplest therapeutic method. H₂ inhaled is broadcast by plasma alveoli and is transported

by blood to the body. There are various forms of inhalation of H₂, which lead to different results, such as nasal masks or tubes.

This method of administration increases H₂ dissolved in arterial blood, but H₂ levels in venous blood are lower than in arterial blood (Ohsawa et al., 2007).

As an inconvenience, the concentration of H₂ in the blood and tissues (Fukuda et al., 2007), as well as the antioxidant effect of H₂, depends on the time and concentration of H₂ inhalation.

b) Ingestion in the liquid form - water with H₂

The consumption of drinking water that contains H₂ is a safe and easily administered way, and from this aspect it can be more beneficial. Another advantage is that it can be frequent. It has been shown that 41% of H₂ ingested by rich water in H₂ is kept in the body (Shimouchi et al., 2012).

However, due to the fact that the solubility in water is low, the ingestion cannot be guaranteed in sufficient concentration of H₂.

c) Bathing in water with H₂

Due to the ability of H₂ to diffuse through the cell membrane, this method of use has evolved to therapeutic applications.

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The water in the H₂-enriched water has been shown to have positive effects in the treatment of skin diseases (Asada et al., 2019), also in the preservation of grafts. Thus, a study in which the excised grafts were submerged in saturated water rich in H₂ has shown effects of mitigating the lesion (Noda et al., 2013) by inhibiting excessive inflammation and oxidative stress (Qian et al., 2021).

d) Injection of H₂ saline solution

This is an invasive method, which could become dangerous if H₂ is injected directly into the skin or vein. The injection can be subcutaneous (Zhang et al., 2018), intravenous or intraperitoneal.

It has been shown that the luminaled saline injection rich in H₂ can be a new and promising way in a model of ischemic lesion/reperfusion of the small intestine (Shigeta et al., 2015).

The injection of the subarachnoid cavity with H₂-rich saline solution has useful effects in brain and spinal cord disorders (Wang et al., 2015).

e) Irrigation with solutions containing H₂

For example, ocular irrigation at Cu H₂ has been proven beneficial (Igarashi et al., 2016). For example, the eye drops containing H₂ reduced the level •OH - (Oharazawa et al., 2010).

Comparisons between methods

By inhalation, H₂ diffuses at the same time with blood transport (Sano et al., 2020).

In the inhalation, H₂ delivery to tissues is done almost at the same time, while by ingesting water with H₂, the delivery time of H₂ is longer (Sobue et al., 2015).

H₂ inhalation causes a slower increase in H₂ concentration than that obtained by intraperitoneal, intravenous or oral administration.

Thus, different H₂ administration routes must be taken into account according to the user's needs to guarantee the best acceptable benefits.

H₂ – Research

Experimental research

The first use of H₂ in experimental medicine was published more than 40 years ago, when following the administration of H₂ hyperbaric to obtain the marked regression of the tumors in mice (Dole et al., 1975). Since then, most studies that have highlighted the beneficial effects of H₂ on the various biochemical indicators of oxidative stress and/or antioxidant capacity in serum and urine have been experimental, but there are also studies that have evaluated clinical characteristics and/or benefits of H₂ in humans. The effects of H₂ have been widely studied and documented for a variety of experimental pathological models and situations (Ohno et al., 2012).

Clinical research

Although H₂ research in the clinical environment is quite new, so far, the effectiveness H₂ has been evaluated in several living situations or human suffering.

a) For example, in 1994 (Abraini et al., 1994), the first application of H₂ was published in humans to alleviate some of the symptoms of high pressure nerve syndrome at depth divers.

b) Significant effects in human studies have been observed especially in mediated diseases based on

oxidative stress, such as chronic inflammation in patients with hemodialysis (Nakayama et al., 2010).

In the case of clinical studies, some limitations have been noted:

- a) Most studies have evaluated the effects following the administration H₂ in the short-term - 8 weeks or less
- b) Samples were relatively low in size
- c) The lack of a dose-response relationship may suggest the absence of a causal relationship

Although most often the amount of H₂ administered in clinical patients has not been standardized, this fact has not influenced the extent of the effects.

It is desirable that studies elucidate many problems of H₂ therapy, including the dose-response curve and long-term clinical effects in a multitude of pathologies, using randomized controlled prospect and systematic finding of the best available evidence.

H₂ - Effects

H₂ has variety of effects: anti-allergic, anti-apoptotic, anti-inflammatory and antioxidant representing a potential therapeutic benefit for both prophylaxis and remediation (Ge et al., 2017). So far, no cytotoxicity has been reported following the administration of H₂ (Zhou et al., 2019).

Beneficial effects of human administration were also found in:

- a) Respiratory damage - asthma (Wang et al., 2020)
- b) Cardiac damage (Tamura et al., 2020)
- c) Muscle impairment - inflammatory and mitochondrial myopathies (Ito et al., 2011)
- d) Joint damage – rheumatoid arthritis (Ishibashi et al., 2012).
- e) Neurological impairment - Parkinson's disease (Yoritaka et al., 2013)
- f) Urological impairment (Matsumoto et al., 2013)
- g) Metabolic impairment - metabolic syndrome (Nakao et al., 2010), diabetes (Kajiyama et al., 2008)
- h) Post-traumatic impairment - inflammation caused by sports (Ostojic et al., 2014)

H₂ is also very useful to ensure immune protection, as shown by studies:

- a) H₂, by regulating the proliferation of immune cells, balances the over-stimulation or immunodeficiency of the immune system (Chen et al., 2017; Xu et al., 2018).
- b) The administration of H₂ improves the activity of the CD4+ and CD8+ (Zhao et al., 2014) cells.
- c) H₂ reduces the manifestations of type I hypersensitivity, from allergic rhinitis (Huang et al., 2019), reversing the Th1/Th2 ratio (Xu et al., 2018)
- d) The high consumption of H₂ influences anti-inflammatory cytokine IL-4, which leads to the reduction of acute renal lesions (Yao et al., 2019),
- e) H₂ administration reduces inflammation from rheumatoid arthritis (Meng et al., 2016)
- f) The consumption of H₂-APA for four weeks by healthy adults causes the reduction of inflammation (Sim et al., 2020).

The most recent and remarkable benefit has been proven in Coronavirus-2019 disease-O₂ inhalation mixed with H₂ has led to the improvement of pulmonary function, emphysema and inflammation (Guan et al., 2020).

H2 - General Mechanisms of Action

The research carried out so far shows that H₂ is involved in different signaling paths or physiological functions, has many actions, influences most of the systems in the body and mediates various beneficial effects. Examples:

a) H₂ passes through the blood-brain barrier, although most antioxidants cannot perform this action.

b) It is able to diffuse rapidly through the membrane compartments, obtaining direct access to the cytosol, mitochondria and nucleus (Ohsawa et al., 2007) and reduces hydroxyl radicals.

c) H₂ can play an anti-inflammatory and antioxidative role:

a. By direct impairment of the transport of mitochondrial electrons, neutralizing oxidative stress to alleviate mitochondrial damage

b. By balancing the homeostasis of the intracellular environment and influencing the transcript of key proteins in regulating inflammation (Ostojic, 2015).

An experimental study has shown that the administration of water containing H₂ dissolved leads to (Cardinal et al., 2010):

a) the sustained increase in the level of H₂ in the kidneys and serum, without any accumulation in time;

b) the functional improvement of the renal allograft over a 60-day tracking period;

c) a decrease in several inflammation markers, including cells that infiltrate the graft, proinflammatory cytokines and activate the mitogenic kinase protein;

d) decreased level of lipid peroxides and peroxynitrite in tissues

H2 - Antioxidant

Mitochondria produce 90% of the energy in the form of ATP, a process that is based on oxidative phosphorylation and which is accompanied by the generation of ROS (Annesley & Fisher, 2019). In this process, Coenzyme Q (CoQ) plays an important role in the electron transfer chain at the mitochondrial level (Gutierrez-Mariscal et al., 2020).

Oxidative stress is due to the imbalance between ROS and the antioxidant system is based on many conditions in the body (Burton & Jauniaux, 2011). For example, excessive red⁻induced mitochondrial damage is an important cause of many neurodegenerative diseases.

An ideal antioxidant is expected to alleviate excess oxidative stress, but not to disturb redox homeostasis.

Results of antioxidant action

We exemplify some of the effects:

a) H₂ provides protection against oxidative reperfusion lesion in vitro and in vivo (Ohsawa et al., 2007).

b) H₂ improves mitochondrial dysfunction and potential cell dysfunction regeneration (Yoshida et al., 2012).

c) H₂ could protect against cell death (Iuchi et al., 2019).

d) Following the administration of H₂ 1.3% by inhalation, for 2 weeks in mice with vasculitis, it was found to reduce tissue damage (Kiyoi et al., 2020).

e) Following the administration of H₂, the significant increase in the concentration of COQ9 (Gvozdkjova et al.,

2020) was found.

f) H₂ removal in diabetics reduces retinal injury (Liu et al., 2013).

g) By the antioxidant action, H₂ provides neuroprotection (Wu et al., 2018) and is useful in Parkinson's disease therapy (Hirayama et al., 2018).

h) It has been observed that the biological and antioxidant effects of H₂ remain even after H₂ has been removed from the body (Dixon et al., 2013).

Antioxidant mechanisms

More ways have been described by which H₂ determines the antioxidant effect:

a) A possible antioxidant mechanism of H₂ is the direct removal of the hydroxyl radical (Lebaron et al., 2019).

b) H₂ also prevents the production of hydroxyl radicals in the presence of catalytic active metals (Huang, 2016).

c) H₂ can enter the cell through the cell membrane and then neutralizes the particles that intervene in the oxidative phenomenon (Ohta, 2014).

d) H₂ can protect against cellular damage by improving the mitochondrial function (Liu et al., 2016).

e) In addition, H₂ reduces the increase of the permeability of the cell membrane (Iuchi et al., 2019) and regulates the potential imbalance of the damaged mitochondrial membrane.

f) It has been found that H₂ increases the activity superoxide dismutase and reduces the level of malondialdehyde (Gharib et al., 2001)

g) H₂ significantly reduces reactive intracellular (ROS) reactive (ROS), promotes the expression of dismutase (SOD) and glutathione (GSH) and regulates the expression of NADPH oxidase (Su et al., 2019; Zhao et al., 2019).

h) H₂ reduces the expression of inflammatory cytokines, which leads to the stopping of infiltration in the inflammatory place with phagocytes, with the consequence of stopping the subsequent release of the reactive species (Dixon et al., 2013; Ge et al., 2017), which explains the therapeutic effect of H₂ in acute or chronic inflammatory diseases; also, H₂ can inhibit the transcript of inflammation regulation proteins

i) H₂ stimulates mitochondrial autophagia, ATP generation source (Wu et al., 2018).

j) 2% H₂ administration for 3 hours leads to stimulating the elimination of damaged or dysfunctional mitochondria, called mitophagia (Yan et al., 2019).

Reported to the type and duration of action, H₂ has four categories of intervention

a) Direct actions, by selective removal of reactive species (Ohsawa et al., 2007) and suppressing the chain reactions of free radicals for lipid peroxidation (Iuchi et al., 2016) and

b) Indirect actions by inducing the expression of antioxidant enzymes

c) Immediate actions consisting of:

a. Partial reduction of nitrites, by lowering the level of nitrotyrosine (Zhang et al., 2015)

b. Direct cleaning of •OH, by neutralization •OH Ionizing radiation result (Qian et al., 2010)

d) Long-term actions consisting of:

a. Chronic regulation of gene expression and signal transduction, by inhibiting the MIR-200 expression in HT-22 cells produced by hypoxia and reoxygenation (Wei et al., 2015).

b. Adjusting the signaling path determined by lipopolysaccharides (Liu et al., 2013) and reduction of kinase protein

Conclusions

1. H₂ has multiple beneficial actions in the body, proved in particular through animal studies, but in the last brush and by clinical studies, which are increasing numerically.

2. The administration of H₂ can be done by several methods, the most commonly used being the inhalation, and the most practical, the water consumption with H₂.

3. The antioxidant action of H₂ is based on complex protective mechanisms, and the resulting effects can ensure many benefits of use.

4. Due to the numerous protective actions, H₂ is considered the right candidate for the role of ideal antioxidant.

Conflict of interests

Nothing to declare.

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Dog-assisted therapy, alternative modality for the development of motor skills in children with disabilities (Note I)

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Abstract

Background. In this paper we tried to present a method of animal-assisted therapy for a group of 3-6 year old preschoolers. The preliminary methodological study aimed at the development of animal-assisted activities and, on the other hand, aspects of the activity exercising demonstrations. The aim was to present the advantages of offered by dog-assisted therapy in the development of motor skills.

Aims. We assume that through dog-assisted therapy we can obtain significant results from the point of view of general motor skills in children with disabilities

Methods. We studied research aimed at highlighting the influence of dog therapy on children in training and recovery activities. We also drew inspiration from our own experience with the therapy dog West. The sessions took place in a kindergarten group of 6 to 10 people.

Results. Most research criteria were found to be easy to use and demonstrated the ability to monitor changes in children's behavior. The children uniformly showed improvements in behavior being more motivated towards the activity in the presence of the dog. Attention also increased in the activities carried out in the presence of the dog.

Conclusions. The studied research and personal observations are extremely promising: it would be worth testing and evaluating the effectiveness of the therapy dog on the activities carried out by children. For this, the present study provides good foundations both in terms of thematics and the application of observational aspects.

Keywords: Animal-assisted therapy, development of motor skills, development of attention, stimulation of motivation.

Introduction

Animal-assisted therapy (AAT) is a structured therapeutic intervention with the deliberate inclusion of an animal in a therapeutic treatment plan. Generally, AAT involves a licensed therapist guiding interactions between a patient and an animal to achieve specific goals (Chandler, 2012; Kruger & Serpell, 2010); (1).

The dog as a therapeutic agent appeared by chance in the case of a therapy session of the American psychiatrist Boris Levinson. He observed the interaction between the strongly internalized child and his dog to whom the boy opened up very quickly, and to whom he began to tell stories.

There is more evidence of the positive effects of dogs on children (Levinson, 1962; Levinson, 1964; Levinson, 1965; Levinson, 1970; Mallon 1994; Reichert 1994; Hansen et al. 1999; Hergovich et al. 2002; Lieber 2002; Anderson & Olson, 2006).

The effect of animals on humans has been investigated in many studies, where they looked at the effect of animals on breathing, heart rate and stress. Friedmann et al. (2010) studied blood pressure in 36 children in performance situations (they had to read aloud from a book).

According to the biophilia hypothesis, observing an animal has a calming effect on people (O'Haire, 2010).

Every child's blood pressure was measured every minute, and each child was examined once in a no-dog situation and once with a dog. The children's heart rate and blood pressure were lower in the presence of the dog.

Baun et al. (1984) found significant differences in blood pressure in those people who petted or talked to a dog versus others who read. They concluded that petting an animal has a more calming effect than resting.

Baun et al. (1984) proved that the presence of the animal also regulates the breathing.

In stressful conditions the presence of a pet can reduce

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the feeling of stress just like the presence of a life partner. This aspect was proved by Allen (2003) and the conditions in which they tested the parameters of stress in the presence of the pet, the life partner or a friend. Also in this study it was proven that the sensation of pain decreases in the presence of the pet.

Coming out of a disadvantaged family environment, children learn the tenderness and care they first show towards the animal, but this attitude later affects the interpersonal relationships (Melson & Fine, 2010). The animal allows itself to be loved and he returns love.

Cole's research has illustrated AAT's potential for facilitating growth towards therapeutic goals when combined with more traditional approaches" (Cole, 2009).

The presence of animals stimulates the spontaneous expression of emotions, which is very important for psychological - and therefore physical - well-being. The presence of animals also reduces anxiety (Wells, 2009). Animals also influence human socialization. Messent, 1983 (quoted by Cusack, 1988) observed that when people walk with a pet they engage in more conversations than without, and these conversations are longer in the presence of the pet.

During one of the studies the development of emerging aggression was observed showed that children's aggressive behavior during the task and decreased while waiting in the presence of an animal (Babos et al., 2002). The results of the research are extremely promising. The children uniformly showed improvement in their emotional and social openness and communication style.

Another exploratory study builds on existing research on the physiological stress response to human-animal interactions in a non-clinical sample of adult dog-owners interacting with their own dog or an unfamiliar therapy dog under similar conditions. Participants were therapy-dog owners interacting with their own dogs and dog owners interacting with an unfamiliar therapy dog. Interestingly, while the results suggested dog owners perceived less stress and anxiety when interacting with their own dogs compared with those interacting with an unfamiliar dog, other results suggested greater reductions in cortisol, SBP, DBP, and HR for those interacting with the unfamiliar dog (Barker et al., 2010).

Although the main goal of animal-assisted therapy is usually better functioning for cognitive processes and the acquisition of knowledge, this therapy can have other significant effects that we can focus on in animal-assisted therapeutic occupations. The therapy dog must be given instructions, which makes the child think and pay attention.

Through physical skill development, children explore their capabilities and learn about themselves and their environment. All children must be allowed to explore their abilities and learn to solve problems. Through play and games, children can learn who they are and what they are capable of doing (Bunker, 1991).

A reading intervention known as canine-assisted literacy has proved to increase children's reading fluency and motivation, providing encouragement for struggling readers, and making reading fun for students in general (Jalongo et al., 2004).

The fields of application of dog-assisted therapy are very broad. It can be applied in the case of children with special

educational needs, with learning disabilities, with reduced mobility, in the case of delayed speech development, the development of children with speech, language and communication disorders or speech impediments (animal-assisted speech therapy), in the development for children with mild, severe disabilities, in the early development of children with autism or symptoms of autism, in children with learning disabilities (dyslexia, dysgraphia), in the development of hyperactive children or with physical problems, in the case of the development of a child with antisocial, behavioral disorders or with integration problems (emotion, empathy, development of social skills).

Many studies have proven that it is very good to work with problem children involving animals. Animals brought into the classroom stimulate learning processes, they have a good influence on the classroom mood (Kaye, 1984).

The dog provides major support in the development of movement: the development of large movements, fine movements, the development of spatial orientation, body schema, body perception, speech, communication, improving attention, concentration, precision, developing memory, developing social skills, developing self-image and self-awareness, developing a sense of rhythm, developing and maintaining a healthy and conscious lifestyle, developing problem-solving skills, increasing tolerance for failure, behavior and behavior problems, attention deficit hyperactivity disorder, foreign language, expanding vocabulary, awakening interest, deepening knowledge etc.

In the case of children with poor development of motor skills, inhibition and frustration appear, therefore these children avoid and refuse motor activities. If the dog appears during the activities, motivation appears, the children perform the tasks willingly, smiling, forgetting about their problems. The dog accepts children as they are, with or without defects, he behaves the same with everyone, it makes no difference.

It is widely accepted that children need physical activities for their healthy development, and it is proven that movement and action are essential for the harmonious development of cognitive functions such as language, sensation and perception, as well as some intellectual skills.

It also plays a big role in behavior control the early motor coordination activities. This is how the child experiences that he is the master of his own actions, that he is ahead he can summon things and control his own movement. Animals are often used to develop greater self-control and a sense of responsibility (Serpell, 2000).

AAT has also been shown to facilitate cognitive and social development (Olds et al., 1994; Sollerhed et al., 2008; Stork & Sanders, 2008), and there appears to be a strong relationship between the development of gross motor skills and language (Rarick, 1980). As children develop more sophisticated motor skills, their capacity for language improves as well.

When dog and child meet there is inevitably a motor component to their interaction. When we think of the image of a child next to a dog we can imagine a series of movements in their way of playing. Inevitably, the idea of detecting the positive effects brought by therapy dogs in the development of motor skills in children arises.

The predictability of school performance can be most easily estimated through perceptual and motor skills. These are the areas where fortunately therapy dogs can be used predominantly, they can be included in motor activities and even provide added value to these activities.

Hypothesis

We assume that through dog-assisted therapy we obtain significant results from the point of view of general motor skills in children with disabilities.

Material and methods

We mention that there is the consent of the Ethics Committee of the Center for Inclusive Education Bonitas for conducting the research. We also mention that there is the informed consent of the child subjects and the consent of the parents for the research..

Research protocol

a) Period and place of the research

b) The experimental research will be carried out for a period of 3 months between February 15 and June 30, 2023. The results obtained will be the subject of Note II.

c) Subjects and groups

The target group are children with disabilities of preschool age between 3-8 years old, girls and boys

The children participating in the research have the following disabilities: autism spectrum disorder, intellectual development disorder, movement disorder, delay speech development

d) Applied tests

- We cross the route
- We cross the bridge
- We sneak under the bridge
- We overcome obstacles
- We lead the dog
- "Movement Score" Trail
- We imitate the dog

e) Statistical processing

Calculation of the significance p-value from the difference of the means, by the specific statistical-mathematical method. Statistical table and p-significance for each item.

Preliminary results

During the activities carried out with the therapy dog West, we tried to develop basic motor skills, aiming to stimulate children with disabilities to move on all fours, motivating them for the activities demonstrated by the dog. During these activities, in addition to motivation, children's attention also develops, they must watch the dog's demonstrations, follow the route.

In the following we present some ideas of activities carried out for the development of motor skills with the therapy dog West.

a) We cross the route

We are putting a play tunnel in the gym. The children are sitting on a bench waiting for the instruction.

The dog presents the task, crosses the tunnel. The children follow him in turn. At the end of the tunnel children can pet the dog. Motor activity performed on all fours by children (Fig. 1).



Fig. 1 – Cross the route by the dog.

We put a bench in the gym. The children sit on another bench waiting for the instruction. The dog presents the task, climbs onto the bench and crosses it on all fours without falling. The children follow him in turn. At the end of the exercise, the children can pet the dog. Motor activity performed on all fours by children.



Fig. 2 – The dog crosses the bridge.



Fig. 3 – The kid crosses the bridge.

b) We sneak under the bridge

The dog is placed on two gymnastic benches, between which there is a distance where children cross. Children are asked to take turns to cross under the dog bridge (Fig. 2; Fig. 3).

At the end of the exercise, the children can pet the dog. Motor activity performed on all fours by children.

c) We overcome obstacles

In the gymnasium we make obstacles out of different gym objects, objects for maintaining balance, climbing, crossing. The dog presents the task, crossing each element of the route. The children follow him in turn. At the end of the exercise, the children can pet the dog. Motor activity performed on all fours by children, by climbing, by crawling (Fig. 4).



Fig. 4 – Crossing the obstacles supervised by the dog.

d) We lead the dog

In the gymnasium we set up some milestones. We present the task, crossing the route around the stakes leading the dog on a leash. The children take turns performing the task. At the end of the exercise, the children can pet the dog. Motor activity performed standing, walking (Fig. 5).

These activities develop walking on all fours, crawling, balance, skill, contributing to the child's development by increasing motor performance and self-confidence.



Fig. 5 – The children walk the dog.

e) "Movement Score" Trail

In the hall we place the elements of the educational game "Movement score". Each tablet means a movement (imitate the bear, imitate the frog, the wind etc.). The dog does the demonstration, runs the route and shows the children the right movement for each tablet. The children follow the dog in turn and make the route. These activities develop balance, eye-hand-foot coordination (Fig. 6, Fig. 7).



Fig. 6 – Imitate the bear, educational activity.



Fig. 7 – Movement score educational activity.

f) We imitate the dog

Children are asked to stand facing the dog and wait for instructions. Every movement of the dog will have to be imitated. When the dog stands, the children do the same, when it lies down, spins, "slaps" the children imitate the movement. It is a game through which we develop attention, large movements (8).



Fig. 8 – Do what the dog is does.

Discussion

We believe that exercises with the help of the dog strengthen the child's self-confidence, therapists always find games where children experience success. Certain exercises are refused by these children because of fear or insecurity in movement, but in the presence of the dog these obstacles disappear, the children no longer think about the sensations of discomfort but simply follow the dog.

The dog is very loved by children and that is why its presence stimulates the children, being much more easily trained in different activities. It is considered a friend, a companion who does not criticize you, accepts you without prejudice.

Since these children are mostly non-verbal at preschool age, they cooperate very quickly and well with an animal that, like him, is directed by short verbal indications and by different gestures. Following the assisted therapies with the dog, relationships with peers deepened as a result of the shared experience.

Conclusions

1. The current work was thought to be a study of the existing research in the field, before starting our own research.

2. In the framework of the research, we propose the use of exercises that develop the functions necessary for the development of the preschool period and are indicated for this age period. We have also presented some of these exercises in the paper.

3. We will focus on developing laterality, eye-hand-foot coordination, improving fine motor skills and stimulating the vestibular system.

4. We want to do the activities with a certain regularity, carrying out one activity per week.

Conflict to interests

Nothing to declare.

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EVENTS

160th Anniversary of the sanitary of cers assembly of the Romanian army

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Romanian medicine has a long and complex tradition, which must be convincingly highlighted. There are many ways to achieve this goal, such as anniversaries of past events.

In 2022, an important event took place, the 160th anniversary of the Romanian army's assembly of medical of cers. It was founded on August 21, 1862. At the same time, the General Directorate of the Romanian Sanitary Service was created. Both entities were funded based on a decree signed by Ruling Prince Alexandru Ioan Cuza (1820-1873). Their aim was to assist the health of Romanian army soldiers, in peacetime and in wartime (as recorded in the press release of the Health Ministry of August 21, 2022, press statement entitled "Military Medicine Day").



Fig. 1 – The new pavilion of the Dr. Constantin Papilian" Emergency Military Clinical Hospital

The anniversary was marked by scientific sessions held in different centers of Romania. In Cluj-Napoca, on August 23, 2022 the "Dr. Constantin Papilian" Emergency Military Clinical Hospital organized the symposium *Military medicine - 160 years of existence. Cluj-Napoca Emergency Military Clinical Hospital – its place in the military medical system and in the community of Cluj Country*. This event was scheduled in the new pavilion of this well-known medical-military institution (Fig. 1). Being a festive moment, the guests were welcomed by Colonel Vasile Stoica. The guests received: the program, the emblem and the badge of this medico-military institution.

At the official opening, Mrs. Colonel Dr. Doina Baltaru – the Commander (Managing Director) of this Hospital – portrayed the outstanding physician and pharmacist Carol Davila (1828-1884), as an example for the military medical staff. Also, Colonel Dr. Doina Baltaru listed some of the most notable achievements of this institution and its important place in the community of Cluj region. Taking into account the recent achievements, the Hospital was included among the prominent clinical medical units of our country. This speech, also scrutinized the need for a wider support of military medicine, which became more evident in the conditions of the dramatic situation of Ukraine.

Mrs. Colonel Dr. Doina Baltaru read the message of the Ministry of National Defense. It clearly shows that the central authorities have a distinctive appreciation for the Cluj Military Hospital.

The program of this event also included the message of the commander of the 4th "Gemina" Infantry Division – General Brigadier Dr. Nicolae Tonu. His aim was to reveal the profound esteem that the Division leadership has for the activity of this valuable medical-military institution in Cluj-Napoca.

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A special guest of the anniversary session was the Rector of "Iuliu Hatieganu" University of Medicine and Pharmacy in Cluj-Napoca - Professor Dr. Anca Dana Buzoianu. She emphasized the collaboration between the academic forum that she leads and Dr. Constantin Papilian" Emergency Military Clinical Hospital, as well as some prospects for the development and enhancement of this cooperation.



Fig. 2 – Prof. Dr. Cristian Bârsu, presenting his communication at the anniversary symposium.

One of the important participants frequently invited at other scientific events of this Hospital was Professor Dr. Cristian Bârsu – the head of the Humanistic Sciences Discipline at the Faculty of Medicine from the same

university (Fig. 2). He gave an interesting medical-historical communication. Its title was *Tribute over time. A little known Carol Davila's representation in the "Iuliu Hatieganu" University of Medicine and Pharmacy*. Professor Bârsu referred to the bas-relief of Davila, made by the foremost Cluj sculptor Prof. Virgil Fulicea (1907-1979). The sculpture is part of the "Gallery of Romanian Scholars", initiated by Prof. Dr. Erwin Popper (1906-1974) – the first dean of the Faculty of Pharmacy from the Cluj Institute of Medicine and Pharmacy. Fulicea's work of art is exhibited in the amphitheater that Popper himself founded and which bears his name. In this presentation, Prof. Dr. Cristian Bârsu identified some insufficiently known, but significant aspects from a medico-historical point of view, from the medical career that Carol Davila had in Bucharest.

A very interesting moment of symposium was represented by Lecturer Colonel Dr. Valentin Oprea-Aron's communication. It was held in the name of the university teaching staff of the Hospital. He presented thoroughly the landmarks of the history of emergency medicine, from antiquity to the contemporary period.

Another sequence of this anniversary occasion was the message of the chief doctor of the 4th "Gemina" Infantry Division – Medical Colonel Emil Coman. He outlined the qualities of the military medical corps. These features are highlighted in the daily activity of the members of Dr. Constantin Papilian" Emergency Military Clinical Hospital.

During this jubilee session, Colonel Dr. Doina Baltaru offered the anniversary diploma "160 years of military medicine" to: Rector Prof. Dr. Anca Dana Buzoianu, Brigadier General Dr. Nicolae Tonu and Prof. Dr. Cristian Bârsu.

As a conclusion of the symposium, Colonel Dr. Doina Baltaru led a guided tour of the recently modernized departments of the Military Hospital for all the guests.

EVENTS

Iuliu Haieganu, the founder of the student sports park in Cluj-Napoca, which today bears his name

Traian Bocu

Chief Editor Health Sports & Rehabilitation Medicine Journal

On Sunday, the 15th of January 2023, the National Culture Day, the sports park of the "Babe-Bolyai" University hosted the ceremony of the unveiling of the bust statue of Professor Iuliu Haieganu, a great medical and academic personality of the city of Cluj.

The event was attended by hundreds of citizens of Cluj, as a sign of respect and appreciation. The Orthodox Church was represented by Archbishop Andrei Andreicu, the Greek Catholic Church by Bishop Claudiu, who led the service in the memory of the sports park founder.

The official unveiling of the statue was performed by the Cluj Mayor Emil Boc, the Babe-Bolyai University Rector Daniel David and the President of the Iuliu Haieganu University of Medicine and Pharmacy Senate, Professor Daniel Murean.

Professor Daniel David emphasized the prominent position of Rector Iuliu Haieganu in the cultural and academic life of Cluj. He said: "Iuliu Haieganu is the first dean of the faculty of medicine in Transylvania. We also remember him as Rector in the years 1930-1931, a

very constructive period, when this park began to take shape. Iuliu Haieganu is part of the famous gallery of professors and rectors. The park still functions according to the principles set by Iuliu Haieganu, all the students of all the Cluj universities are granted equal entrance".

Emil Boc, the Mayor of Cluj, underlined education as a basis of culture. Education lies at the foundations of this city. The Mayor also noted the large participation of academic, cultural and sports elites in this event, which reflects the respect for the memory of Iuliu Haieganu. This is where the Sports University Club was established due to Iuliu Haieganu's great spirit.

The big statue (3 meters in height, on a 1.50/1.20 m pedestal), placed in the park central alley, near the main entrance, was created by sculpturer Dumitru Cosma. On the left of the statue, the artist conceived an emerging budding branch, made of bronze, representing the Professor's son, died prematurely at the age of 10 years.

The ceremony in the "Iuliu Haieganu" Sports Park ended with an homage of flower wreaths.



The unveiling of the statue of Prof. Dr. Iuliu Haieganu by the officials attending the ceremony: Emil Boc, Mayor of Cluj (middle), Daniel David, Rector of Babe-Bolyai University (left) and Daniel Murean, President of the Iuliu Haieganu University of Medicine and Pharmacy Senate



The Statue of Professor Iuliu Haieganu, the founder of the park bearing his name.

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Speech by Rector of the Rector of Babe -Bolyai University, Prof. Dr. Daniel Davi.



The stages of the sports park foundation and construction, presented by the Dean of the Faculty of History, Prof. Dr. Ovidiu Ghitta.



The speech in Honour of Prof. Dr. Iuliu Ha ieganu by Prof. Dr. Daniel Mure an, President of the Iuliu Hatieganu University of Medicine and Pharmacy Senate.



The importance and signigf cance of the event emphasized in Emil Boc's speech, Mayor of Cluj.



The memorial plate on the statue front with the following inscription: Iuliu Ha ieganu 1885-1959. Doctor, Academic, promoter of Clun modern medicine and of this sports park. A monument made by Cluj Municipality and the "Babe -Bolyai" University of Cluj-Napoca.



The statue of Prof. Dr. Iuliu Ha ieganu, after homage paid by flower wreaths.

FOR THE ATTENTION OF CONTRIBUTORS

The subject of the journal

The journal has a multidisciplinary nature oriented toward biomedical, health, exercise, social sciences fields, applicable in activities of physical training and sport, so that the dealt subjects and the authors belong to several disciplines in these fields. The main rubrics are: “Original studies” and “Reviews”.

The Journal is aimed at adapting the profile of the journal to scientific contemporaneity in the field of medical and pharmaceutical sciences and interdisciplinary integration with health, physical activity and biopsychosocial rehabilitation.

The journal will have the same contents: editorials, original articles, review articles, case reports, recent publications, events. The journal is open for publication to all members of the national and international scientific community and offers the possibility to promote young people involved in research, along with top researchers in the above mentioned fields.

Regarding “Reviews” the main subjects that are presented are: oxidative stress in physical effort; mental training; psycho-neuroendocrinology of sport effort; physical culture in the practice of the family doctor; extreme sports and risks; emotional determinatives of performance; the recovery of patients with spinal column disorders; stress syndromes and psychosomatics; olympic education, legal aspects of sport; physical fitness/exercise in the elderly; psychomotricity disorders; high altitude sportive training; fitness; biomechanics of movements; EUROFIT tests and other evaluation methods of physical fitness; adverse reactions of physical fitness; sport endocrinology; depression in sportsmen/women; classical and genetic drug usage; Olympic Games etc.

Among articles devoted to original studies and researches we are particularly interested in the following: the methodology in physical education and sport; influence of some ions on effort capacity; psychological profiles of students regarding physical education; methodology in sport gymnastics; the selection of performance sportsmen.

Other articles approach particular subjects regarding different sports: swimming, rhythmic and artistic gymnastics, hand-ball, volleyball, basketball, athletics, ski, football, field and table tennis, wrestling, sumo.

The authors of the two rubrics are doctors, professors and educators, from universities and preuniversity education, trainers, scientific researchers etc.

Other rubrics of the journal are: the editorial, editorial news, reviews of the latest books in the field and others that are presented rarely (inventions and innovations, universitaria, preuniversitaria, forum, memories, competition calendar, portraits, scientific events).

We highlight the rubric “The memory of the photographic eye”, where photos, some very rare, of sportsmen in the past and present are presented.

Articles signed by authors from the Republic of Moldova regarding the organization of sport education, variability of the cardiac rhythm, the stages of effort adaptability and articles by some authors from France, Portugal, Canada must also be mentioned.

The main objective of the journal is highlighting the results of research activities as well as the permanent and actual dissemination of information for specialists in the field. The journal assumes an important role regarding the achievement of necessary scores of the teaching staff in the university and pre university education as well as of doctors in the medical network (by recognizing the journal by the Romanian College of Physicians), regarding didactic and professional promotion.

Another merit of the journal is the obligatory publication of the table of contents and an English summary for all articles. Frequently articles are published in extenso in a language with international circulation (English, French).

All the content of the journal is available immediately upon publication and is Open Access.

The Editorial Board of the Health, Sports & Rehabilitation Medicine journal informs its collaborators and readers that access to the journal is open and free. The journal does not have article processing or submission charges.

The journal is published quarterly and the works are accepted for publication in English language. The paper is sent by e-mail at the address of the editorial staff. The works of contributors that are resident abroad and of Romanian authors must be mailed to the Editorial staff at the following address:

Health, Sports & Rehabilitation Medicine

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Website: www.jhsrm.org

Objectives

Our intention is that the journal continues to be a route to highlight the research results of its contributors, especially by stimulating their participation in project competitions. Articles that are published in this journal are considered as part of the process of promotion in one's university career (accreditation that is obtained after consultation with the National Council for Attestation of University Titles and Diplomas).

We also intend to encourage the publication of studies and research, that include original relevant elements especially from young people. All articles must bring a minimum of personal contribution (theoretical or practical), that will be highlighted in the article.

In the future we propose to accomplish criteria that would allow the promotion of the journal to superior levels according international recognition.

THE STRUCTURE AND SUBMISSION OF ARTICLES

The manuscript must be prepared according to the stipulations of the International Committee of Medical Journal Editors (<http://www.icmje.org>).

The number of words for the electronic format:

- 4000 words for original articles;
- 2000 words for case studies;
- 5000-6000 words for review articles.

Format of the page: edited in WORD format, A4. Printed pages of the article will be numbered successively from 1 to the final page.

Font: Times New Roman, size 11 pt.; it should be edited on a full page, with diacritical marks, double spaced, respecting equal margins of 2 cm.

Illustrations:

The images (graphics, photos etc.) should be numbered consecutively in the text, with arabic numbers. They should be edited with SPSS or EXCEL programs, and sent as distinct files: „figure 1.tif”, „figure 2.jpg”, and at the editors demanding in original also. Every graphic should have a legend, written **under** the image.

The tables should be numbered consecutively in the text, with roman numbers, and sent as distinct files, accompanied by a legend that will be put above the table.

PREPARATION OF THE ARTICLES

1. Title page: includes the title of article (maximum 45 characters), the name of authors followed by surname, work place, mail address of the institute and mail address and e-mail address of the first author. It will follow the name of article in the English language.

2. Abstract: For original articles a summary structured like this is necessary: (Background, Aims, Methods, Results, Conclusions), of maximum 250 words, followed by 3-8 key words (if is possible from the list of established terms). All articles will have a summary in the English language. Within the summary (abstract) abbreviations, footnotes or bibliographic references should not be used.

Background, Aims. Description of the importance of the study and explanation of premises and research objectives.

Methods. Include the following aspects of the study: Description of the basic category of the study: of orientation and applicative. Localization and the period of study. Description and size of groups, sex (gender), age and other socio-demographic variables should be given. Methods and instruments of investigation that are used.

Results. The descriptive and inferential statistical data (with specification of the used statistical tests): the differences between the initial and the final measurement, for the investigated parameters, the significance of correlation coefficients are necessary. The specification of the level of significance (the value p or the dimension of effect d) and the type of the used statistical test etc are obligatory.

Conclusions. Conclusions that have a direct link with the presented study should be given.

Orientation articles and case studies should have an unstructured summary (without respecting the structure of experimental articles) to a limit of 150 words.

3. Text

Original articles should include the following chapters which will not be identical with the summary titles: *Introduction* (General considerations), *Hypothesis*, *Materials and methods* (including ethical and statistical informations), *Results*, *Discussions* results, *Conclusions* and suggestions. The conclusions should be formulated briefly, without comments extracted from the research, and numbered. Other type of articles, as orientation articles, case studies, Editorials, do not have an obligatory format. Excessive abbreviations are not recommended. The first abbreviation in the text is represented first in extenso, having its abbreviation in parenthesis, and thereafter the short form should be used.

Authors must undertake the responsibility for the correctness of published materials.

4. References

The references should include the following data:

For articles from journals or other periodical publications the international Vancouver Reference Style should be used: the name of all authors as initials and the surname, the year of publication, the title of the article in its original language, the title of the journal in its international abbreviation (italic characters), number of volume, pages.

Articles: Pop M, Albu VR, Vișan D et al. Probleme de pedagogie în sport. *Educație Fizică și Sport* 2000; 25(4):2-8.

Books: Drăgan I (coord.). *Medicina sportivă*, Editura Medicală, 2002, București, 2002, 272-275.

Chapters from books: Huliș I, Băluțu O. Fiziologia senescenței. In: Huliș I. (sub red.) *Fiziologia umană*, Ed. Medicală, București, 1996, 931-947.

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