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Teachers Physical Exposure Grading in Percentile Scale: Development and Assessment of Reliability

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ABSTRACT

Background and Objectives: *Work is essential in the lives of men and women; Although various scales for measuring the Physical exposure of most type of workers like commuter and aeromechanics and many more have already been developed in previous studies, a scale for the teaching staff particular to teachers has yet to be developed, also there is dearth of studies that have revealed its importance in the musculoskeletal disease. The purpose of this study was to develop a scale to measure the physical exposure in percentile form for teachers that are exposed during their normal teaching period that may lead to further musculoskeletal problems and to confirm its validity and reliability.*

Design: *An exploratory qualitative research study.*

Methods: *The developed scale was given to two trained interviewer to interview 500 school teachers who voluntarily participated in the present study and returned valid responses for test–retest reliability.*

Results: *Over all inter rater reliability was excellent for the teacher's physical exposure grading in percentile scale, i.e. =0.716 (95% confidence interval 0.95 to 0.98)*

Conclusion: *The teacher's physical exposure grading in percentile scale (TPEGP) Scale is composed of 2 subscales measured from a total of 10 factors. The validity and reliability of the TPEGP Scale was supported by the statistical analyses.*

Keywords: *Teachers Physical Exposure grading percentile scale (TPEGP), musculoskeletal diseases (MSD).*

INTRODUCTION

Musculoskeletal disorders are a major public health problem, and represent a Global Threat to Healthy Aging[1]. Musculoskeletal disorders (MSDs) are inflammatory and degenerative conditions that affects the muscles, tendons, ligaments, joints or peripheral nerves, usually leading to pain or discomfort[2,3]. Large proportion of these disorders is assumed to be associated with adverse work conditions[4]. Wahlström J and co-workers found a relation between high physical exposure and high perceived muscular tension that further leads to musculoskeletal problems[5]. Study done by Devereux JJ and co-researchers showed that workers highly exposed to both physical and psychosocial workplace risk factors were more likely to report symptoms of musculoskeletal disorders than workers highly exposed to one or

the other[6]. Repetitive work tasks, forceful exertions, awkward postures, heavy lifting, job stress, job strain and many other factors have been demonstrated in occupations as high risk for musculoskeletal diseases[7,8,9,10]. Other factors may be prolonged standing, sitting and awkward posture is known to be positively associated with MSD[11,12,13].

Many studies suggest how important is an assessment to rule out the interference of these factors in many different workers and occupations. Kilbom Å et al and co-workers established a relation between physical work load and work related musculoskeletal disorders and suggested various quantitative assessment of exposure to the main risk factors. To find out the same they focused on commonly used methods like questionnaires, diaries, interviews, systematic observations, and direct measurements[14]. Li G, Buckle et al also assessed Physical exposure and risks for potential work-related musculoskeletal injuries by using a variety of methods, including pen and paper based observation methods, videotaping and computer-aided analysis, direct or instrumental techniques, and other various approaches to self-reported assessment[15].

Teachers are our nation builders; it takes heart, commitment and passion. But for all the very real challenges, like job stress and physical exposure that they undergo every day they may lose their actual skills of teaching in their daily routine as the above factors interfere in all their life.It may also prevent them from carrying out their normal activities, and can also cause some to change jobs or duties, reduce their activity at home and seek medical attention if not taken proper precaution in job place at right time. Teachers appear to be more prone to suffer musculoskeletal diseases of the back, neck and upper limbs due to the various bad ergonomic risk factors[16,17,18].With regards to other occupational groups teachers report high rates of MSD of between 40% and 95%[19]. Another study done by Loveness A. Nkhata and co-researchers showed that life time prevalence of MSD was 77.9% among Nurses at the University Teaching Hospital in Lusaka, Zambia[20].

There are many assessment tools to find out how a teacher is at the risk of job stress[21,22].As for assessment of physical exposure and its relation to musculoskeletal problems (specifically for precision, Prehension and repetitive type of work) there are very few studies done. Hence the aim of the present study is to propose a new questionnaire to rule out the physical exposure risk to musculoskeletal problems in a percentage form and to propose its reliability to use it specifically for the teaching profession.

METHOD

Development of instruments

Design of questionnaire:

The scale developed was considering the physical exposure of the school teachers during their school hours, for the period of past month. This is a newly designed interview-administered questionnaire. In the present study, subjects demographic data was taken which included their name, identity no, age, gender, home address, school name and address, type of school, subject's school experience, designation in school, working hours and duration of breaks they get during school hours. Further the scale contains of two subdivisions of Prehension and prescision, were each subdivision had five factors for grading. Prehension had factors like (1) Writing with pen, pencil, chalk and /or all other small instruments that are used during teaching and should use Pad to pad (pinch), tip to tip (pincer grip), pad to side, & side to side grasps for most of them, (2) Any activities done by hand like cutting, drawing that may need power grips like Cylindrical, spherical & hook grips, (3) Caring weights in hand, (4) Talking, text or chapter explanation i.e. in simple terms mouth activities, (5) Foot /knee activities if any like ankle toe movements. Prescision included (1) Activities in excellent or safe zone (2) Over head activities or danger zone (3) Activities in standing (4) Activities in sitting /banding (5) Activities in walking.

The response scale comprises of ten categories that is doing the above activity patterns with breaks for 0 to 10, 11 to 20, 21 to 30, 31 to 40 and more than 41 minute and continues for 0 to 10, 11 to 20, 21 to 30, 31 to 40 and more than 41 minutes per day. The above categories were then scored as 1, 3, 5, 7, 9 and 2, 4, 6, 8, 10 respectively. The break that was taken during any activities had not to be more than 5 minutes. The score obtained by the above subdivisions was to added and multiplied by the number of lectures they take per day keeping the maximum lecture taken by a teacher per day as 5.The maximum score of Prehension and prescision subdivision was 100 (i.e. 50 +50 = 100), which after multiplying by the maximum number of lectures teachers take per day was 500 (i.e. 100 x 5 = 500).

To convert the score into percentile form the obtained score of the scale was divided by the maximum score of the scale and then multiplied by hundred. The percentile score was further divided into four categories as minimal physical exposure (i.e. high exposure to both precision and repetitive work) = 15-36 %, medium exposure (i.e. medium exposure to precision or repetitive work) = 37-57 %, moderately high exposure (i.e. moderately high exposure to precision or repetitive work) = 58-78 % and high physical exposure (i.e. high exposure to both precision and repetitive work) = 79-100 %.

PILOT STUDY

For the reliability of developed questionnaire, two interviewers were asked to interview 100 teaching staff over a one month period (at first visit first interview and within the four days the second interviewer, the fourth week of the first visit again the first interviewer had to interview the same study participants {teachers}). Before any interaction from the teaching staff for the study purpose approval was taken from the ethics committee of KLE University, Belagavi for the study protocol and permission was taken from the 15 school heads/ administrative to conduct the research. All the teaching staff (study participants) were explained in detail the study conducted in their vernacular language and then were asked to sign the inform consent voluntarily for all to participate in the study. Present study began in October 2015 and was completed by March 2016. This study was conducted during the free time of the teachers at their respective schools they teach. The average time for an interview was10 minutes /day for each participant. After completing each interview, interviewers had to calculate the score and report to research team; the scale scores were then verified by the research team, and corrections were made before all data were finally entered in software for statistical analysis.

STATISTICAL ANALYSIS

SPSS 16.0 on trial was used to conduct allthe statistical analyses in our study.

Reliability

The Cronbach's alpha coefficient was used to determine the overall reliability of the instrument, and it was considered an acceptable reliability for a new instrument if the Cronbach's alpha coefficient was higher than 0.7. For the reliability of internal consistency of each question of the instrument Spearman rank correlation was used in the study.

RESULTS

The study population consisted of middle-aged, mainly school teaching staff, about 2 and more years of experience of teaching at the time of participation in this study. All the 20 schools were randomly chosen regardless of government or private sector from the Belagavicity by the use of envelop method. Two well-trained interviewers conducted the study and reported the final data to the chief investigator. After the collection of the data, it was corrected for minimal bias and underwent statistical evaluation for its reliability.

Cronbach's α was used as an estimate for the reliability of the overall instrument on its psychometric aspects. In present study Cronbach's α = 0.716 were according to the results of

Cronbach's α 0.8> α ≥ 0.7 is acceptable. Hence our instrument was considered to be acceptable.

For the internal consistency of each question of the instrument Spearman rank correlation was performed. Reliability of each of the questions were found to be statistically significant (table: 1)

Question no	spearman rank correlation values
1	0.914
2	1
3	0.991
4	0.853
5	0.947
6	0.939
7	0.922
8	0.968
9	0.932
10	0.876

Table 1: The internal consistency of each question of the instrument using spearman rank correlation and its values

DISCUSSION

The study tested the reliability of a newly designed questionnaire on physical exposure experienced by teachers in their school hours at the school they teach. Physical exposure in the study was scored by the activity patterns (i.e. Prehension and prescision) and time duration they had to continue it. Present study was a newly designed interview-administered questionnaire and a pilot study. The questionnaire was developed using the cognitive model[23,24] that administered a recall calendar and cognitive ability[25] to report their past physical exposure or the physical activity they did. For any of theretrospective studies most important are the psychometric properties[26] of the instrument for measuring the pastimes physical activity patterns with good cognitive or in simple wards ability to remember past activities. Due to these resound the questionnaire was found to have good test-retest reliability as assessed by examining the correlations for different types of activity and time periods. This questionnaire was most acceptable as the participants were helped to remember all their activity patterns they have done during their past month by the help of a trained interviewer. The questionnaire was therefore interviewer-administered rather than self-administered by the trained interviewer in cognitive interviewing methods[27,28]. Furthermore, given all the possible physical activity patterns that teaching staff is exposed to with its approximated time, the level of and the amount of information being recalled, was much easier than using any other self-administered questionnaire. In its present format, the questionnaire was easy to administer and complete as it had direct questions to answer in simple language with no difficult wordings. The interviewer was also trained prior to the interview in a one day work shop on how to give cognitive options regarding the physical activities they must have exposed to in last month. They were also trained to gather more information on how long a teacher does a particular type of physical activity pattern in a day during the school hours.

Study participants did not find the questionnaire too long or too difficult to complete; indeed, some actually commented that it was easy to answer as the questions were direct and the components of it included almost all the physical activities that they do during the school hours. It was also much easier for them to answer all physical patterns that they have done past month as the interviewer would give hints if any of the activity patterns they had forgotten to tell to the interviewer. Almost all the study participants admitted that the questionnaire provided requires less time to answer than any other interviews. The newly designed questionnaire for physical exposure during the school hours faced by the teachers took less time to complete as the interviewer were trained prior to how to ask questions and to extract answers from the study participants. As the interviewer was well known to what to fill in which blanks and what the criteria is for scoring for each divisions of the questionnaire scale it saved much of the time of the teachers as compared to any of the self-administrated questionnaire as well as the time of the researcher.

By this study most all the physical activity patterns were taken into consideration and were framed in such a way that it would be easy to answer for the study participants (teachers) correctly without much efforts of cognitive ability as well as in less period of time. The study focused equally on Prehension as well as prescision working in school environment by the study participants. As to the calculating of scores of how much a teacher is at physical exposure by the designed interview-administrated questionnaire, it was much easier to score it in percentage form and was also easier to interpret.

The designed Teachers Physical Exposure Grading in Percentile Scale is very important in knowing at what level a teacher is at risk of musculoskeletal problems specific to the teaching profession. Further research may be done to see the reliability of each component of the scale to measure the outcome measures for any intervention given to musculoskeletal problems in teachers.

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