INCIDENCE, SEX AND AGE DIFFERENCES OF LUMBAR STRAIN AMONG LAW ENFORCEMENT OFFICERS IN IBADAN: EFFECTS OF AN EIGHT-WEEK STATIC-STRETCHING AND VIBRATION-THERAPY EXERCISE PROGRAM

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Abstract

*Lumbar strain is a prevalent musculoskeletal issue among law enforcement officers due to the physically demanding nature of their work, which often involves prolonged standing, repetitive movements, sudden exertion, and use of heavy protective gear. This study therefore examined incidence, sex and age differences in lumbar strain among law enforcement officers in Ibadan: effects of an eight-week static-stretching and vibration-therapy exercise program. The populations for this study included male and female of all federal government law enforcement officers in Ibadan, with lumber strain. Ninety law enforcement officers were sampled using randomized pre-test post-test control group experimental research design of 3x2x2 factorial matrixes. Data were analysed **using Analysis of Co-variance (ANCOVA) at 0.05 significance level. Result revealed that, participants with severed lumber strain are in the majority among law enforcement Officers (87.8%). The study also revealed that** there was no **significant main effect of treatment and gender on low back pain** ($F_{(2,83)} = 0.011$, $p<0.05$, $\eta^2 = 0.00$) **of law enforcement Personnel in Ibadan. Estimated marginal means indicated** slightly higher posttest mean score (23.391) for female than their male (23.253) counterpart. Finally, Result indicated that there was a **significant interaction of treatment, gender and age on low back pain** ($F_{(6,84)} = 6.723$, $p<0.05$, $\eta^2 = 0.170$) **of law enforcement Officers in Ibadan. Conclusively,** incidence of **severed** level **of lumber strain were prevalent among law enforcement officers in Ibadan. The study recommends that,** regular health assessments should be instituted for law enforcement officers, especially considering the high incidence rate observed*

Key Words: *Lumbar Strain, Static-stretching and Vibration-therapy, Exercise Program*

Introduction

One of the most common actions in daily living is forward bending. Forward bending is an action that occurs most frequent in every lifestyle. This has become a risk for the development of lumber strain (LS) as a result of the frequent rate at which the pelvic tilt. Bending alteration is also one of the risk factors associated with LBP consequences of the sequence of movement of the hip and lumbar spine patterns during forward patterns bending. It was reported that changes in lumbar range of motion and motion velocity have been recognized in individuals with LS (Tesfaye, 2019). Back care education has also been shown to be effective in reducing pain and functional disability in individuals with low back pain (Seif, 2015). A clinical assessment can be used to triage individuals suffering from low back pain. This should entail taking a history, performing a physical examination, and performing neurological testing to identify radicular characteristics (Kamper, Yamato & Williams, 2016). Patients with low back pain should be evaluated for red flags to rule out major pathologies, and diagnostic testing (such as imaging) should be performed if a serious pathology is suspected (Buchbinder., et al, 2018). Psychosocial risk factors (yellow flags identified by prognostic screening tools) should be evaluated in order to anticipate poorer outcomes.

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Public health programmes that address obesity and poor levels of physical exercise should be developed, as should a forum for reducing the consequences of low back pain on everyday functioning (Buchbinder., et al, 2018). Evidence for prevention and treatment of Critical Low Back Pain (CLBP) frequently comes from high-income countries. It is unknown whether these guideline recommendations are appropriate to low- and middle-income countries. When comparing high-income countries to low-income and middle-income ones, public health programmes and their urgency will change. The existing mechanisms of health-care reimbursement are an impediment to changing health pathways. It is beneficial to map out the entire health pathway for low back pain, from the initial contact all the way through to expert care. Health-care providers should provide regular education about the causes, processes, natural history, and prognosis of low back pain, as well as encourage the advantages of physical activity and exercise. Exercise, alone or in combination with education, has been proven to be effective in the prevention of LBP in moderate-quality data. It was discovered to have a significant preventative impact (Alnamazi., et al, 2024).

A systematic review and meta-analysis published in 2014 discovered just four paediatrics trials in paediatrics low back pain. This calls into question the evidence for treating back pain in children. There was some indication that education was ineffective in children. There was little evidence that ergonomically constructed furniture reduced low back discomfort (Bai, Kamarudin & Alli, 2024). Understanding the physical demands of police employment, as well as the research associating driving with heavy lifting, twisting, and turning, one can predict a high incidence of low back disorders in law enforcement (Range., et al, 2023). A study of Royal Canadian Mounted Police (RCMP) personnel found one-year prevalence rates of low back pain to be within those reported for the general population (25-62%), with police officers falling within the upper range of normal with prevalence rates of 44-62% (Gregory, et al, 2011).

The high incidence rate of low back pain (LBP) in law enforcement, combined with short recovery times and inadequate use of the health-care system, emphasizes the need for improved prevention and treatment strategies (Range. et al, 2023). The majority of LBP has muscular strain aetiology; officers sought chiropractic care and bone-base treatment. Furthermore, without complete healing, officers were taking a pharmaceutical-based treatment that made them drowsy and less capable of making rapid and succinct choices. A 15-year follow-up of participants who had previously experienced low back pain was evaluated for risk markers for low back pain. Previous absenteeism due to low back pain, the use of analgesics to treat low back pain, and occupation were discovered to be the most relevant risk markers of self-reported work incapacity (Turk & Okifuji, 2012). As a result, police departments should focus on LBP education, treatment, and prevention.

Trunk flexion, back extensor endurance, and physical activity engagement were shown to be considerably higher in a group of Canadians who reported no history of low back pain compared to the group who did indicate a history of low back pain in a recent

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study (Payne., et al, 2010). Furthermore, those with no history of low back pain have much smaller waist girths. Poor back endurance and obesity have previously been linked to an increased incidence of low back pain (Biering-Sorenson, 2014). Their analysis of the literature found substantial evidence that high levels of hamstring flexibility and abdominal muscle endurance are likely to alleviate low back pain (Carpenter & Nelson, 2019). While there has been no previous evidence linking physical activity to a lower incidence of low back pain, physical activity involvement was found to be a good discriminator of recurring back pain, and the relationship between physical activity and overall health is well established. It was recently discovered that law enforcement officers who self-reported the highest levels of fitness were the least likely to experience low back pain (Nabeel. Et al, 2017).

Heavy labouring occupations with occupational physical stress were not shown to be sufficient to produce superior musculoskeletal fitness, particularly in the law enforcement corps. This shows that, while there are numerous dangers associated with heavy labour, heavy labour does not appear to generate a physical conditioning impact that would aid in the prevention of occupational-related injury, and that an outside fitness programme is required. Trunk flexion was found to be favourably connected to back health in both males and females, while extensor endurance was found to be positively related to back health (Han., et al, 2017). Abdominal strength is thought to be an excellent predictor of future LBP risks.

As methods for lumber strain treatment, exercise such as stretching, aerobic exercise, and sling are prevalent (Drummond., et. al, 2024). Among them, stretching exercise relieves muscle tension, leads to improve blood circulation. Increase the movement in the trunk and legs by stretching improves muscle strength, alleviate low back pain, and help recovery of normal movements. Among many methods of stretching, static stretching is presented as a safer and more effective method because it does not exceed the normal range of motion of joints. It does not require a high level of fitness, and causes less muscle pain. In particular, static stretching using a load is known to maximize the effects to stretch muscles and tendons. It was reported that the static stretching using a load improves flexibility within a shorter period of time.

Vibration Therapy (VT) also known as Whole Body Vibration (WBV) consists of the transfer of relatively low frequency ambient vibration to the human body via a broad contact area (Adegoju, Abon & F. Olatoomirin, 2021). These frequencies range from 0.5 to 80 Hz. When in touch with a vibrating surface, transmission occurs through the feet when standing, the buttocks when sitting, or the reclining torso (Adegoju, Abon & Olatoomirin, 2021). This response is produced by muscle and tendon oscillation, which causes modest and rapid changes in muscle-tendon unit length. These alterations are then sensed by muscle spindles, which try to avoid muscular stretching by contracting reflexively (Lora., etal,2010). The high frequency and low amplitude vibration boosts gravity force through acceleration variations, which benefits bone morphology and promotes muscular toning. This vibration mode can be employed by groups with low

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tonus and movement, such as the elderly (Fmlam., et al, 2018). Furthermore, as an intervention strategy, Vibration therapy (VT) training can treat chronic low back pain (CLBP). Most studies reported that stretching and Whole-Body Vibration has positive effects in healthy individuals instead of patients with diseases (Hae-In Bae., et al, 2017). The study examined incidence level, sex and age difference of lumber strain among law enforcement agencies in Ibadan: following eight-week static stretching and vibration therapy exercises.

Statement of the Problem

Lumbar strain is a prevalent musculoskeletal issue among law enforcement officers due to the physically demanding nature of their work, which often involves prolonged standing, repetitive movements, sudden exertion, and use of heavy protective gear. In Ibadan, law enforcement officers frequently report lower back pain and discomfort that may compromise their performance, productivity, and overall well-being. However, there is limited empirical evidence on how factors such as incidence levels, sex, and age contribute to lumbar strain in this occupational group. In Nigeria, lumber strain issue among law enforcement agencies has been the most prevalent musculoskeletal condition and major occurrence of injury in pelvic dysfunctionality of spinal muscles, nerves, bones, discs or tendons, mostly during the daily duties of Nigeria Army (NA), Nigeria Police Force (NPF), Nigeria Security & Civil Defense Corps (NSCDC) (Gregory, et al,2011).

Additionally, although static stretching and vibration therapy have been recognized as potential interventions for reducing musculoskeletal pain and improving flexibility and muscle recovery, few studies have examined their specific effects on lumbar strain among law enforcement personnel in a Nigerian context. The lack of data on how these interventions influence different age groups and sexes further limits the development of tailored preventive strategies. This study seeks to fill that gap by investigating the incidence level of lumbar strain and the differences by sex and age among law enforcement officers in Ibadan, following an eight-week regimen of static stretching and vibration therapy exercises.

Objectives of the Study

The objectives of the study are to:
1. determine the level of incidence of lumber strain among law enforcement officers in Ibadan, Oyo State
2. examine the significant main effect of treatment and gender on low back pain of law enforcement Corp in Oyo state.
3. Examine the significant interaction of treatment, gender and age on low back pain of law enforcement officers in Oyo state.

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Research Question
The research question below was answered
1. What is the level of incidence of lumber strain among law enforcement officers in Ibadan, Oyo State

Hypotheses
The hypotheses were tested.
1. There will be no significant main effect of treatment and gender on low back pain of law enforcement Corp in Oyo state.
2. There will be no significant interaction of treatment, gender and age on low back pain of law enforcement officers in Oyo state.

Methodology

Research Design
The randomized pre-test post-test control group experimental research design of 3x2x2 factorial matrixes was adopted for this study. The design employed three groups of participants which are, experimental I, Experimental II and control groups.

Population of the Study
The populations for this study include male and female of all federal government law enforcement officers in Ibadan, Oyo State with lumber strain. The law enforcement corps to be included are from 3 divisions of enforcement corps; the Nigeria Army NA); Nigeria Police Force (NPF), Nigeria Security & Civil Defense Corps (NSCDC).

Sample and Sampling Techniques
A total of ninety (90) law enforcement officers were recruited to participate in this study using a purposive sampling technique. The participants were drawn from three distinct enforcement agencies: the Nigerian Army (NA), the Nigeria Police Force (NPF), and the Nigeria Security and Civil Defence Corps (NSCDC). Officers selected had all presented with symptoms of low back pain (LBP) and had received medical attention for the condition at their respective agency-affiliated healthcare facilities within the previous six months. Initial identification of potential participants was conducted through a review of medical records in each agency's health centre. To ensure consistency with the study's inclusion criteria, a brief screening questionnaire was subsequently administered to verify the presence and history of low back pain among prospective participants. The purposive sampling ensured that only individuals who met the following criteria were included: (i) aged between 30 and 50 years, (ii) clinically diagnosed with low back pain within the last six months, and (iii) currently affiliated with one of the three specified law enforcement agencies. Equal representation was maintained by selecting 45 males and 45 females.

Following recruitment, the 90 eligible participants were randomly assigned into three groups using a simple randomization procedure:
• Experimental Group 1 (n = 30)

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- Experimental Group 2 (n = 30)
- Control Group (n = 30)

This approach allowed for gender parity and balanced group allocation, thereby minimizing potential biases and ensuring the internal validity of the study

Research Instruments
Protocol 1: Baseline Physical Assessment
This protocol involved collecting anthropometric data from participants before the intervention. The purpose was to establish a baseline for each participant's physical characteristics.
Instruments Used:
- **Stadiometer** – Used to measure the participants' height (in meters/centimetres) while standing upright without footwear.
- **Digital Weighing Scale (Camry)** – Used to measure each participant's body weight to the nearest 0.1 kg.

Objective: To calculate BMI and assess general body composition prior to intervention.

Protocol 2: Pre-Intervention Screening & Mobility Assessment
This protocol was designed to assess the participants' baseline activity level, physical function, and readiness for the intervention.

Instruments Used:
- **Pedometer (Realalt 3D Trisport)** – Used to estimate the average number of steps taken during walking, providing insight into daily mobility levels.
- **Stopwatch (Gymboss Interval Timer)** – Used to time participants during mobility or stretching exercises to assess endurance or timing compliance.

Objective: To evaluate pre-intervention mobility levels and monitor timed activities.

Protocol 3: Exercise Intervention & Treatment
This protocol refers to the actual therapeutic or experimental intervention applied to participants, including body vibration and aerobic/stretching exercises.

Instruments Used:
- **Body Vibration Machine (Pinty 2000W)** – Used as a treatment tool for participants in the experimental groups. It stimulates muscle contractions through whole-body vibrations, aimed at relieving chronic low back pain.
- **Aerobics Floor Mats** – Provided a comfortable and stable surface for participants to perform stretching and floor exercises safely.

Objective: To apply the experimental treatment across intervention groups and compare effects against the control group.

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Protocol 4: Monitoring During Intervention
This final protocol was used to track participant activity and ensure standardized duration and consistency during sessions.

Instruments Used:
- **Stopwatch** – Monitored and regulated the duration of each intervention session.
- **Pedometer** – Continued use during walking or movement-based protocols to track activity and ensure consistency across participants.

Objective: To maintain consistency in exercise time and effort among groups.

Data Analysis
Descriptive statistics of frequency count, percentages, was used to analyse the demographic data and research question of the participants; mean and standard deviation was used to determine the anthropometric compositions of the participants, while the hypotheses were tested using Analysis of Co-variance (ANCOVA) at 0.05 level of significance.

Results and Discussion
This section presents and discusses the result of data collected on the field as well as the analysis of results and discussion of findings;

Demographic Data Presentation.
The analysis of socio-demographic characteristics of participants is presented as follows:

Table 4.1 Division of enforcement corps

Division of enforcement corps	Frequency	Percent
Nigeria Army Force	30	33.3
Nigeria Police Force	30	33.3
Nigerian Security & Civil Defence Corps (NSCDC)	30	33.3
Total	**90**	**100.0**

Table 1 reviews that the Division of enforcement corps distribution of respondents on the table above shows that out of the total respondents of 90, 30(33.3%) were from Nigeria Army (NA), Nigeria Police Force (NPF) and Nigeria Security & Civil Defense (NSCDC) respectively

Table 2 Age of the Respondents

Age	Frequency	Percent
30-39 yrs	45	50.0
40-50 yrs	45	50.0
Total	90	100.0

Table 2 reveals that 45(50.0%) of the participants were in the age range of 30 to 39 years and 45(50.0%) were between 40 to 50 years respectively.

Table 3 Gender of the Respondents

Gender	Frequency	Percent
Male	45	50.0
Female	45	50.0
Total	90	100.0

Table 3 above reveals that equal numbers participants 45(50.0%) were males and females respectively.

Research Questions

Analysis of other items related to variables in the Questionnaire

Research Question 1: What is the level of incidence of lumber strain among law enforcement officers in Ibadan, Oyo State?

Table 4: Summary of Results of level of low back pain among participants

Class	Range	Frequency	Percentage
None	0 to 1	0	0.0%
Mild	1 to 3	2	2.2%
Moderate	4 to 6	9	10.0%
Severed	7 to 10	79	87.8%
TOTAL		**90**	**100.0%**

As indicated in table 4, 0(0.0%) participant had **low level of lumber strain, while 2(2.2%) participants had Mild level of lumber strain** and 9(10.0%) participants had moderate level **of low back pain** and 79(87.8%) participants had severed **level of lumber strain. It implies that participants with severed level of lumber strain are in the majority among law enforcement Officers in Ibadan, Oyo State.**

Hypotheses
Ho1: There will be no significant main effect of treatment and gender on low back pain of law enforcement Corp in Oyo state.

Table 5: Summary of Analysis Covariance of main effect of treatment and gender on lumber strain of law enforcement officers

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	7749.714[a]	6	1291.619	97.641	.000	.876
Intercept	399.451	1	399.451	30.197	.000	.267
Pre	100.459	1	100.459	7.594	.007	.084
Treat	1894.723	2	947.361	71.617	.000	.633
Gender	.428	1	.428	.032	.858	.000
Treat * Gender	.290	2	.145	.011	.989	.000
Error	1097.941	83	13.228			
Total	57801.000	90				
Corrected Total	**8847.656**	**89**				

a. R Squared = .876 (Adjusted R Squared = .867)

Table 5 shows that that there was no **significant main effect of treatment and gender on low back pain** ($F_{(2,83)}$ = 0.011, $p<0.05$, η^2 = 0.00) **of law enforcement Officers in Ibadan, Oyo State.** The null hypothesis was therefore considered tenable. This implied that t**here was no significant interaction of treatment and gender on low back pain of law enforcement Corps in** the study area. The eta square value of 0.00 shows the treatment effect size of 0.00%.

Table 6 Estimated Marginal Means of low back pain by Gender

Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Male	23.253[a]	.543	22.174	24.332
Female	23.391[a]	.543	22.312	24.470

a. Covariates appearing in the model are evaluated at the following values: Pre-test = 17.82.

Table 6 shows that female participants had a slightly higher posttest mean score (23.391) than their male (23.253) counterpart. This implied that the female gender may have a slight high reduction after 8-week static and vibration therapy exercise programme on lumber strain than their male counterpart.

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Ho2: There will be no significant interaction of treatment, gender and age on low back pain of
   law enforcement officers in Oyo state.

Table 7: Summary of Analysis Covariance of main effect of treatment gender and age on low back pain of law enforcement Corp

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	7749.714[a]	6	1291.619	97.641	.000	.876
Intercept	399.451	1	399.451	30.197	.000	.267
Treat	1894.723	2	947.361	71.617	.000	.633
Pre	100.459	1	100.459	7.594	.007	.084
Treat * Gender * age	152.109	6	50.564	6.723	.001	.170
Error	1097.941	83	13.228			
Total	57801.000	90				
Corrected Total	**8847.656**	**89**				

a. R Squared = .876 (Adjusted R Squared = .867)

Table 7 shows that that there was a significant interaction of treatment, gender and age on low back pain ($F_{(6,84)} = 6.723$, $p<0.05$, $\eta^2 = 0.170$) of law enforcement Officers in Ibadan, Oyo State. The null hypothesis was therefore rejected. This implied that there is a significant effect of treatment, gender and age on low back pain of law enforcement Corp in Oyo state. The eta square value of 170 shows the treatment effect size of 17.00%.

Discussion

   This study examined the effect of an eight (8) week whole body vibration and stretching exercise on low back pain among law enforcement corps in Ibadan Oyo State, Nigeria. It was reviews that the Division of enforcement corps distribution of respondents on the table above shows that out of the total respondents of 90, were from Nigeria Army (NA), Nigeria Police Force (NPF) and Nigeria Security & Civil Defense (NSCDC) respectively. Furthermore, the study reveals that slightly below half of the participants were in the age range of 30 to 39 years and half were between years respectively. The study also indicated that, equal numbers participants were males and females respectively.

   The findings showed that participants with severed level of lumber strain were the highest among law enforcement officers in Ibadan, Oyo State. The finding is in line with the result of the level of low back pain in Royal Canadian Mounted Police (RCMP) officers where the prevalence of low back pain was between 44 and 62% each year (Brown., et al,2019). According to data from the Royal Canadian Mounted Police (RCMP), 51% of members consider back pain to be a serious or moderate health issue within the force (Laslett., et al, 2019). According to a 1996 LBP survey, 56% of RCMP

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members have acute, chronic, or recurring LBP. Brown et al. discovered greater back pain and injury rates in a random sample of police officers who drove a patrol car as part of their employment. While 54.9% of the officers surveyed reported chronic and/or recurring LBP, barely half sought medical assistance through chiropractic care, physical or occupational therapy, massage therapy, or other professional help, compared to 64% in the current study. Only 25% reported taking sick leave, despite the fact that 60% said they should have taken more time off to heal and not returned to work until they were symptom-free. This is very comparable to the findings, which show that 63% of officers believed they should have utilized more sick time to speed up their recuperation. It has been demonstrated that law enforcement officers have a significant rate of lower back problems that develop over the course of their careers.

There was no significant main effect of treatment and gender on lumber strain treatment outcome. This means that neither static-stretching nor vibration-therapy exercise programme, nor the gender of the individuals had a statistically significant impact on the level of lumbar strain observed. In other words, the treatment groups did not show a significant difference in strain levels, and neither did the male and female participants. However, the estimated marginal means shows that female participants had a slightly higher posttest mean score than their male counterpart. This implied that the female gender may have a slight high reduction after 8-week static and vibration therapy exercise programme on lumber strain than their male counterpart. This data supports previous findings that low back pain (LBP) is the most common health condition causing pain and disability in older persons (Bressler., etal,2019). Earlier study reveals that LBP prevalence progressively increases from teenage to 45 years of age and subsequently falls, which may be ascribed to occupational exposure among working-age people, or age-related changes in pain perception or stoicism (Muskan, Rai & Rishi, 2025).

Finally, Hypothesis two reveal that treatment, gender, and age all have a significant main influence on low back pain. The findings supported the hypothesis that the ageing process causes muscle, joint, and bone degeneration, diminishing muscle mass and strength by up to 40% after the 40th life year (Gustafsson & Ulfhake, 2024). Although resistance exercise is the preferred treatment for reducing sarcopenia and increasing strength, it is regarded as a very harsh training for the elderly due to its large range of motion and the danger of fractures and strains (Hurst., et al, 2022).

Conclusion

Based on the findings of this research, it was concluded that incidence of severed level of lumber strain was prevalent among law enforcement officers in Ibadan, Oyo State. Also, the study concluded that the 8-week static-stretching and vibration-therapy exercise program is effective for both males and females, but there may be a modest gender-related variation in responsiveness, favouring females. In other words, the treatment groups did not show a significant difference in strain levels, and neither did the male and female participants. Finally, treatment, gender, and age all have a significant main influence on lumber strain.

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Recommendation

Based on the findings of the study, the following recommendation are made:

1. Law enforcement agencies in Ibadan should incorporate structured physical fitness routines into their wellness programs.
2. Since females showed a slightly better response to the exercise program, fitness plans should be tailored to optimize benefits for both genders, possibly incorporating exercises that address these gender-related variations.
3. To identify and manage lumbar strain early, regular health assessments should be instituted for law enforcement officers, especially considering the high incidence rate observed.
4. As age significantly influences lumbar strain, exercise and treatment programs should be adapted to meet the needs of different age groups within the police force.
5. The federal government should make educating officers about the risks, prevention, and management of lumbar strain will empower them to take proactive steps to reduce injury risk, complementing the exercise interventions a priority.

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