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ANTHROPOMETRIC PERSPECTIVE AND ERGONOMIC EVALUATION OF MINIBUS AS A MEANS OF PUBLIC TRANSPORTATION IN OKITIPUPA, NIGERIA

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SUMMARY: Transportation is very important. Without it, there would be no life in the city and life is essential for the survival of modern society. As the population increased, the need for various means of transportation became critical. One of the reliable means of transportation is the use of minibus. As reliable as minibus seems, little attention has been given to ergonomic interaction between it and its users in Okitipupa, Nigeria. Therefore, this study focuses on the anthropometric perspective and ergonomic evaluation of minibus as a means of public transportation in Okitipupa, Nigeria. 120 commuters (60 males and 60 females) participated in the study. Seat dimensions such as seat height, seat depth, seat width, backrest height and clearance height were collected. These dimensions were compared with popliteal height, buttock-popliteal length, hip width, sitting-shoulder height and sitting stature respectively using match equations. Commuters' responses and the outcome of the match equations analysis were in reasonable agreement. For example, about 95% commuters complained of leg pain due to inappropriate seat height while the seat height was inappropriate for virtually all the commuters from match equations analysis. The study seems to suggest that the anthropometric dimensions (AD) of the intended users were not considered in the design of the minibus. However, commuters using minibus which is not compatible with their AD are liable to future health issues due to repetitive CTDs (cumulative trauma disorders) and awkward postures. AD of the intended users, if considered, may help to reduce the CTDs.

Key words: *anthropometric perspective, ergonomic evaluation, transportation, minibus*

INTRODUCTION

Transportation is very crucial. Without it, there would be no life in the city and life is essential for the survival of modern society *(Onokala, 2001)*. Nigerian cities are developing, and the number of people living in cities is rising, which raises demand for transportation services and to which Okitipupa is not an exemption. The supply of appropriate transportation infrastructure hasn't always kept up with demand, and efforts to do so have been sporadic, poorly planned, and ineffective *(Nwachukwu, 2014)*. Transport, a crucial service in urban centre, enables individuals, businesses, and other organizations to conduct their operations in areas in the cities specifically chosen for these purposes *(Nwachukwu, 2005, Rohana et al., 2012)*.

The population and area/size of a city, its transportation demand and characteristics, and its land use pattern may all have an impact on the decision to use one or more of the public transportation systems. However, buses are the preferred mode of transportation for the majority of communities and it is among few form of transportation that the world's impoverished can afford.

A nation's development depends on the availability of public transportation, which is a com-

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ponent of its fundamental infrastructure *(Amsori et al., 2013)*. That is, transportation can be a reliable indicator of economic development. It works as a factor that stimulates economic growth by providing employment, improving the effectiveness and efficiency of other businesses and also contributing to national investment and development *(Aidoo et al. 2013)*.

The public transport system in Okitipupa plays a vital role in daily commuting for a significant portion of the population. Minibuses, a commonly used mode of transportation in the region, have become representative of this system. Additionally, it appears that regulations and guidelines to ensure that the minibuses are built according to ergonomic and safety norms are not in place. In essence, AD of the intended users (Okitipupa residents) are scarcely available to the manufacturers of the minibus.

As it is well known that ergonomics and anthropometric dimensions play a crucial role in the suitability of a workstations of which public transport is one *(Okunribido, 2000, Oladapo and Akanbi, 2023)*. Uncomfortable seating, poor interior layout, and inadequate handholds can lead to discomfort, stress, and even injuries during transit *(Smith et al., 2019)*. By addressing these ergonomic issues, public transport can become more accessible and appealing to a wider range of individuals, including those with mobility challenges *(Jones, 2018)*. Therefore, this study deals with the anthropometric perspective and ergonomic evaluation of minibus as a means of public transportation in Okitipupa, Nigeria.

METHODOLOGY

A preliminary investigation was conducted between June and September 2023 within Okitipupa metropolis, Nigeria. It was found out that one brand of minibus is mostly used for transportation (6-seater minibus).

Study Design

In order to carry out ergonomic evaluate between passengers and minibuses in Okitipupa, a survey was conducted to collect anthropometric data from individuals boarding these buses, and minibus seat dimensions. The commuters were categorized based on their gender, age, and occupation. This was done to facilitate data analysis because anthropometry measurements vary according to gender, age, race, occupation, ethnicity and patterns of nutrition *(Ismaila, 2009, Agrawal et al., 2010, 2012, Oladapo and Akanbi, 2023)*.

Furthermore, information about any potential comforts and discomforts that commuters experienced while using the minibus was gathered. To collect this potential data, the users were asked to fill out questionnaires (modified version of the Nordic Questionnaire) after their informed consent were obtained. Most of the respondents filled out the questionnaires themselves, but for those who were illiterate, the questions were read to them in their native language, Yoruba. A sample of the modified version of the Nordic Questionnaire is presented below.

QUESTIONNAIRE

SECTION A

Fill the appropriate box.

1. Passengers' age: _____________ years
2. Sex: Male { } , Female { }
3. Occupation: Student { } , Trader { } , Civil servant { } , Others { }
4. How often do you bore minibus? _________________ times/day
5. Maximum time usually spent in the bus: 2-20mins { }, 20-40mins { }, 40-60mins { } , Above { }

SECTION B

Comment on:

6. Entrance/Exit
    - Width: Too wide { }, Too Narrow { }, O.k { }
    - Height: Too high { }, Too Low { }, O.k { }
7. Seat width: Comfortable { }, Not Comfortable { }, O.k { }
8. Back rest: Too High { }, Too Low { }, O.k { }
9. Reasons for riding in minibus
    - Cheapness: Is it far relative-cheep? Yes { }, No { }
    - Comfort: Is it comfortable to ride in them? Yes { }, No { }
    - State other reasons

      ____

      ____

SECTION C

General comments

10. Should minibus be evacuated from the road? Yes { }, No { }

    If Yes or No, state reason why __________________________________

    ____

Is there any pain when riding on minibus?: Yes { }, No { }

If Yes, what is the nature? Leg pain { }, Back pain { }, Neck pain { }

Others (Specify) ___________________________

11. How often do you have the pain? Always { }, Once a while { }

____

12. What do you think can make minibus comfortable to ride on?

    ____

    ____

Sample Selection

60 males and 60 females were randomly selected from public places (religious gathering, motor park, market) for this study. These individuals agreed to be part of the survey after the aim was explained to them. Roscoe *(1975)* and Oladapo and Akanbi *(2023)* had stated that a sample size between 30 and 500 is adequate for most research.

Table 1. Sample Classification

Tablica 1. Klasifikacija uzorka

		Male	Female	Total
Age:	11-20	10	15	
	21-30	17	15	
	31-40	10	11	
	41-50	10	10	
	51-60	8	7	
	60 above	5	2	60
Occupation:	Traders	10	30	
	Students	25	15	
	Civil servants	15	10	
	Others	10	5	60
Total:		60	60	120

Measurements of Minibus Dimensions

The following dimensions of minibus were considered and thus defined:

- **Seat Height (SH):** Measured as the vertical distance between the floor of the minibus and the highest point on the front edge of the seat *(Oladapo and Akanbi, 2016b).*
- **Seat depth (SD):** Measured as the horizontal distance between the back and the front edge of the sitting surface *(Dianat et al., 2013).*
- **Seat Width (SW):** Measured as the horizontal distance between the lateral edges of the seat *(Dianat et al., 2013).*
- **Back rest Height (BH):** Measured as the vertical distance between the sitting surface and the top edge of backrest *(Dianat et al., 2013).*
- **Clearance Height (CH):** Measured as the vertical distance between the floor of the minibus and the highest point on the underneath roof of the minibus *(Akinola et al., 2024).*

Acquisition and Description of Commuters' Anthropometric Measures

The following measurements were taken and defined thus:

- Popliteal Height (PPH): Defined as the vertical distance between the floor/footrest surface and the popliteal space (which is the posterior surface of the knee) at 90° Knee flexion *(Agha, 2010).*
- **Buttock-Popliteal Length (BPL):** Defined with the knee flexed at 90°, as the distance between the posterior surface of the buttock and the posterior surface of the knee or popliteal surface *(Panagiotopoulou, et al., 2004).*
- **Hip Width (HPW):** Measured as the highest horizontal expanse across the hips in the sitting position *(Tunay and Melemez, 2008).*
- **Sitting Shoulder Height (SSH):** Defined as the vertical distance from the seat pan to the top of the shoulder, that is, at the acromion process *(Panagiotopoulou et al., 2004).*
- **Sitting Stature (SST):** defined as the vertical distance from the seat pan to the highest point of the head in sitting position, when the participant sat upright and looked straight ahead.

Determination of Potential Mismatch

According to Agha *(2010)*, a match/mismatch implies that the users' dimensions are within/outside the upper and lower limits set by the researchers for the appropriateness of the existing facility dimensions. However, since the current study deals with ergonomic evaluation of minibus and its commuters, a match/mismatch was adapted to implies that the commuters' dimensions are within/outside the upper and lower limits set by the researchers for the appropriateness of the existing minibus dimensions.

In order to evaluate a potential mismatch or otherwise in the present arrangement between commuters and the minibus available to them, dimensions of minibus were compared with anthropometric measures of the studied population. The match criteria (product dimensions against the users' measures) which were used in this study are presented in Table 2

Table 2. Minibus Dimensions versus Relevant User Dimensions

Tablica 2. Dimenzije minibusa u odnosu na relevantne korisničke dimenzije

Serial number	Minibus dimensions	User dimensions
1	Seat height *(SH)*	Popliteal height *(PPH)*
2	Seat depth *(SD)*	Buttock-popliteal length *(BPL)*
3	Seat width *(SW)*	Hip width *(HPW)*
4	Backrest height *(BH)*	Sitting Shoulder height *(SSH)*
5	Clearance height *(CH)*	Sitting Stature *(SST)* + *SSH*

Seat height (SH): This is the foremost dimension required for the development of a match criterion *(Qutubuddin et al., 2013, Castellucci et al., 2014, Oladapo and Akanbi, 2023)*. It is the commencing point and the foremost important variable for the design of the facility *(Molenbroek et al., 2003, Castellucci et al., 2010)*. The expressions presented here were adapted to evaluate the ergonomic compliance in the design of Minibus. SH needs to be provided relative to popliteal height *(PPH); (Occhipinti et al., 1993, Corlett and Clark, 1995, Helander, 1997, Dul and Weerdmeester, 1998)*, and such that the knees can be flexed with the lower legs at a maximum of 30^o angle to the vertical axis *(Molenbroek et al., 2003)*. The expression below requires that *SH* is lower than *PPH* so that: (1) the lower leg is at a 5-30^o angle relative to the vertical and (2) the shin-thigh angle is between 95 and 120^o *(Evans et al., 1988, Occhipinti et al., 1993, Sanders and McCormick, 1993)*. Therefore, to evaluate potential match/mismatch of SH, an expression reported by Agha *(2010)* was adopted with slight modification as presented in term of [1].

$$(PPH + Shh) \cos 30^o \leq SH \leq (PPH + Shh) \cos 5^o \quad [1]$$

where *PPH* is popliteal height, *Shh* is shoe height and *SH* is seat height.

Seat Depth (SD): This is the next to the foremost common measurement *(Castellucci et al., 2014, Oladapo and Akanbi, 2015).* Most researchers submitted that SD should be designated for the fifth percentile of popliteal-buttock length distribution, including even the shorter users *(Pheasant, 1991, Khali et al., 1993, Sanders and McCormick, 1993, Occhipinti et al., 1993, Orborne, 1996, Helander, 1997, Milanese and Grimmer, 2004)*. Therefore, to evaluate potential match/mismatch of *SD*, an expression reported by Chung and Wong *(2007)* was adopted and presented in term of [2].

$$0.800\ BPL \leq SD \leq 0.950 BPL \quad [2]$$

where *BPL* is buttock-popliteal length and *SD* is seat depth.

Seat Width (SW): SW should be sufficient to support ischial tuberosity in order to provide stability and allow space for lateral movements *(Khali et al., 1993, Corlett and Clark, 1995, Oladapo and Akanbi, 2016a)*. It should be large enough to accommodate even the users with the largest hip breadth *(Evan et al., 1988, Occhipinti et al., 1993, Sanders and McCormick, 1993, Orborne, 1996, Helander, 1997)*. Therefore, to evaluate potential match/mismatch of SW, an expression reported by Dianat et al. *(2013)* was adopted and presented in term of [3].

$$HPW < SW \quad [3]$$

where *HW* is hip width and *SW* is seat width.

Backrest height (BH): BH is sufficient when it is below scapula *(Evans et al., 1988, Orborne, 1996, Oladapo and Akanbi, 2016b)* to facilitate mobility of the trunk and arms *(Khali et al., 1993)*. Therefore, to evaluate potential match/mismatch of BH, an expression reported by Gouvali and Boudolos *(2006)* was adopted and presented in term of [4].

$$0.60\ SSH \leq BH \leq 0.80\ SSH \quad [4]$$

where *SSH* is sitting shoulder height and *BH* is backrest height.

Clearance Height (CH): The clearance height of a minibus refers to the vertical distance between the ground and the highest point on the bus. *CH* should be sufficient to accommodate the sitting height in order to provide stability and allow space for up and down movements of the head. It should be high enough to accommodate even the users with the highest sitting stature. To evaluate potential match/mismatch of *CH*, the expression that was used is as shown in term of [5].

$$SST + SSH < CH \quad [5]$$

where *SST* is sitting stature, *SSH* is sitting shoulder height and *CH* is clearance height.

RESULT AND DISCUSSION

The findings of this research work are presented below

Minibus Passengers' Anthropometric Measurements and Seat Dimensions

The anthropometric measurements of male and female passengers are presented in Table 3 and Table 4 respectively. The dimensions of the minibus seat are presented in Table 5. This was done so that the minibus manufacturers wound find these dimensions accessible, easy and useful to apply *(Mokdad and Ansari, 2009)*.

Table 3. Summarized anthropometric measurements (cm) of male minibus passengers

Tablica 3. Sumirane antropometrijske mjere (cm) muških putnika u minibusu

Variable	Minimum Value	Maximum Value	Mean	SD	5th Percentile	50th Percentile	95th Percentile
PPH	38.60	58.70	47.46	5.26	40.49	46.00	57.74
BPL	40.40	58.30	48.75	4.63	42.29	47.70	56.67
HPW	29.00	43.50	37.20	2.99	31.20	37.45	40.53
SSH	42.70	66.50	55.40	5.29	47.39	54.50	64.50
SST	71.20	98.00	83.18	5.30	75.78	83.00	91.58

NOTE: *PPH:* Popliteal height, *BPL:* Buttock-popliteal length, *HPW:* Hip width, *SSH:* Sitting Shoulder height, *SST:* Sitting Stature, *SD:* Standard Deviation.

Table 4. Summarized anthropometric measurements (cm) of female minibus passengers

Tablica 4. Sumirane antropometrijske mjere (cm) ženskih putnika u minibusu

Variable	Minimum Value	Maximum Value	Mean	SD	5th Percentile	50th Percentile	95th Percentile
PPH	40.20	52.30	46.00	2.45	42.29	42.29	51.60
BPL	39.00	49.00	45.15	2.40	41.50	41.50	48.61
HPW	38.00	45.90	40.20	2.63	35.48	35.48	44.91
SSH	41.40	69.10	53.37	5.32	46.99	46.99	63.02
SST	67.40	97.30	81.15	5.06	74.09	74.09	90.02

Table 5. Summarized Dimensions (cm) of Minibus Seat Variables

Tablica 5. Sažete dimenzije (cm) varijabli sjedala minibusa

Variables	First trial	Second trial	Third trial	Mean
Seat height	30.70	30.70	30.70	30.70
Seat depth	37.33	37.33	37.33	37.33
Seat width (front seat)	34.00	34.00	34.00	34.00
Seat width (back seat)	86.45	86.45	86.45	86.45
Seat width (middle seat)	123.20	123.20	123.20	123.20
Backrest height (front seat)	33.15	33.15	33.15	33.15
Backrest height (middle and back seats)	48.65	48.65	48.65	48.65
Clearance height	131.60	131.60	131.60	131.60

Match/Mismatch Analysis

From ergonomic perspective, there are three types of design principles that can accommodate intended users of any equipment. These are: design for extreme individuals, design for adjustable range and design for average. Though, no one individual has absolute average dimensions, yet while designing equipment for social use, design for average is desirable. Thus, the ergonomic evaluation carried out in this study was based on the average values of the selected body dimensions. The results of the ergonomic evaluation are presented in tables 6 and 7.

Match between Seat Height and Popliteal Height

As it can be seen from table 6, the appropriate dimensions for seat height for male passengers ranged between 42.40 cm and 49.77 cm. For female passengers, the suitable dimensions for the seat height is between 41.92 cm and 49.51 cm (Table 7). The existing dimension of the seat height is 30.70 cm. This implied that the existing seat is generally too low for virtually all the passengers. A low seat may increase the knee and soft region pressure since the passengers may be forced to fold their legs *(Halder et al., 2018)*. Furthermore, users that sat on a seat too low may have increased risk of low back pain due to the fact that such seat may lead to increased angles of lumbar flexion while the users sat *(Pheasant, 1996, Milanese and Grimmer, 2004)*.

Match between Seat Depth and Buttock-popliteal Length

From Table 6, the suitable dimensions for the seat depth for male passengers is between 39.00 cm and 46.31 cm and that of their female counterparts ranged between 36.12 cm and 42.89

Table 6. Match Table for Male Minibus Users
Tablica 6. Tablica podudaranja za muške korisnike minibusa

Match criteria	Minimum values	Maximum values	Seat variable values	Brief remarks
PPH vs SH	42.40 *(1.5)	49.77 *(2.5)	30.70	Not okay
BPL vs SD	39.00	46.31	37.33	Not okay
HPW vs SW	37.20	37.20	34.00 (FS) 123.20 (MS) 86.45 (BS)	Not okay for *FS.* Very okay for *MS* and *BS*
SSH vs BH	33.24	44.32	33.15 (FS) 48.65 (MS) 48.65 (BS)	Well manageable for *FS.* Not okay for *MS* and *BS*
(SST + SSH) vs CH	164.50	164.50	131.60	Not okay at all

NOTE: *FS:* front seat, *MS:* middle seat, BS: back seat, *( ): height of the heel of shoe

Table 7. Match Table for Female Minibus Users
Tablica 7. Tablica podudaranja za ženske korisnike minibusa

Match criteria	Minimum values	Maximum values	Seat variable values	Brief remarks
PPH vs SH	41.92 *(2.4)	49.51 *(3.7)	30.70	Not okay
BPL vs SD	36.12	42.89	37.33	Very okay
HPW vs SW	40.20	40.20	34.00 (FS) 123.20 (MS) 86.45 (BS)	Not okay for *FS.* Very okay for *MS* and *BS*
SSH vs BH	32.02	42.70	33.15 (FS) 48.65 (MS) 48.65 (BS)	Very okay for *FS.* Not okay for *MS* and *BS*
(SST + SSH) vs CH	166.40	166.40	131.60	Not okay at all

cm (Table 7). The dimension of the existing seat depth is 37.33 cm. Seat depth is not okay for male passengers but very okay for female passengers. However, any high mismatch between seat depth and buttock-popliteal length indicated that buttock popliteal length is larger than the seat depth and as a result, thigh are likely to be compressed and blood circulation may not be possible *(Milanese and Grimmer, 2004, Gouvali and Boudlos, 2006)*. The effective use of the back rest may not be guaranteed if seat depth is shorter than buttock-popliteal length *(Pheasant, 2003, Niekerk et al., 2013)*. Furthermore, seat depth that is too short give indication that the thighs would be unsupported while in the sitting posture and this may lead to loss of stability and discomfort *(Pheasant 1996, 2003, Castellucci et al., 2010, Dianat et al., 2013)*.

Match between Seat Width and Hip Width

The appropriate dimension for seat width is 37.20 cm (Table 6) and 40.20 (Table 7) for male and female passengers respectively. The dimensions of the current seat width are 34.00 cm *(FS)*, 123.20 cm *(MS)* and 86.45 cm *(BS)*. The *MS* is for three passengers while the *BS* is for two passengers. For the male users, *SW* is not okay for commuters using *FS*. It is very okay for commuters using *MS* and *BS*. For female commuters, *SW* is not appropriate for *FS* but okay for *MS* and *BS* users. The dimensions of the seat width do not fulfill the condition that it should accommodate the user's hip and clothing and allow for comfortable arm movement *(Bridger, 1995)*. Narrower seats have the tendency of causing discomfort, unsteadiness and restriction of movement *(Evans et al., 1988, Khalil et al., 1993, Orborne, 1996, Helander, 1997)* but wider seats occupy more space and cannot be said to be unsuitable *(Gouvali and Boudolos, 2006, Castellucci et al., 2014)*.

Match between Backrest Height and Sitting Shoulder Height

From Table 6, the sufficient dimension for backrest height ranged between 33.24 cm and 44.32 cm for male passengers and that of their female counterpart ranged between 32.02 cm and 42.70 cm (Table 7). The dimensions of the current backrest height are 33.15 cm *(FS)*, 48.65 cm *(MS)* and 48.65 cm *(BS)*. The minimum dimension required for backrest height for male users is 33.24 cm *(FS)*. This is a bit higher than the value of the existing backrest height which is 33.15 cm. However, the difference in the two dimensions are infinitesimal and can be neglected. The *MS* and *BS* have backrest height which are unsuitable for male users (higher than users' scapular). For female users, the backrest height is suitable for *FS* users. The *MS* and *BS* have backrest height which are unsuitable for female users (higher than users' scapular). Backrest that is higher than users' scapular will likely restrict arm mobility *(Evans et al., 1988, Orborne, 1996)*. This will require that the users flex their shoulders more than 25^0 and abduct them more than 20^0 so as to sustain their elbows, a situation not conducive for long distance *(Parcells et al., 1999, Milanese and Grimmer, 2004)*.

Match between Clearance Height and Sitting Stature

From Table 6, the suitable dimension for clearance height is and 164.50 cm for male users while that of their female counterpart is 166.40 cm (Table 7). The dimension of the existing clearance height is 131.60 cm. The clearance height is grossly inadequate for both male and female passengers and as a result their heads were in contact with the roof of the minibus. While sitting under this condition, the commuter experiences neck pain due to awkward sitting position they are forced to adopt. This situation may not allow for any movement of the head. Furthermore, the passengers have to bend forward in order to enter the minibus due to its insufficient clearance height.

Passengers' Perception of Compatibility of Minibus

One hundred and twenty passengers (100%) that participated in the study completed the questionnaire. All of them confirmed their frequent usage of minibus for transportation in not less than five years.

Table 8 presents the perception of passengers regarding the use of minibus as means of transportation. Over 90% of the total commuters who responded to the questionnaire attributed the discomforts experienced any time while boarding the minibus to lack of space to adjust their legs and 27% mentioned lack of facility for head rest as contributing to neck pains they experienced.

Table 8. Perception of Passengers Regarding the Use of Minibus as Means of Transportation

Tablica 8. Percepcija putnika o korištenju minibusa kao prijevoznog sredstva

Entrance/Exit Width	
Too wide	10%
Too narrow	0%
Okay	90%
Entrance/Exit Height	
Too high	0%
Too low	95%
Okay	5%
Seat Height	
Too high	3%
Too low	88%
Okay	9%
Seat Width	
Comfortable	94%
Not comfortable	2%
Okay	4%
Backrest Height	
Too high	6%
Too low	2%
Okay	92%
Reasons for Boarding Minibus	
Cheapness	80%
Comfort	72%
Other reasons	0%
Evacuate Minibus from Plying Our Roads?	
Yes	10%
No	90%
Nature of Pain	
Leg pain	95%
Back pain	27%
Neck pain	27%
Others	38% (general body pain due to vibration)
Frequency of Pain	
Always	85%
Once a while	15%
What do you think can make minibus comfortable to ride on?	
Redesign	71%
Nothing	29%

Furthermore, 38% complained of discomfort due to vibration and about 6% of the passengers complained of hitting their body parts against minibus body whenever the seat is fully occupied. One major reason stated for using minibus is that it is locally available and affordable.

The outcome of this current study seems to suggest that for a comfortable ride, the redesigning of the minibus is desirable. This assertion is corroborated by the general opinion of the passengers. Over 70% passengers submitted that the minibus required a redesign (Table 8). The redesigning should possibly be done on gender basis. Similar studies have shown that gender differences contribute significantly to variations in anthropometric data *(Jeong and Park, 1990)*. Researchers have also reported the implications of the variations in body proportions among genders and ages which included the requirement of suitable facility for different genders *(Chung and Wong, 2007, Gouvali and Boudolos, 2006, Dianat et al., 2013)*.

CONCLUSION

This study carried out investigation into anthropometric perspective and ergonomic evaluation of Minibus as a Means of Public Transportation in Okitipupa, Nigeria. Majority of the commuters in the study reported discomforts while riding on the minibus.

Using match equations, dimensions of minibus which were deemed optimal were recommended. These dimensions, if employed, may help to reduce the cumulative trauma disorders experienced by the commuters using the minibuses.

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ANTROPOMETRIJSKI ASPEKTI I ERGONOMSKA OCJENA MINIBUSA KAO SREDSTVA JAVNOG PRIJEVOZA U GRADU OKITIPUPA, NIGERIJA

SAŽETAK: Prijevoz je vrlo važan. Bez njega ne bi bilo života u gradu, a život je od velike važnosti za opstanak modernog društva. Kako se populacija povećavala, razni načini prijevoza postali su zaista važni. Jedno od pouzdanih prijevoznih sredstava jest minibus. Unatoč njegovoj pouzdanosti, malo je brige usmjereno na interakciju između prometala i njegovih korisnika u gradu Okitipupa, Nigerija. Stoga se ovo istraživanje bavi antropometrijskim aspektima i ergonomskom ocjenom minibusa kao sredstva za prijevoz. Uzorak je činilo 120 putnika (60 muškaraca i 60 žena). Prikupljeni su podatci o visini sjedala, dubini sjedala, širini sjedala, visini stražnjeg naslona i visini iznad sjedala. Ti podatci su uspoređeni s visinom tijela do unutrašnjeg pregiba koljena, duljinom od stražnjice do koljenog pregiba, širinom kukova, visinom ramena u sjedećem položaju i sjedećem stavu, korištenjem odgovarajućih jednadžbi. Odgovori putnika i rezultat analize jednadžbi prilično su se podudarali. Na primjer, oko 95 % putnika žalilo se na bolove u nogama zbog neprikladne visine sjedala, dok je analiza jednadžbi pokazala da je visina sjedala bila neprikladna za gotovo sve putnike. Istraživanje je pokazalo da antropometrijske dimenzije (AD) korisnika nisu uzete u obzir pri dizajniranju minibusa. Stoga su putnici korisnici minibusa, koji nije u skladu s njihovim antropometrijskim dimenzijama, skloni potencijalnim zdravstvenim teškoćama koje se mogu pripisati kumulativnim traumatskim poremećajima i nespretnom položaju tijela. Antropometrijski podatci o korisnicima, ako ih se uvaži, mogu smanjiti kumulativne traumatske poremećaje.

Ključne riječi: *antropometrijski aspekti, ergonomska ocjena, prijevoz, minibus*

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