EFFECTS OF ACUTE SUPPLEMENTATION OF CAFFEINE ON HYDRATION STATUS DURING ENDURANCE RUNNING EXERCISE IN THE HOT AND HUMID ENVIRONMENT

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Abstract

Caffeine is one of the commonly used ergogenic aids. Many researches have established the performance enhancing property of caffeine but its effects on hydration status during endurance exercise has not been explored.

The present study was conducted to investigate the effect of acute supplementation of caffeine on hydration status during endurance running exercise in the hot and humid environment. Nine heat acclimated recreational runners (25.4 $\pm$ 6.9 years) and nonusers of caffeine (23.7$\pm$ 12.6 mg per day) participated in this placebo controlled double blind randomised study.

Subjects ingested caffeine at a dose of 5mg per kg of body weight or placebo (capsule) one hour before the exercise trial. The treadmill speed for the endurance exercise was set at 70% of the VO_{2max} in a heat-controlled laboratory environment (31^{o}C, 70% relative humidity). Subjects were allowed to drink 3 mL of cool water per kg of body weight every 20 minutes during the trials to avoid the possibility of dehydration. Pre and post trial body weight were recorded. Heart rate, skin temperature and core body temperature were recorded at an interval of 10 minutes. Sweat rate and changes in body weight were calculated. Heart rate, skin temperature and core body temperature did not show any significant variation between the trials but these parameters were significantly increased ($p<0.01$) during the running endurance exercise from their respective resting values in both the trials. Body weight and sweat rate did not show any significant variation in both the trials.

Therefore, the present investigation may conclude that the ingestion of 5 mg of caffeine per kg of body weight does not impose any significant effect on hydration status of the body during endurance running exercise in a hot and humid environment.

Keywords*:* Caffeine, acute supplementation, hydration, endurance running.

ASSESSMENT OF PULMONARY FUNCTION AMONG COTTON MILL WORKERS IN WEST BENGAL

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Abstract

Respiratory problem is one of the major health threats to cotton mill workers . It leads to some systemic symptoms in exposed workers along with a no. of other physical problem like hearing loss or noise problem , low back pain etc

To assess the magnitude of respiratory health problems of inhalation of

cotton dust by cotton mill workers of West Bengal.

This cross sectional study was carried out on 187 cotton mill workers of

West Bengal and a control group of 65 non workers surrounding the industry . Anthropometric parameters and spirometry was performed. Spirometry includes FVC, FEV_1, $FEV_{1\%}$, $FEF_{200-1200}$, $FEF_{25-75\%,}$ $FEF_{75-85\%}$ and PEFR.

Results: Out of 187 employees restrictive lung function was observed in 65.7% cottonmill workers and among them 21.39% reported bissinosis like symptoms like chest pain, chest tightness, wheezing and cough. The bissinosis like symptoms were from carding mainly ring frame section (51.42%) and rest from winding , doubling and others. Majority of workers with abnormal lung function test have duration of exposure to dust particle in between 10-40 years. But abnormal lung function below 10 years of exposure have been observed in smokers. Besides higher age group (36-60yrs) smoker workers showed abnormality in lung function (75%) more in comparison to lower age group smoker workers (60%). All the lung function parameters show significantly ($p<0.001$) lower values in cotton mill workers of both higher and lower age group as well as smoker and non smoker groups in comparison to control group.

Conclusion: This study clearly indicates poor pulmonary function in cotton mill workers

exposed to dust . This baseline information is expected to development of a regional occupational health data base for use in local regulation and resource allocation for intervention to ensure safe and healthful working condition in cotton mill workers. Restrictive lung disorder is the prominent lung function abnormality and higher age group workers are mostly affected depending on the duration of exposure to dust particle especially the carding and spinning section workers where suspended dust particle and respirable dust particle is above the recommended level(0.2 mg/m^3). Smoking is another factor for decline in lung function of cotton workers.

Recommendation: Therefore abiding to the international standard (100 μ/m^3) is recommended. Technical support like close cotton processing and air conditioning of work places, specially the high dust zone will be effective. Besides by providing protective face mask , by disallowing overtime working , discouraging smoking and transfer of workers from more dusty to less dusty area when become symptomatic, periodic health check up and worker's compensation for occupational disability should be available.

Keywords: Pulmonary function, cotton mill worker

VARIABILITY OF AGE AND TRAINING ON BODY COMPOSITION, AEROBIC CAPACITY, ANAEROBIC POWER AND STRENGTH OF INDIAN HOCKEY PLAYERS

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Abstract

Hockey is a sport with a long history that has undergone quite rapid and radical change within the past decade.

The present study was aimed to find out the variability of age and training body composition, aerobic capacity, anaerobic power and strength of hockey players. A total of 120 male hockey players volunteered for the present study, were divided equally (n=30) into 4 groups: U16 (14-15 yrs); U19 (16-18 yrs); U23 (19-22 yrs); senior (23-30 yrs). The training sessions were divided into 3 phases: [Transition Phase (TP), 4 weeks], [Preparatory Phase (PP), 8 weeks], and [Competitive Phase (CP), 4 weeks]. The training programme consist of aerobic, anaerobic and skill development training, and were completed 4 hrs/day; 5 days/week. The selected physiological variables were measured in the laboratory.

The results showed a higher ($P<0.05$) height, body mass, lean body mass (LBM), maximal aerobic capacity (VO_{2max}), anaerobic power and strength among the senior players than that of the junior players. However, a decrease ($P<0.05$) in body fat and heart rates have been found with the advancement of age of the players. Further, an increase ($P<0.05$) in VO_{2max}, anaerobic power, grip and back strength; and a decrease ($P<0.05$) in body fat and recovery heart rate have been noted in PP and CP when compared to that of TP. But, no significant change was observed in height; body mass, LBM and maximal heart rate after training.

The present study would provide useful information for training and selection of hockey players.

Key words: anaerobic power, body fat, strength, training, VO_{2max}

EVALUATION OF RELATIONSHIP BETWEEN SOME ANTHROPOMETRIC AND PHYSIOLOGICAL VARIABLES WITH PHYSICAL FITNESS AMONG GIRL STUDENTS AT AN AGARTALA COLLEGE

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Abstract

A different Anthropometric measurement of 350 female college students of 18-22 years of age of almost same socioeconomic status was randomly selected among nontribals & tribals here at Agartala.

Resting heart rate, anticipatory heart rate rise , blood pressure, extent of physical activity , sleeping hours & physical fitness index (PFI) by standard Harvard step test, intervals between date of onset of menstruration days & taking the PFI test were recorded. Then the other abovementioned variables (including anthropometry but except PFI) were tried to relate with the PFI of all subjects to find out the fact that which of the anthropometric & physiological variable has got most close and statistically significant relation with the PFI.

The reasons of finding such significant relationship have been analyzed.

Keywords: Anthropometric measurements, heart rate, blood pressure, physical fitness index

PHYSIOLOGICAL COST OF EVALUATION OF MANUAL PUMPS IN ORISSA

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Abstract

The small and marginal farmers constitute 83.8 per cent of the total farming community in Orissa. They use different manual pumps for irrigation purpose. A double cylinder pedal operated diaphragm pump (PDP) was developed in the College of Agricultural Engineering & Technology, OUAT, Bhubaneswar and its physiological cost like working heart rate (WHR), work pulse (WP), oxygen consumption rate (OCR) and energy expenditure rate (EER) and its discharge at an optimum suction head of 3.4m were evaluated with male and female operators in the age group of 18 to 45 years in the Central Farm of OUAT, Bhubaneswar.
The mean value of WHR, WP, OCR while operating with Krishak Bandhu pump (KBP) was observed to be 118.2 beats min^{-1}, 43.1 beats min^{-1} and 0.72 l min^{-1} for male and 115.1 beats min^{-1}, 43.4 beats min^{-1} and 0.64 l min^{-1} for female operators respectively. But in case of PDP the WHR, WP and OCR were recorded to be 115.1 beats min^{-1}, 40.1 beats min^{-1} and 0.71 l min^{-1} for male and 113.6 beats min^{-1}, 41.6 beats min^{-1} and 0.62 l min^{-1} for female operators respectively. The corresponding energy expenditure rate (EER) varied in the range of 14.2 to 15.9 kJ min^{-1} for male and 12.1 to 14.4 kJ min^{-1} for female operators while operating with KBP. The EER was recorded to be in the range of 14.0 to 15.5 kJ min^{-1} for male and 12.3 to 13.4 kJ min^{-1} for female operators in case of improved pedal operated diaphragm pump.
The average discharge was found to be 4273.4 lph and 3717.7 lph for male and female operators respectively in case of pedal operated diaphragm pump which was higher in comparison to KB pump.

Keywords: Physiological cost, Diaphragm pump, Working heart rate, Oxygen consumption rate, Energy expenditure rate

COMPARISON OF PHYSIOLOGICAL WORKLOAD OF WOMEN WORKERS DURING SPRAYING WITH BAKPAK, KNAPSACK AND POWER SPRAYER

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Abstract

The mean values of HR and oxygen uptake of the subjects for Bakpak (SP_1), knapsack (SP_2) & power sprayer (SP_3) in the laboratory were 87.98, 96.52 & 100.38 beats/min and 0.398, 0.487 & 0.587 l/min respectively. The corresponding values of increase in heart rate over rest (Ä HR) and energy expenditure (EE) were 9.24, 19.43 & 25.42 beats/min and 8.31, 10.17 & 12.25 kJ/min respectively. Whereas, the mean values of HR and oxygen uptake of the subjects for SP_1, SP_2 & SP_3 in the field were 93.82, 100.59 & 109.30 beats/min and 0.408, 0.524 & 0.62 l/min respectively. The corresponding values of Ä HR and EE were 15.60, 21.87 & 27.60 beats/min and 8.52, 10.95 & 12.88 kJ/min respectively. The spraying operation with all the sprayers falls under moderate work based on heart rate data. Whereas, based on oxygen consumption it falls under light grade of work.

The workload in the spraying operation with was within the acceptable limits of the female workers based on HR and oxygen consumption data. Due to the noise and vibrations of engine on back there is fear among the women workers for power sprayer. Hence it is not easily accepted by women workers.

There is a need to collect the data on postural discomfort experienced by the female operators during spraying, awareness about power sprayer and make improvements in the mounting of all sprayers on the operator's back as per the anthropometric data to reduce the postural discomfort.

Key Words: Oxygen uptake, energy expenditure, heart rate, postures

EFFECTS OF LOAD CARRIAGE IN HAND, SHOULDER AND BACK ON KINEMATIC PARAMETERS OF GAIT

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Abstract

Kinematic responses of load carried in hand, shoulder and back were investigated at comfortable walking speed (0.97 $m.sec^{-1}$) on ten healthy male Indian infantry soldiers with mean (SD) age 23.3(2.6) yrs, height 172.0(3.8) cm and weight 64.3(7.4) kg. Gait data was collected using six CCD cameras based 3D Motion Analysis System while the subjects walked on a 12m level ground walkway with thirteen load conditions including no load (NL). Load carried were rifle(R,4.2kg) in hand(RH) and on shoulder(RS), light machine gun(LMG,6.8 kg) in hand(LMGH) and on shoulder(LMGS), haversack(HS, 4.4kg) and R(HSR,8.6 kg) in hand(HSRH) and on shoulder(HSRS), HS and LMG(HSLMG,11.2kg) in hand(HSLMGH) and on shoulder(HSLMGS), backpack(BP,10.7kg) and R(BPR,14.9kg) in hand(BPRH) and on shoulder(BPRS) and BP and LMG(BPLMG, 17.5kg) in hand(BPLMGH) and on shoulder(BPLMGS). Spatial, temporal parameters and joint angular changes at gait events of initial foot strike(FS1), midstance(MST), terminal stance(TS) and toe-off(TO) for ankle, knee, hip, pelvis and trunk joints and the ranges of motion (ROM) in sagittal plane were recorded.

Data was subjected to One way analysis of variance (ANOVA) followed by Bonferroni post-hoc test for comparing different load conditions. Midstance showed significant changes when load was carried in hand, either singly or in combination.Trunk forward lean angles showed significant changes in all conditions. Ankle, knee, hip and pelvic angles did not show any significant change.

Result showed that trunk remained more extended with upright posture maintaining center of gravity at natural position while walking with load on shoulders than in hand. The increased forward inclination while carrying load in hand and back may be explained as due to design artefact of the existing BP or may be attributed to some intrinsic adaptive phenomenon in the individual to counterbalance the load on back.

Keywords: Load carriage, mode of carriage, kinematics, ROM

.EFFECT OF AN ERGONOMIC INTERVENTION ON MUSCLE FATIGUE AND RESPIRATORY STRESS OF GOLDSMITH'S DURING BLOWING PIPE ACTIVITY IN INDIA

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Abstract

Gold smiths use metal blow pipe to heat the gold bead. Repeated prolonged nature of these procedures creates some health problems among the goldsmiths. In order to reduce these risks, effective interventions for reducing the stress are needed. The objective of the current study was to investigate alternative air pipe as an intervention for goldsmiths to continue their work.

For this current study 100 male goldsmiths were selected form the Davangere District of Karnataka. The study was included questionnaire study on MSD and respiratory symptoms, Pulmonary Function Test, Measurement of peak expiratory flow rate and electromyography of three major facial muscles (Buccinators Right, Buccinators Left and Orbicularis Oris). A new ergonomic intervention was introduced to the goldsmiths with their active suggestions. Subjects were interviewed at the end of each week to ascertain intervention acceptance.

A large number of goldsmiths complained of respiratory symptoms in this industry. Reduced lung volumes and peak expiratory flow rates of goldsmiths was found, presumably from heavy pressure generated by using blow pipe. This work habit also increases the fatigue of facial muscles, at the end of the day. In this study an ergonomic intervention ware provided in three primary types. Finally one type of hand air pipe was selected by the analysis of subject's preference.

This way in this current study we eliminate the hazards manual Blowing Pipe activities of the goldsmiths. By introducing this mechanical hand air pipe, it can reduce or can give relief the goldsmiths from various occupational hazards.

Key words: Goldsmith; respiratory symptoms; muscle fatigue; ergonomic intervention

CARDIORESPIRATORY CHANGES WITH NEW COMPACT BACKPACK SYSTEM AND EXISTING DISTRIBUTED MODE OF LOAD CARRIAGE

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Abstract

Carrying moderate to heavy load is a common phenomenon in any industrial setup and military operations. In Indian Army, soldiers normally carry 21.3 kg in different load carriage ensembles (LCe) such as backpack (10.7 kg, BP), haversack (4.4 kg, HS), and web (2.1 kg, Wb) distributed in different parts of the body and rifle (4.1 kg) in hand. This load distribution is unequal, may involve excess energy expenditure, mostly uncomfortable, and restricting the normal movement of the hand carrying rifle. A new BP has been developed with two chambers which can accommodate existing BP content in the upper chamber and HS and Wb items in the lower chamber. The rifle can be placed on sides of the new BP leaving the hands free. Physiological evaluation of carrying 21.3 kg in the existing LCe and in the new BP was carried out on a group of army soldiers to understand the efficacy of the new BP vis- á- vis the existing one.

Six physically fit soldiers with Mean ± SD age 29.83 ± 2.86 yrs, height 165.5 ± 3.15 cm and weight 63.5 ± 5.47 kg, carried 21.3 kg load in new BP and in existing LCe at 4.5 km.hr^{-1} speed at level ground and at 5% gradient on a treadmill in controlled laboratory environment. Pulmonary ventilation (VE), heart rate (HR), oxygen consumption (VO2) and energy expenditure (EE) of the volunteers were recorded breath by breath by using K4b2 system (Cosmed Sr.l Italy). They also expressed their level of comfort in a 14 point scale (Borg, 1985). Student's paired't' test (two-tailed) was used to compare the results of existing LCe with that of new BP.

Responses of cardiorespiratory parameters were less with new BP than existing distributed LCe. But the changes were not significant. All the subjects expressed their increased comfort with the new compact BP system than the other one. The study needs to be conducted on a large population group to validate the effectivity of new BP system.

Keywords: Cardiorespiratory parameters, load carriage, compact mode, distributed mode.

ERGONOMIC INTERVENTION THROUGH TECHNOLOGY KIT FOR DRUDGERY REDUCTION OF HILL FARM WOMEN OF INDIA

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Abstract

The present study focused on technological empowerment of hill farm women to reduce drudgery by developing a gender sensitive ergonomically designed technology kit for drudgery reduction in household, agriculture and live stock care operations and to ascertain the impact of drudgery reducing technologies on health status and output of hill farm women. **Locale:** The study was conducted in two hilly states of India viz. Uttrakhand (10 villages and 500 representative samples) and Himachal Pradesh (35 villages and 1500 representative samples).

Ergonomic Assessment: The assessment of traditional as well as improved prototypes of tools used for identified drudgery prone tasks in different work sphere were studied on ergonomic parameters viz. total cardiac cost of work (Heart Rate Monitor); energy expended (Formulae) Rated perceived exertion of tasks (Borg's scale), biomechanical profile (Grip, leg and back dynamometer); body postures (Flexi curve); musculo-skeletal problems (body map); output of operation and area covered (in meters).

In addition, measuring tapes, weighing balance, scale drawing, line drawings, sketches and video filming techniques were also used for appropriate designing and development of tools. **Result Highlights:** Maximum drudgery prone tasks were identified as weeding, cutting/uprooting, transplanting, harvesting and clod breaking in agricultural tasks; cutting and collecting fodder, dung collection and milking under livestock care; tea plucking under tea related allied tasks and bringing fodder, mopping and plastering under household tasks. Physical fitness of majority of respondents from both the states was found to be good followed by high average. Musculo-skeletal problems described by respondents due to use of traditional tool were severe low back pain, moderate pain in head, shoulders and severe pain in lower legs. Heart rate values were more than acceptable limits for the tasks performed with the traditional tools as compared to the improved tools viz. clod breaking (T-124 bpm, I-120.3 bpm), uprooting (125 bpm), fodder picking (T-1116 bpm, I-104 bpm), Tea leaves collection in kilta (T-101bpm, I-95.5 bpm); Tea leaves picking - (Finger blades T-101bpm, I-96 bpm) and plastering (109 bpm). Similar trend was observed for other operations under study. Significant increase was observed for area covered under operation (Clod breaker T-208 sq.mt; I-302.45 sq.mt) and output of operation (Cutting T-15.75 kg, I- 25.23 kg.; Uprooting T-9.88 kg and I-11.3 kg). Significant reduction was observed in body pains, fatigue and discomfort of the worker while working with the improved tools as compared to the existing tool. Farm women were highly satisfied with the use of improved technology kit and it is recommended to be multiplied and disseminated at large scale.

Key words: ergonomics, intervension, tea leaves picking, discomfort