



Awareness of Ergonomics in School Going Children of Rural Government Schools

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Abstract

Aim: This study aims to study the awareness of ergonomics in school-going children of rural government schools. Children experience various difficulties due to improper ergonomic setup and their habits. Musculoskeletal problems are highly prevalent in school children due to improper ergonomics. **Objective:** The objective of this study is to determine awareness of ergonomics in school-going children of rural government schools. **Method:** This was an observational study in which 110 school children of the age group 13 to 18 participated. According to inclusion and exclusion criteria, a sample population was selected. The participants were then given a questionnaire and instructions on how to fill it out. The study was conducted using a self-made validated questionnaire for a duration of 6 months. **Results:** Out of 110 children, 9% of children have an excellent awareness of school ergonomics, 46% have good knowledge whereas 45% have poor knowledge. **Conclusion:** According to the findings of this study, the majority of children are aware of a few things regarding school ergonomics but not thorough about it. The rest of the children from rural government schools are completely unaware of ergonomics and its application in daily life. Also, most children agree with the need for conducting ergonomics awareness programs.

Keywords: Awareness, Classroom, Children, Ergonomics, Musculoskeletal Pain, Posture, School

1. Introduction

Ergonomics can be defined as an applied branch of applied science concerned with designing and organizing products, used by people with the goal that product and people interconnect most efficiently and cautiously¹. Ergonomics, derived from the Greek words “ergon” (meaning work) and “nomos” (meaning natural law), is the science of designing environments to fit the individuals who inhabit them². School is the place where children live, learn, experience, and socialize. The school environment has a large impact on children’s lives as they spend most of the hours of the entire day over here. School ergonomics allows a child to study and play with greater comfort and less chance of getting injured. Principles of ergonomics

were earlier applied only to adult workplaces to ensure their safety however; a new study indicates it is equally important for young ones. Behavioral patterns of children put them at greater risk for environmental hazards more than adults.

In the quick-paced field of education, curriculum, teaching techniques, and student results are frequently the main points of emphasis. However, school ergonomics is an important component that significantly impacts learning but is frequently overlooked.

Children carry bags on their backs every day, the backpacks are helpful for carrying supplies and also keeping their hands available for other things. But these backpacks might be problematic for children because they have no notion how much weight they can carry comfortably.

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Many other ergonomic hazards have been identified in school settings. They include incompatibilities of seating, the position of the blackboard, and the surrounding atmosphere (lighting, noises, and ventilation). These factors can cause eye strain, dry eyes, headaches, and vision problems in students who spend hours studying³. Research shows extensive mismatches between student body sizes and chairs and desks, unhealthy behavior while carrying school causes unfavorable consequences ranging from general tiredness, musculoskeletal pains, shoulder level stiffness, spinal issues, injuries, and also psychological disturbances³. Students often sit for long periods, hunched over desks that are not ergonomically designed. This can result in back and neck pain, as well as poor spinal alignment. Ill-fitting or uncomfortable furniture, such as desks and chairs that are too high or too low, can lead to poor posture habits in students. Slouching, leaning forward, or holding uncomfortable poses over extended periods might cause strain. The muscles negatively affect spinal alignment. Inadequate ergonomics can lead to fatigue and discomfort, which can impair students' concentration, focus, and overall academic performance. Discomfort caused by uncomfortable seating or poorly positioned workstations can be distracting and hinder learning.

We typically tend to dwell on the discomfort of adults due to improper sitting habits at work however the habits start from sitting in school. Children typically sit in poor posture in class, flexing or twisting their neck, trunk, and back for extended periods, resulting in musculoskeletal pain⁴. Poor sitting posture at a young age can cause improper formation of the bones and lead to spinal issues like postural kyphosis, making them hard to correct later in life. However, in many rural schools, students encounter unique challenges in terms of physical well-being and educational development. Limited resources, inadequate infrastructure, and a lack of awareness often contribute to substandard learning environments. Due to infrastructure limitations, the children sit on the floor with folded knees.

When it comes to teaching ergonomics, there is no better time than when the children are young. These are important years where good habits can be established. Educating children about balancing posture, body function, movements, and ergonomic implications can prevent and minimize these problems. By implementing ergonomics practices in rural schools, we can help reduce the risks of musculoskeletal problems, discomfort, and

long-term health issues among school-going children. In addition, optimizing their learning environments can enhance their focus, involvement, and academic performance thus paving the way for a brighter future and increased opportunities for success with the introduction of "Health Promoting Schools", WHO has provided an opportunity to ensure a safe environment for school children. Awareness programs should be implemented in schools to help students become aware of and understand the impact of ergonomics risks while completing regular duties.

2. Materials and Methodology

This study was an observational study type with 110 participants. The institutional ethics committee in the area where the study was conducted provided ethical clearance for this research project (protocol number 639/2022-2023).

Permissions were obtained as needed and according to inclusion and exclusion criteria sample population was selected. The study process was explained to the participants and an informed permission form was obtained from them. The participants who had filled out the form were then given a questionnaire and instructions on how to fill it out. After that, responses were collected. Based on responses, statistical data was analyzed. Later results and conclusions are determined. This procedure was carried out in 6 months.

3. Inclusion and Exclusion Criteria

Secondary school children (age group 13-18) of both genders studying in government schools and willing to participate were incorporated into the study. Children with neurological or musculoskeletal conditions were excluded.

4. Results

According to Figure 1 total of 110 subjects participated in the study out of which, there were 49% were females and 51% were males (Figure 1).

Age: 17 Children were 13 years old, 23 were 14 years old, 19 were 15 years, 21 children were 16 years old, 14 were 17 years and 15 were 18 years old (Figure 2).

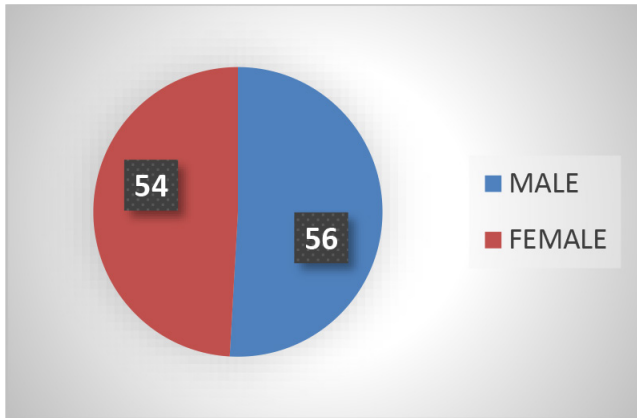


Figure 1. Gender.

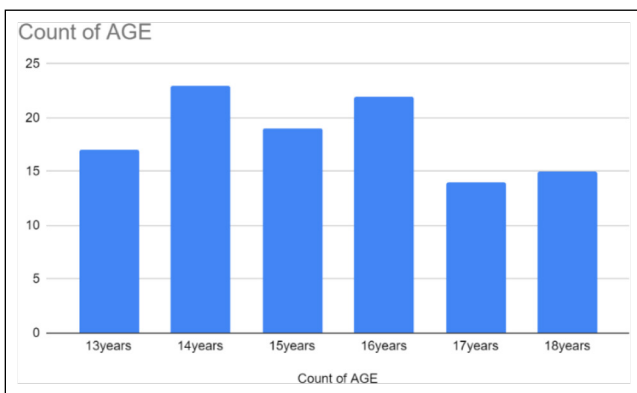


Figure 2. Age.

Standard: Out of all participants 16 were from 7th grade, 20 from 8th, 18 from 9th, 24 from 10th, 15 from 11th and 17 from 12th (Figure 3).

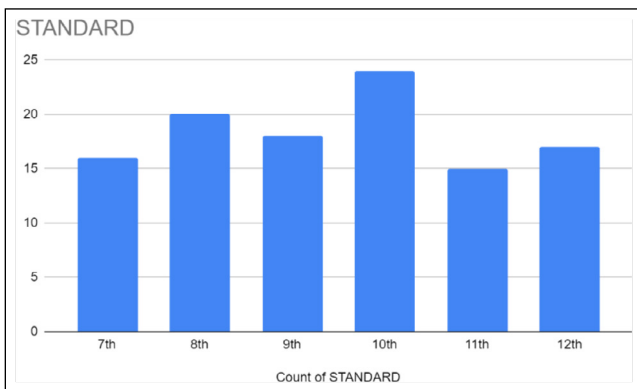


Figure 3. Standard.

Figure 4 shows that 55% of children don't know about ergonomics and 45% know about the term ergonomics.

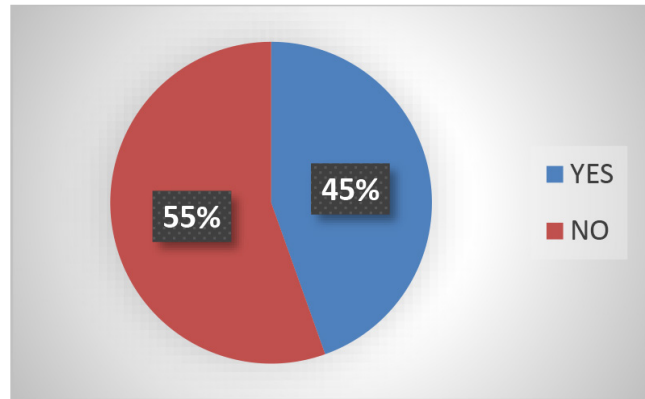


Figure 4. Awareness of term ergonomics.

Figure 5 shows that 68% of children agree that School ergonomics will allow you to study and play with great comfort and less chance of getting injured. 19% strongly agree, 12% disagree and 1% strongly disagree.

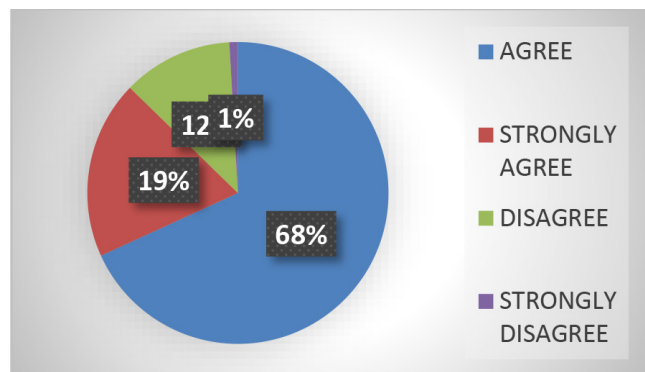


Figure 5. Children that agree about ergonomics.

Figure 6 Shows that 39% of children travel to school by walking, 23% by cycle, 20% by private vehicle, and 18% by public vehicle.

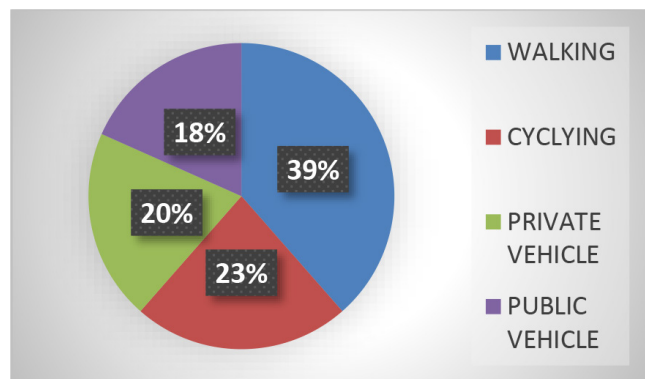


Figure 6. Mode of transport.

Figure 7 shows, how the children usually carry their bags while going to school. Of these 80% of children carry their bag on both shoulders, 18% on one shoulder, and 1% on wheels and, across the body.

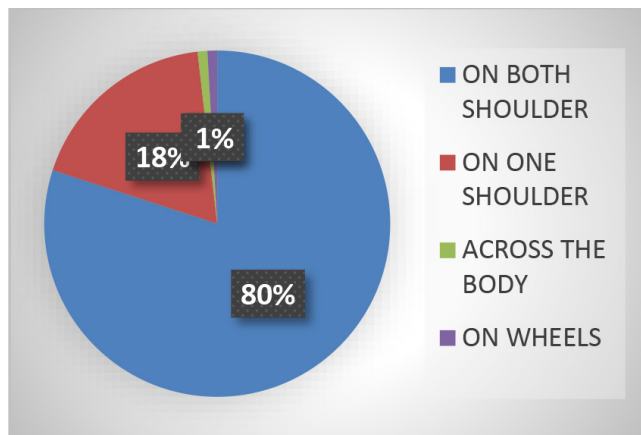


Figure 7. Method of carrying school bags.

Figure 8 shows the effect of carrying a school bag in 35% of children is neck pain, 29 % have tiredness, 24% have back pain and 22% have nothing.

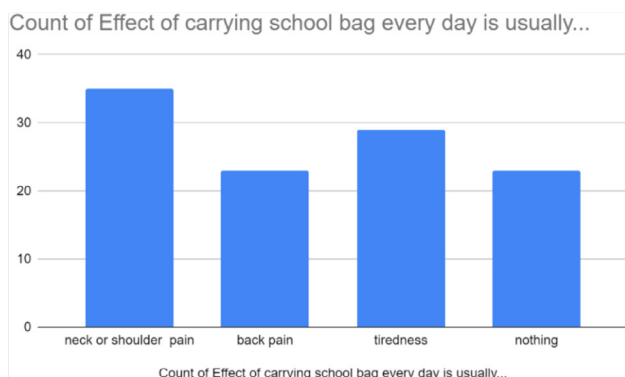


Figure 8. Effect of carrying a school bag.

Figure 9 states that out of 110 children 77% follow their school schedule, 14% follow it sometimes and 9% don't follow it.

Figure 10 shows that during the past four 44% of children feel that their bag is always heavy, 19% say that it is heavy sometimes and 37% don't think their bag is heavy for carrying.

Table 1 shows the questions that were asked to children about their posture in their school. 58% of children were aware that keeping their neck flexed for a prolonged time can lead to bad posture and pain, while 42% were not aware. 57% of children were aware that

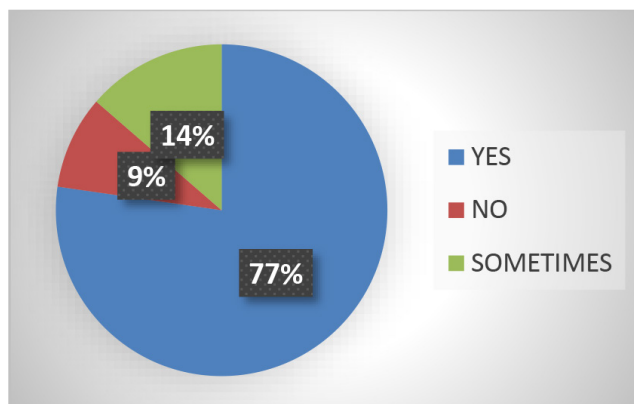


Figure 9. Following school schedule.

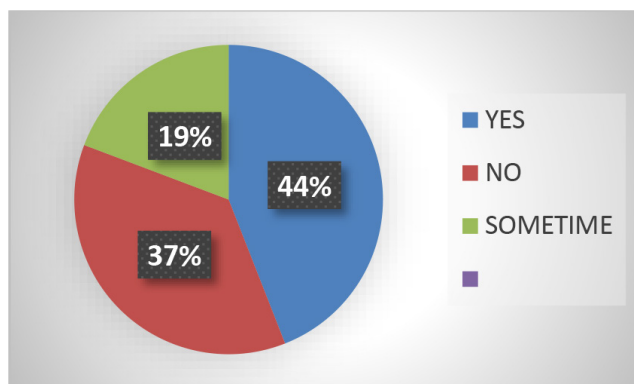


Figure 10. Think their bag is too heavy to carry.

Table 1. Questions about awareness related to posture

Questions	Yes	No
Aware that keeping your neck flexed for a prolonged time can lead to bad posture and pain	58%	42%
Aware that uncomfortable chairs and desks can lead to poor posture and musculoskeletal pain	57%	43%
Aware that stretching every 40mins is a healthy feature in the daily routine of students	45%	55%
Aware that, their backpack should not be more than 2.5-5 kg weight	47%	53%

uncomfortable chairs and desks can lead to poor posture and musculoskeletal pain while 43% didn't know about it. 45% of children know that stretching every 40 minutes is a healthy feature in the daily routine of students, and 55% don't have an idea about it. 47% were aware that their backpack should not be more than 2.5-5 kg in weight and 53% were not aware.

Table 2 shows the questions about the classroom and habits of school children 37% Feel comfortable while sitting on their school bench, 27% feel it is comfortable sometimes and 37% don't feel it is comfortable. 42% said that the Seating backrest allows you to keep your back straight and provides required support, 18% said sometimes and 40% stated that it doesn't allow. 40% of children keep their arms and elbows at the same level as their desk while writing, 31% keep it sometimes and 29% don't. 59% constantly keep their neck flexed while reading and writing. For 20% of children, the blackboard is visible from their bench, for 11% it is visible sometimes and 69% can see their blackboard. Out of all 54% of children have a break between their lectures, the rest have it sometimes or don't. Only 47% of children exercise or play outdoor every day.

Children were questioned about whether they believed your school needed to do ergonomics awareness programs (Table 3).

5. Interpretation

According to the response following were the results-9% of Children have an excellent awareness of school ergonomics, 46% of children have good knowledge whereas 45% have poor knowledge. (Table 4, Figure 11)

Table 2. Questions about school classroom and habits

Questions	Yes	No	Sometimes
Feel comfortable while sitting on your school bench	37%	36%	27%
Seating backrest allows you to keep your back straight and provides the required support	42%	40%	18%
Keep your arm and elbow at the same level as your desk while writing	40%	31%	29%
Constantly keep your neck flexed while reading and writing	59%	17%	24%
Is your blackboard visible from your bench	69%	11%	20%
Do you have breaks between your lectures	54%	33%	13%
Do you exercise/play outdoors every day	47%	20%	33%

Table 3. Shows the number of children who believed their school needed to conduct an ergonomics awareness program

Strongly Agree	47%
Agree	48%
Disagree	1%
Strongly Disagree	0%

Table 4. Awareness score in school children

Score Ranges		
Excellent 5-6	10	9%
Good 3-4	51	46%
Poor 0-2	49	45%



Figure 11. Awareness score in school children.

6. Discussion

Many studies have been carried out lately to identify the problems and risk factors associated with childhood musculoskeletal disorders. Previous studies have highlighted risk factors for childhood ergonomics, including classroom posture, the weight of school bags, the furniture in the classroom, and anthropometric measurements⁵. School is where students live, learn, experience, and socialize. School ergonomics plays a very important role in children's lives as they spend their maximum time of the day at school. School ergonomics allows a youngster to study and play more comfortably and safely. Earlier the principles of ergonomics were only applied to adult workspaces to ensure their safety and comfort but it is equally important for school children. Ergonomics enhances system performance and human well-being. Curriculum, teaching strategies, and student results are typically the key areas of emphasis in the fast-paced sector of education. School ergonomics, on the

other hand, is a critical component that has a significant impact on learning but is sometimes overlooked.

According to studies, musculoskeletal discomfort and back pain issues are present not only in adults but also in children. It is believed that educating people on proper posture, body function, and movement patterns, as well as their ergonomic implications, can help to reduce and even eliminate these issues⁶. Such an ergonomics awareness teaching program must begin in childhood and become a part of the school curriculum.

In the present study, the observational study was carried out to investigate children attending government schools' ergonomic awareness. The children that participated in this study were secondary school students, ranging in standard from 7 to 12. In this study, 110 participants were involved from age 13 to 18 years of which the children were given a questionnaire, which included questions about awareness of school ergonomics and its effects on body posture, function, and comfort. According to the data obtained the study shows that half of children know about the term ergonomics and agree that following ergonomics principles will allow them to stay in a comfortable environment, While most of the students haven't heard about the term ergonomics and its application. The majority of children face musculoskeletal pain and discomfort while sitting in a classroom. This study thus demonstrates that a smaller proportion of students are knowledgeable about school ergonomics and their application.

H. Dekel and E. Heyman⁶ conducted a study in which an educational program "Ergonomics, Movement and Posture" (EMP), was taught in elementary schools by Physical Education (PE) students at the Kibbutzim College of Education in Israel, as part of their practicum. The program shows that PE teachers, who have a relevant background in movement and posture aspects relating to ergonomics, can teach these subjects throughout the educational system by using adequate pedagogical methods adapted to each age group.

A cross-sectional study was carried out in a typical district of Sri Lanka by Kapila Jayaratne⁷ at a school. The research procedure comprised the following: determining the relationship between specific ergonomic factors and the outcomes of mismatched ergonomics; assessing the distribution of ergonomic and other contributing factors; assessing musculoskeletal pain; assessing the prevalence and other consequences of mismatched ergonomics; and formulating a workable solution. Based on their findings,

they concluded that many kids did feel uncomfortable as a result of the poor seating arrangements in the classroom.

A cross-sectional study was conducted in two primary schools, 100 students were selected randomly from years 2 and 5 and given a questionnaire to gain information on their background, musculoskeletal pain/discomfort complaints, previous skeletal injuries, and satisfaction with classroom furniture⁸. Neck pain was the most prevalent Musculoskeletal Disorder (MSD), followed by upper back pain and lastly lower back pain. For neck pain, 2 elements that had a significant association were the backrest shape and satisfaction with the desk heights. Besides, the upper back pain was significantly associated with the relative schoolbag weight, while the lower back discomfort was strongly associated with age and schoolbag weight⁸. Therefore it is necessary that the classroom should be ergonomically correct and comfortable for children.

Most of the children, according to our analysis, think their benches are uncomfortable and carry heavy backpacks. Few children are aware that this might result in pain and musculoskeletal discomfort. Most of the children can see their blackboard and, are aware that keep neck flexed while reading and writing can cause discomfort and pain. Only half of the children have breaks between their lectures and exercise regularly.

According to a study, an early intervention group ergonomics education program lasting one session is suitable and efficient for children between the ages of eight and eleven. It is recommended that this program be used as a means of reducing musculoskeletal pain in students in this age group⁹.

7. Conclusion

Based on the data collected, the majority of students were found to be somewhat aware of school ergonomics, roughly half of them knew a few things about school ergonomics but were not very knowledgeable about it. The remaining students at the rural government school have no idea what ergonomics is or how to use it in everyday life. The study also found that many of the kids have musculoskeletal pain when they sit in class. The study's findings indicate that 46% of children have good knowledge of school ergonomics, 45% have poor knowledge and 9% have a great understanding of this subject. This justifies the need to provide awareness of ergonomics among children and conduct awareness

programs in rural government schools. When asked whether they believed their school needed an ergonomic program, most of the kids strongly agreed.

8. References

1. Gupta A, Bhat M, Mohammed T, Bansal N, Gupta G. Ergonomics in dentistry. *International journal of clinical pediatric dentistry*. 2014; 7(1):30. <https://doi.org/10.5005/jp-journals-10005-1229> PMID:25206234 PMCID:PMC4144062
2. Naqvi W. *Physiotherapy in community health and rehabilitation*. Jaypee Brothers Medical Publishers; 2011.
3. Jayaratne K. Ergonomic considerations in school environments-the need for widening the scope. *Work*. 2012; 41(Supplement 1):5543-6. <https://doi.org/10.3233/WOR-2012-0877-5543> PMID:22317609
4. Syazwan AI, Azhar MM, Anita AR, Azizan HS, Shaharuddin MS, Hanafiah JM, Muhaimin AA, Nizar AM, Rafee BM, Ibthisham AM, Kasani A. Poor sitting posture and a heavy schoolbag as contributors to musculoskeletal pain in children: An ergonomic school education intervention program. *Journal of Pain Research*. 2011; 287-96. <https://doi.org/10.2147/JPR.S22281> PMID:22003301 PMCID:PMC3191927
5. Asyiqin MAN, Shamsul BM, Shahrizal DM. Development of ergonomics furniture for primary school in Malaysia. *Alam Cipta: Int J Sustain Trop Des Res Pract*. 2009.
6. Heyman E, Dekel H. Ergonomics for children: an educational program for elementary school. *Work*. 2009; 32(3):261-5. <https://doi.org/10.3233/WOR-2009-0824> PMID:19369718
7. Jayaratne K. *Making a difference: Ergonomics for children in developing countries*. Abingdon: Taylor & Francis; 2012.
8. Azuan KM, Zailina H, Shamsul BM, Asyiqin MAN, Azhar MNM, Aizat IS. Neck, upper back and lower back pain and associated risk factors among primary school children. *J Appl Sci*. 2010; 10(5):431-5. <https://doi.org/10.3923/jas.2010.431.435>
9. Mackie HW, Legg SJ. Measurement of the temporal patterns of school bag carriage using activity monitoring and structured interview. *Ergonomics*. 2007; 50(10):1668-79. <https://doi.org/10.1080/00140130701584837> PMID:17917906