An Ergonomic Study on Occupational Wellbeing and Womanness Issues of Assam Police

A Thesis

Submitted to the

Indian Institute of Technology

In partial fulfilment of the requirements for the degree of

DOCTORATE OF PHILOSOPHY

by

SHILPI BORA

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Assam, India 781039

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February 2018

DECLARATION

It is hereby certified that the work contained in this thesis entitled "**An Ergonomic Study on Occupational Wellbeing and Womanness Issues of Assam Police**" has been carried out by me, a student in the Department of Design, Indian Institute of Technology, Guwahati (IITG), Assam, India under the guidance of Professor Debkumar Chakrabarti being submitted for the award of Doctor of Philosophy. This work has not been submitted elsewhere for a degree.

Place: IIT Guwahati
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CERTIFCATE

The research work entitled "**An Ergonomic Study on Occupational Wellbeing and Womanness Issues of Assam Police**" to be submitted by Miss Shilpi Bora to the Indian Institute of Technology, Guwahati, Assam, India towards partial fulfilment of the award of the degree of Doctor of Philosophy, has been carried out under my direct supervision. This work has not been submitted for the award of any other degree or diploma to this institute or any other institute or university to the best of my knowledge and belief. She has also fulfilled all the requirements including mandatory coursework as per the rules and regulations for the award of the degree of Doctor of Philosophy of Indian Institute of Technology, Guwahati.

Place: IIT Guwahati
Date: …...……2018

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ABSTRACT

Participation of women in police service is one of the most important and sensitive work organizations in any part of world. Role of police is important in maintaining law and order among any nation, and such organization is often dominated with males traditionally – thus are criticized time and again for lack of induction of women. This issue has become more pertinent in recent decades, increase in crime against women and children being one prime reason. However, despite the efforts made in aspects like changing recruitment policy etc., the work culture inside this organization has been perceived to be not favorable (the same being perceived officially and documented in parliamentary reports also). For effective policing, it is important to ensure healthy and amiable work culture for women within the organization at all levels. Few studies that have been conducted in form of case studies mostly citing lack of basic facilities for women; but a systematic study quantifying their occupational well-being, job satisfaction and also necessary facilities have not been reported so far and specifically for police force in Assam, India have not been conducted. Such in-depth work might be realistically expedient for competent government authorities for revising their extant policies for improving and promoting women recruitment in police service.

To access the issues specifically faced by the policewomen and possible development alternates, the current study was undertaken with objectives were 1) To understand the occupational stress factors and wellbeing issues experienced by Assam policewomen in their respective workplace with specific reference to convenience facilities that are provided to them while they are on duty, 2) To examine the possibilities of ergonomic design intervention for the existing workplace for policewomen; which could improve the overall workplace scenario, 3) To propose the ergonomic design interventions (preliminary recommendations) to address the major inconveniences faced in workplace with specific reference to womanhood and 4) To evaluate the impact of implementation of the said interventions on the occupational stress factors and wellbeing issues. For study, two police stations, namely a) All Women Police Station and b) Common Police Station were selected in Guwahati metropolitan area of lower Assam and also at Tinsukia District of upper Assam.

In addition, the above surveys were also conducted in a women police station in China so as to compare the Indian scenario with international one having somewhat similar traditional issues

related to womanhood. Surveys were designed and developed carefully based on initial review of literature and discussions with policewomen. Special care was taken considering the confidentiality and sensitivity of the issues. Permissions through proper channel were obtained before conducting surveys in above mentioned police stations. Policewomen from other police stations also participated in survey. Occupational well-being, environmental stress and job satisfaction issues were revealed during survey. More than that, based on group discussions with policewomen, several issues were brought out. It was revealed that there is significant shortage of policewomen (only one per common police stations across the cities) in common police station and lack of basic amenities such as furniture, computers, rest rooms and washrooms. Further, significant lack of attention towards maintaining hygiene in all policewomen station was observed. There was no provision for child care facility and for pregnant women in both police stations. Though, these were not found to be that much important in their work life based on discussion. There is no visitor area for women and others. Similarly, with job related issues, policewomen are not able to avail benefits like in other government organizations. The policewomen job is often perceived awkwardly among their society. There is no provision of mobile utility van, which is very important for duties in extreme times (curfew) and also at night. In short, there is significant lack of basic amenities that provides privacy, safety and comfort especially to policewomen in Assam.

Interestingly, unlike in Assam, Policewomen station in China have no such shortage of staff and are well-equipped with basic amenities; although they also lack child care facilities and provisions for pregnant women. They have well-equipped mobile utility Van, but that also lacks provisions for women. For Chinese policewomen also, job satisfaction is found to be towards neutral among women. Occupational well-being is found to be better among Chinese policewomen than policewomen in Assam.

Based on the above identified issues related to occupational well-being and basic amenities, preliminary 2-D layout plan for police station and mobile utility van were proposed. The plan consisted of all basic amenities such as restrooms, washrooms, office and specific visitor areas for women. The layout for mobile utility van also incorporated specific washrooms for male and female, along with their sitting area. The above design encompasses ergonomics principles of office workplace and conveniences. Some of the suggestion made during the study was implemented and found satisfactory.

CONTENTS

List of Figures

List of Tables

CHAPTER 1- INTRODUCTION: WOMEN WORKFORCE IN LAW ENFORCEMENT, ASSAM

Chapter 1 introduces women participation in police job in India with specific to Assam. Stress is one of the major concerns need to be study considering woman relevant issues such as menstruation, pregnancy, breastfeeding mothers, motherhood affecting performance in this male - dominated job. It leads to the possibilities of ergonomic appraisal in the working condition and wellness of the policewomen.

CHAPTER 1

INTRODUCTION: WOMEN WORKFORCE IN LAW ENFORCEMENT, ASSAM

1.1. Introduction

"I am relieved if, rather than sex bias; the reason why more women are not breaking through the glass ceiling of academic medicine is because their children are hanging on the tails of their white coats. Most of us are happy to have them there, and academic medicine offers a level of professional fulfilment, financial stability, and geographic flexibility that is well worth the juggle"

(Laine, 1998)

In today's culture, womanness endures being designated from basically male perspective. This could be expressively factual in the third world countries like India. According to Jayita and Murali (2009), they depicted that the adjectives used to delineate a woman may vary from feminine to tender, motherly, etc. A woman is all this and more. They have also revealed that a working mother is independent and empowered, especially if she is from a low socio-economic background. And that is the spirit of her womanness. In addition to this, a family gets a support with the income where financial independence gives a sense of enablement, improves the family's standard of living which together constitute a very vital elevation for families with a low socioeconomic background. The employed mother embodies modern womanness. The present-day work atmosphere needs to deliberate the special needs of this working population, changing its orientation from male dominance to gender neutrality and parenting friendly behaviour.

To more than half of the proportion, women nowadays participate equally in the job as those of their male counterparts worldwide. Through their paid work, women around the world continue to make a tremendous contribution to the economy in a variety of occupations both with intellectual as well as exercising physical capabilities such as teachers, secretaries, doctors, machine operators, child care worker, agricultural farm women, policewomen and many more.

Almost all the jobs, commonly believed to be masculine in nature, require physical fitness to a certain degree. One such job, the police job is highly stressful and very complex in nature, especially applicable for women police personnel. It engrosses complete dedication and maximum commitment of the employees. While on job, they face many destitutions from their jobs, in addition to sacrificing their family lives (Mangaleswaran, 2012). In recent years, police departments have become progressively apprehensive with the professional impact of occupational stress on police personnel, specially the female workforce. Stress has been perceived to be a grave problem faced by the law enforcement workplaces, and attempts to identify the problems, and ameliorate them subsequently have been undertaken. Policewomen play a fundamental role in police department and recent times have seen a boost in the number of women joining the police force. As stress is unavoidable in the police job and women tend to be at greater risk for the deleterious effects of it, it is deemed important to address the concerns regarding their well- being. Policewomen at All Women Police Station, (AWPS) Pan Bazar Guwahati participations in police organization and saluting the women for joining such a stressful job Figure.1; THIS AWPS is the first of its kind in whole northeast.

Figure.1. Policewomen at All Women Police Station, (AWPS) Pan bazar Guwahati attaining dignity and taking involved in police job.

It has recently been observed that, women are aptly contributing to the working sectors, (getting outside the family premises) – including their contribution to the nation by the virtue of their entrance into so far known to be men's occupations, such as police forces, which is recognized by potential and strength the police personnel deem to have as evident in Figure.2. The job of Police personnel is indeed a challenging one, which embraces uncertainty in many forms including longer hours of duty, sudden unexpected deployments and exposure to unavoidable risky circumstances, to name a few. In the prevailing socio-cultural set-up, policewomen are

often overstrained and thus, they find it difficult to maintain equilibrium between their job and household responsibilities. Police service poses considerable occupational stress essentially due to its unforeseen undesirable consequences on the individuals and on the organization (the Service) at large. Workplace problems differ from other stressors in aspects like difficulties in balancing a job with family responsibilities, a person's personality traits, related trends of coping with workplace problems and so on. Workplace problems are taxing features of any organization. The police service is known to pose workplace problems having a considerable contribution to the workplace and occupational stress (Sundaram & Kumaran, 2012).

As seen from the daily on-job rosters of the policewomen across India, and the same being equally applicable for policewomen of Assam Police, they commonly witness quite a few adversities, for example, lesser acceptance of their on-job role to their family, conflicts in balancing job and family components, on-job stress, lack of job satisfaction, workplace discomfort on personal front; along with inadequate welfare measures, unsatisfactory facilities, less flexible leaves and benefits etc. on the organizational front.

Figure. 2. Picture showing police women gradually involved in male dominated job. The purpose of this picture is to show that the ratio of female police is increasing especially in police job and there is a need to change in the policy. *(source:http://indianexpress.com/article/india/allot-one-third-of-vacant-posts-in-police-to-women-maneka-gandhi-to-rajnath-singh-4639722/ accessed on 2016).*

Police service poses considerable occupational stress largely due to its various undesirable consequences on the individuals and on the organizations (the Service) at large. Workplace problems differ from other stressors in aspects like difficulties in balancing a job with family responsibilities or a person's personality traits and related trends of coping with workplace

problems. Work-place problems are troublesome features of any organization. The police service is known to pose workplace problems having considerable influence on stress (Sundaram & Kumaran, 2012).

With reference to the daily on-job rosters of the policewomen across India, and the same being equally applicable for policewomen of Assam Police, they are commonly witnessed to go through quite a few adversities for example, lesser acceptance of their on-job role to their family, conflicts in balancing job and family components, on-job stress, lack of job satisfaction, workplace discomfort on personal front; and with inadequate welfare measures, unsatisfactory facilities, less flexible leaves and benefits etc. on the organizational front.

In India, women comprise 24.4 % of the overall workforce, where safety has become essential to their physical, professional, intellectual and emotional well-being at their workplace (Division Planning Commission; 2015). Several technical, managerial fields with innovative modules are growing fast, where it deems quaint essential to accommodate the women in those domes, policing profession certainly being no exception. The predisposition should be distinctly set for first-hand opportunities and potentials of improvement and accomplishment through more recruitment of women in the workplace. The impression of women in law enforcement is attaining position throughout the world, and numerous nations are tapping intense determinations to mainstream women in policing. In this regard, organizations in India have also paid some attention recently towards improving occupational well-being and reducing job stress. Workplace design is one of the important aspects that affect mental stress and work productivity in the office.

Consequently, an effective and efficient workplace for policewomen along with safety and proper convenience facility in such police stations (previously suited the male predominant job) has become imperative for their occupational well-being. The particular stress instigated by daily living or working situations might lead to various health problems and subsequent changes in job performance and above all, quality of life (Selokar *et al.*, 2011).

Although empirical studies have begun to appear in literature / newspapers / reviews on Police Research & Development regarding the policewomen and their occupational well-being, the field is still very much grey, rather in its infancy. Especially, there is the only negligible amount of Indian studies conducted among them. The present piece of work therefore, intended to explore the issues related to basic amenities, conveniences and occupational welfare in the

police station and while on patrolling duties (available vs. required) for policewomen. This is probably because; the output at workspace (police station) and the efficiency of the employee has been efficaciously echoed as a critical contributor to their satisfaction leading to healthier and effective participation. In light of these, this study aimed to look into the office workspace design for police station with the target of the occupational well-being of the women police personnel through ergonomic design interventions.

A new delineation of womanness is being produced by the market in Indian society. As a response to this new delineation of 'modern Indian womanness', fundamentalist forces have opened the front in trying to keep the traditional Indian womanness alive (Tiwari, 2015). Such endeavours are bereaved of any purposeful elucidation of womanness in India. Thus Indian womanness confronted that with multifaceted challenges to her designation, uniqueness and self-esteem in the stimulate the circumstances.

Based on our understanding of womanness in context of Indian society, it becomes even more essential to provide a workplace that caters to issues of it. As mentioned in Tripathi *et al.*, (2016), it is important that police stations consider safe and hygienic environment for women to work. Further, it should also consider to provide secure childcare centres within the stations or nearby locality of it. There is a need to consider differences in anatomy, physiology, genetics, age and social status of woman especially making any policy or design of common police stations, where female staff has to work in coherence with male staff. This should be different in both rural and urban areas as the differences in social status varies in these regions. These suggest that there is a need for specific study of womanness issues in police stations. A very few studies were presented in the literature review on the occupational stress of policewomen. The reason behind this might be the confidentiality in the police job.

1.2. Review of Literature

The review of literature presented herein is broadly classified into three sections: (1.2.1.) Womanness and policing (1.2.2.) On-Job stress and occupational well-being (1.2.3.) Policing (Police Service) as a job (1.2.4.) Policewomen in Service – the women's perspectives (1.2.5.) Handling of uniforms, equipment and fittings in the police station: A part of duty rosters (1.2.6.) Workplace Amenities: A possible stressor for policewomen? (1.2.7.) Policewomen at All Women Police Station (AWPS), Pan Bazar Guwahati (1.2.8.) Stress of policewomen in Assam (1.2.9) Ergonomics application in police station towards improved occupational well-being.

1.2.1. Womanness and Police Job

"First, from the early 1950s, many employed mothers began to challenge, although not overturn, the dominant discourse of the ideal mother as exclusively bound to the home. The simple fact that so many women were drawn to work outside the home despite criticism demonstrates the monetary and psychological importance of employment for women"

(Wilson, 2006)

Womanness confers upon a woman the responsibility both at home and workplace. This process also changes the way in which she is alleged in society and at her workplace. It can oblige her to take more than accessible leave options, and job security can be at risk. Significant social and personal adjustments are obligatory to cope with such circumstances. A working mother, especially one who has the good opulence to be able to poise her home and work, enjoys the stimulation that a job or career provides. She develops the ability of hovering a beneficial member of society and at the same time gains financial independence. Along with motherhood/womanness, work adds to the completeness of being a woman (Jayita and Murali, 2009).

In society, womanness continues to be styled from a vitally male viewpoint. This can be especially true of societies in third world countries like India. Adjectives used to delineate a woman may diverge from feminine to tender, motherly, etc. As a working mother, she is sovereign and empowered, especially if she is from a low socio-economic background and that is the essence of her womanness. The proficient desires of the modern working woman are to linger ascend, as soon as she becomes a mother her priorities often change. Stereotypes rule and strong principles persevere about the undesirable possessions of maternal employment on women, their marriages, and their children, despite methodical evidence to the contrary.

Stress in the workplace is now realized (since recent past) as a serious problem faced by women personnel in law enforcement. The police organisation and the administrative system therein have traditionally been led by males. Female police officers thus became affected of different sources of stress from their occupation. However, with more and more females entering the workforce and more emphasis being placed on equal opportunity hiring, there has been considerable increase in the number of women becoming police officers. Understandably, female officers will be no less susceptible to the everyday occupational stresses than their male counterparts. However, it is possible female police personnel are subject to different sources

of stress from their occupation and have very differential reactions. Police work tends to be regarded as inherently stressful because of the personal risk of exposure to confrontation and violence and the day-to-day involvement in a variety of traumatic incidents. As a result, high levels of stress-related symptoms are expected in this group of personnel. In relation to this, it has been found that sources of stress-related symptoms within police officers are significantly associated with mental ill-health. They also confirmed that the organizational culture and workload are the key issues in officer stress. (Collins and Gibbs, 2003; Phenix, 2007; Karunanidhi & Chitra, 2013).

Women and girls are teamsters of transformation and need to be at the centre of the sustainable improvement of goals in the society (Tatun, 2015). Their wellbeing desires to be at the heart of implementation approaches in the workplace. In contemporary India, the prominence of women subjugates a significant place and her role that she plays specially to enrich her family is indeed extraordinary. Emmanuel and Rajan (2013) deliberated that the elimination of variation in the society has brought many changes in the lives of people as well as it has brought in some meaning in lives of men folks. Nevertheless, this level of status does not ensue in all the parts of India. It defers from urban to rural, rural to slums and slums to tribal areas (Emmanuel and Rajan, 2013). Tripathi *et al.,* (2016) has recommended that the primary anticipation and obligation is the needs to be contented for any working mother is the obtainability of safe, hygienic and secure childcare centres in the locality of the workplace. This will not only provide mental amity to the working mothers but will also augment her competence and administrative productivity and will aid to accomplish the most anticipated work-family balance.

1.2.2. On-Job Stress and Occupational Well-Being

On-Job stress and occupational well-being are the two major issues for the women in the police job that are describe below:

1.2.2.1. On-Job stress

Women in India have come a long way after independence from just a skilled homemaker to acquire skills and capabilities at par with their male counterparts (Figure. 3). But still, more conflict arises with the working mother who has to fulfil the demand at work followed by various demands at home. This can leave a working woman anxious and stressed. More

problems arise with the working mother as she has to fulfil the duties at work as well as home. This gives rise to a common conflict among married working women that they work for balancing the family financially, while unlike their counterparts they have to play the role of a homemaker also. As societies become more advanced technologically, women depend increasingly on their individual talent and modernisation for their progress and growth in the professional sphere. Such dual roles of the working women often lead to additional stress in their lives. Stress is the psychological and physiological reaction on perceived imbalance of the level of demand against the capacity to meet that demand by individuals. (Bhuvaneshwari, 2013). In his study, he revealed that stress in married working women is caused due to long working hours congested with various family and official commitments, harassments and improper work-life balance. Such type of stress leads to various problems such as chronic headaches, diabetes mellitus type 2, hypertension and obesity, to name a few. And therein he suggested that stress can be relieved from organizational support, balancing between work and life (by spending time with family for entertainments, practising yoga) etc. Nezhad et al. (2010) have shown that development of educational tools and interventions can raise awareness of work-family issues; by which occupational stress among the working women can be decreased. And it would also be useful for organizations and health professionals to relieve working women to fine-tune the problems related to work-family balance.

Figure.3. shows policewomen is saluting in their regular duty. It also indicates that women are confident in executing this type of job *(Source:https://www.beingindian.com/featured/crpf-deploys-560-women-commandos-in-anti-naxal-operations-for-the-first-time)*

The interrelationships between four workplace problems, namely the need for mentoring programmes, stress, job satisfaction and consideration of making career changes, to determine whether female officers' workplace experiences differ significantly from male officers. The analyses show that police officers who perceive a need for a formal mentoring programme reportedly experience higher levels of workplace stress. The findings also indicate that officers with higher stress levels are less satisfied with their jobs. To decrease workplace stress and improve job satisfaction in this department, administrators must address the lack of mentoring for both male and female officers (Hassell et al. 2010)

1.2.2.2. Occupational well-being

Occupational stress is a major hazard for many workers increased workloads, downsizing, overtime, hostile work environment and shift work are just a few of the many causes of stressful working conditions. The occupational stress of police has active impact on the organizational inference and that it is most obsessions for police organization as stated by Vidya and Kotian (2016). They have concluded that women have a significant part to play in the police force and women (police) need to accomplish proficient fineness that would inevitably adjustment gender stereotypes and make the important players in decision making, career planning and management in police.

The influence of occupational stress, work-life balance, job attitude, and personality on the psychophysiological well-being of women constables is growing day-by-day. To overcome these consequences of occupational stress, interventions in the form of stress management programs like trainings for stress management and building positive attitude towards job needs to be instigated. Various enactment policies by the organization for work-life balance should be provided with them. Moreover, use of personality test during the recruitment of policewomen for screening individuals with high neuroticism should be considered, as this personality characteristic has been found to have a profound negative influence on their well-being. All these might minimize the risk of occupational stress among policewomen (Karunanidhi and Chitra, 2013).

Adegoke (2014) revealed that the work-stress, frustration and depression on psychological well-being of police employees in Ibadan metropolis has a significant effect. Based on these verdicts, he has endorsed that the government and police organization should aspires to find

means of managing psychological attributes such as, psychological well-being, emotional labour, work-stress and social networks of their employers.

The, psychological well-being, physical health, efficiency and safety at work are important factors for any police agency to cogitate. It is essential to endorse scientific awareness and consequent conceivable interventions for the fatigued officers. Therefore, Violanti (2012) have examined police officer exposure to shift work and the association of such exposure with adverse health and psychological outcomes. It was that risk scrutiny among currently employed officers was performed for outcomes of subclinical disease based on independent variables of shift work, sleep quality, stress biomarkers (cortisol), and lifestyle covariates such as physical activity, diet, smoking and alcohol abuse. Additional analysis involved calculation of risk for specific causes of death in police officers compared to the U.S. General Population and internal police comparisons by shift work patterns.

Rani et al. (2010) have supported the emerging view that work is central to an individual's life and professed impartiality in terms of distribution, procedure and interaction dramatically lead to employees' psychological well-being (life satisfaction) which elicits contentment, fulfilment and to make an employee more competent to face the existential challenges of life. The study affords valuable insinuations for the police practitioners, researchers and management body to comprehend the psychological needs of police employees where they can experience themselves to be gratifying and improve as inclusive citizens with true human capabilities at work and non-work realms of life.

1.2.3. Police Service as a Job

Police job is commonly perceived and measured as a stressful occupation by many researchers (Collins and Gibbs, 2003; Phenix, 2007; Karunanidhi & Chitra, 2013) in comparison to many other occupations. Unlike most professions, law enforcement officers experience a variety of psychological and physical experiences. They are exposed to both operational and organizational stressors in their job. In recent years, police departments have become progressively alarmed with the effects of occupational stress on police officers.

Haines (2003) and Shane (2010) have identified stressors that are supervisory and shift-work dependent, resulting in decreased time spent with their families, fellow officers, and the citizens

at large, among numerous other factors such as low pay, irregular sleep schedules, and conflict with family and friends. Sundaram and Kumaran (2012) implicated of the root causes of stress that might be due to killing someone in the line of duty, seeing criminals go free, a fellow officer killed in the line of duty, staff shortage and having to handle a large crowd / mass demonstration, lack of recognition for good work, racial conflict, personal insult from mass / mob / colleague, lack of opportunity for career growth, stringent supervision, stressful job-related events impose direct reflections on age, gender, religion and marital status of the women police constables. Socio-demographic factors also affect stress level among police personnel. Findings revealed that political pressure, lack of time for family, negative public image and low salary were the prime reasons of stress among police personnel, especially the policewomen (Sundaram, 2012). The above sited stressors of police personnel deem to minimise with relevant training and education to help deal with the many challenges they face daily. With proper support, education, and counselling, they will be able to perform more efficiently with safety. Implementation of effective training in yoga and meditation programs, work based on importance etc. will help the policewomen to overcome from negative attitude (consequence of stress, perhaps) and give power to handle the very critical situations, decision making ability, increase the performance.

Work is measured as one of the most essential functioning of human life and has a great influence on individual's overall well-being. The issues which might cause problem could be like police has to perform risky assignments; working hours are comparatively long; rigid hierarchy pattern; and along with this, police have to maintain law and order in the state as well. Such situations cause stress at work and impacts workplace efficiency through the level of job satisfaction and psychophysiological well-being. The role of workplace support could be considered as moderator in above mentioned connection. Workplace support includes help from seniors, peers and colleagues. Sufficient workplace support leads to enhanced level of job satisfaction and psychological well-being among officers (and personnel as well).

1.2.3.1. Various Rank and Task of Police in Assam

In India, women comprise near to half of the population, but only a negligible share of woman population gets absorbed and involved in the law implementation and administration across India. In this context, Assam – the queen of North-east, there is considerable extent of difficulties concerning the relation to the circumstantial position of women in the Assam Police

with reference to working situations and the challenges that the women face. Though there are rank hierarchy present in the police job the responsibility stress is almost same to all ranks, thus the assessment of occupational stress in police job should encompass covering all the rules together.

North East Network, CHRI (2016) mentioned in their report that, the head of the police force is the Director General of Police who is accountable to the state government for supervision of the police force (no changes direct as it is in the report).

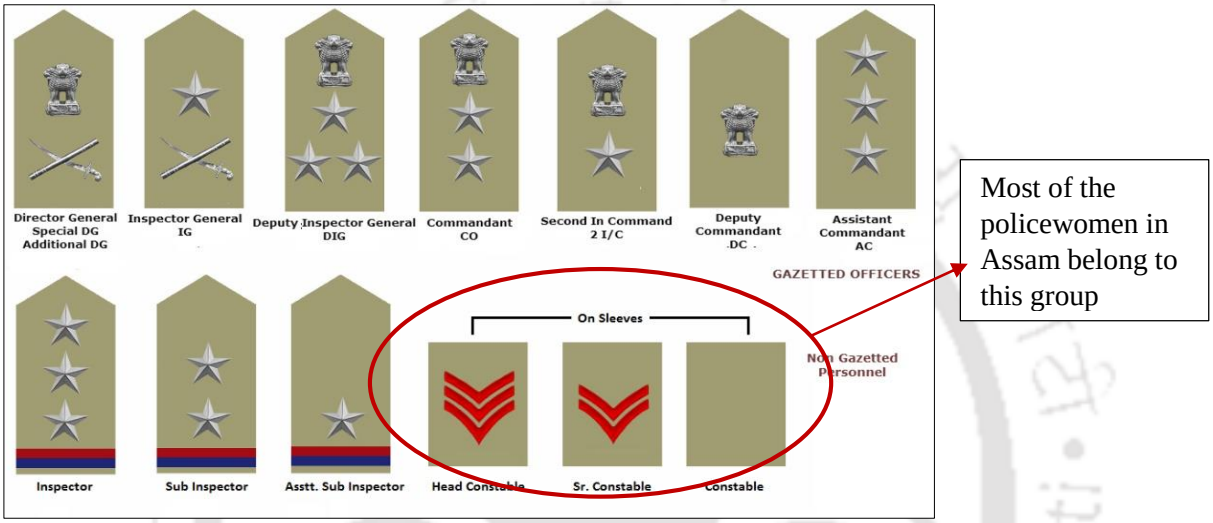


Figure.4. Rank Structure in Indian Police Forces and Assam women representation *(Source:https://capfofficer.wordpress.com/2015/02/24/rank-structure-in-central-armed-police-forces/).*

The rank hierarchy is considered as follows (Figure.4.):

(A) Officer cadre (through UPSC / APSC)

1. Director General of Police (DGP)
2. Additional Director General of Police (Addl. DGP)
3. Inspector General of Police (IGP)
4. Deputy Inspector General of Police (DIG)
5. Senior Superintendent of Police (SSP)
6. Superintendent of Police (SP)
7. Additional Superintendent of Police (Addl SP)
8. Assistant Superintendent of Police (ASP) / Deputy Superintendent of Police (DSP)

(B) Sub Officer Cadre

1. Inspector
2. Sub- Inspector (SI)

3. Assistant Sub-Inspector (ASI)
4. Head Constable
5. Constable

Mostly women police personnel are only to execute definite tasks which consist of escorting female prisoners, duties related to cases of violence against women and children, aiding policemen in any enquiries, investigations, interrogation and execution of warrant especially in any problem regarding women usually, watching duty of female accused and any miscellaneous duty conferring to the ability, traffic police (Bhanupriya, 2015).

1.2.4. Policewomen in Service – the Women's Perspectives

In India, police department has conventionally been male dominated (Rizvi, 2015). Nonetheless, in cohort with a changing socio-cultural environment and an upsurge in educational opportunities, women have gradually started identifying their inherent capability and strength. Nowadays contingent numbers of women are joining the police service. Figure.5. shows the percentage of policewomen across different states of India in decreasing order from Chandigarh to Assam. One such example is the police stations of Assam with the lowest rank i.e., only 0.93 percent of women police personnel joining the police force. However, in the prevailing ancestral and communal setup, policewomen are taxed and find it difficult to poise their work and life roles. This is what Rizvi (2015) investigated the eminence of policewomen as a marginalized group in the Indian Police Service and the problems they face due to their gender.

Womanness confers a woman upon the responsibility both at home and workplace. This process also changes the way in which she is purported in society and at her workplace. It can oblige her to take more leaves than the manageable limit, and job security could also be at risk. Significant social and personal adjustments are essential to cope with all such circumstances. A working mother, especially the one who has the good opulence to be able to poise her home and work, enjoys the stimulation that a job or career provides. She develops the ability of hovering a beneficial member of society and at the same time gains financial independence. Along with motherhood and womanness, work adds up the completeness of being a woman (Jayita and Murali, 2009).

In society, womanness continues to be adapted from an absolutely male viewpoint. This seems to be especially true of societies in third world countries, like India. Adjectives used to delineate

a woman may diverge from feminine to tender, motherly, etc. A woman is all this and more. As a working mother, she is sovereign and empowered, especially if she is from a low socio-economic background and that is the essence of her womanness. Financial independence stretches a sagacity of empowerment, and the additional income that the family gets, improves the family's standard of living and these together constitute a very vital elevation for families with low socioeconomic background. The proficient desires of the modern working woman are to linger ascend, as soon as she becomes a mother her priorities often change. Stereotypes rule and strong principles persevere about the undesirable possessions of maternal employment on women, their marriages, and their children, despite methodical evidence to the contrary.

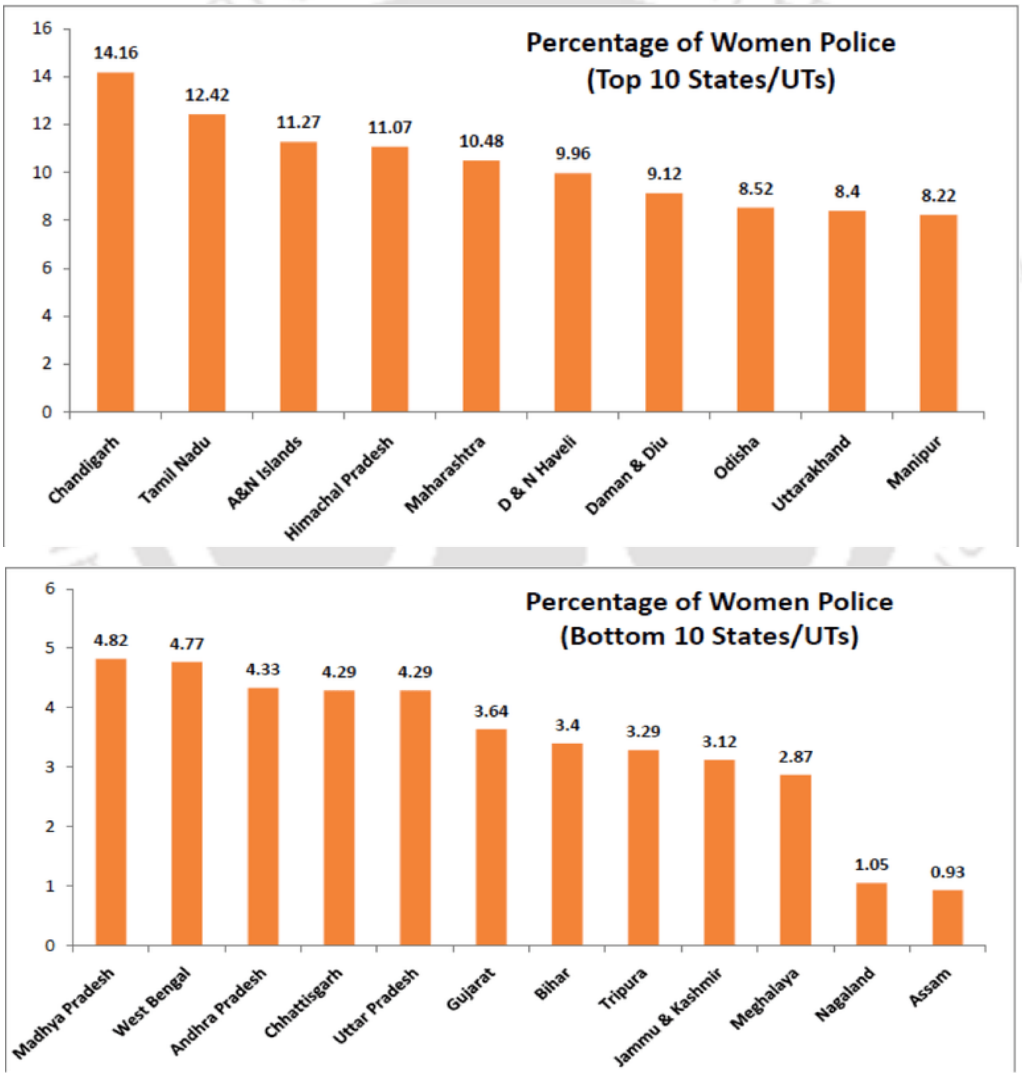


Figure.5. Percentage of policewomen across different states of India and it says that Assam representation is not encouraging

(Source: https://factly.in/women-in-the-police-force-numbers-beyond/)

As stated by Jayita and Murali (2009) the argument that working women have little time to spare for their family and they do not take into account the hours of housework and domestic errands of a full-time housewife. Working women also put aside quality time to spend with their family and can contribute to a more cheerful and encouraging family atmosphere. By efficient time management, a working women is fairly able to distribute time for her various roles as well as escalate her own worth and importance. Some extents of personal yet substantial adjustments are necessary at the individual level and at the workplace, which could help the mother to fulfil the dual responsibilities of career and motherhood. The working women perhaps symbolizes the modern womanness. The modern work environment needs to contemplate the special needs of this working population, changing its alignment from male dominance to gender neutrality and parenting friendly behaviour.

The menopause is inevitable and it affects virtually every woman irrespective of working or not with their corresponding age. Hence Griffith et al. (2013) have recommended means to improve the experience of the women police personnel as they get older, and especially as they go through the menopause. Four major categories of concern, as depicted by them are: (1) rising awareness of ageing and health issues in general and the menopause in particular, among managers and colleagues; (2) increasing access to informal and formal sources of supports;(3) improving aspect of physical working environment; and (4) allowing more flexibility in jobs roles and working arrangement, for their better living.

During pregnancy, the policewomen must be aware of an array of possible risk factors, including chemical hazards, firearms and other issues. Social pressures that accompany being a pregnant policewoman in a male-dominated occupation comprise continued pressures to be a good mother and employee at the same time as the child grows. Aside from all these discrimination and lawsuits, there are some legitimate health issues surrounding pregnancy for a policewoman, including health-related issues involving stress, firearms, and toxic chemical exposure, (noise, lead, and toxic-substance exposure from weapon cleaning). Hence the problems surrounding a pregnancy aren't discriminatory; a policy needs to be put in place. For issues concerning stress, culture, or firearms and chemical exposures, women need to speak up, because what affects a pregnant woman ultimately affects everyone (Connelly 2011). Police organizations often have to facade undefined perilous circumstances. Likewise, policewomen are exposed to treacherous situations; which does never meet the requirements of “protection of maternity”. The policewomen should be given differential treatment in this

regard as a symbolic of support towards their importance in the police force (Chen & Lin, 2013).

In America (1998), women accounted for 46.2 % of the total workforce – a percentage that was expected to increase over time. With such a massive figure of employees who may become pregnant, it was essential to apprehend how pregnancy can impact workplace safety. The increased risk of pre-term delivery among women whose jobs encompass an amalgamation of stressful factors, such as standing for long durations, working long hours and repetitive lifting etc. Consequently, Tapp (2000) examined some ergonomic stressors in the workplace which might distress the pregnant worker; and outlined pre-emptive steps the safety practitioner could adapt to mineralized all those hazards. He concluded that, the pregnant woman needs superfluous attention with respect to potential ergonomic hazards that were either created or exacerbated by pregnancy. Thus, when a pregnancy is first reported, the safety professional must work with the office nurse / physician, employee and her physician to assess these hazards. Appropriate accommodations can avert injuries, enrich the employee's comfort, and help her better handle the stress of work pooled with the physical changes related to pregnancy.

In 2000, women justified for 10.6% of local law enforcement officers and 14.4% of federal law enforcement officers. These records are likely to upsurge in the next few years. New issues that are relevant to female officers have been raised, such as adjusting the working conditions of pregnant women. Every employer must make the workplace as safe as possible for all employees. Pregnant employees incline to be more susceptible to chemical and physical hazards and deserve superior deliberation to minimize risks to the foetus. Law enforcement agencies should implement policies to ensure the best possible outcome of the pregnancy and to decrease the woman's professional risks. Occupational chemical hazards faced by pregnant workers include exposure to heavy metals (lead, mercury), organic solvents (acetone, benzene, formaldehyde, halogenated hydrocarbons, styrene, toluene, trichloroethylene, xylene), and pesticides. Physical hazards include trauma, radiation, and noise. Additionally, pregnancy hazards that are specific to the law enforcement profession include firearms training and an increased likelihood of trauma. Thus Law enforcement agencies must ensure the best working conditions for all employees, including pregnant officers. However, he also reveals that they must have a good knowledge of possible medical problems and work-related hazards which help agencies design appropriate policies to inform and protect the officers and their families, while also serving the public and complying with current laws (Czarneki, 2003).

The Police Federation of England and Wales (Bamboo and Lin, 2013) has put forth a booklet which assists a pregnant policewoman about their pregnancy, maternity leave and on their return to work. It provided all relevant general and specific information for policewomen about the baby's development, health care needs and their rights as a woman working in police force. It also reported that, the police organisation is supported to provide the policewomen with precise information about their pay and other benefits they should enjoy during their maternity leave. The organisation is also responsible for the safety, health and welfare of the policewomen including their child; and it must have gone through a formal risk assessment process and taken all known relevant medical advice into account. Some women may have no problems and wish to continue working for as long as possible but others may have had earlier problems or be unwell during their pregnancy. Each case should be treated individually and sympathetically through the risk assessment process for leaves and better working conditions.

Kruger (2007) has examined the required qualifications and essential functions of the job of police and discussed some of the policies that police agencies have imposed on pregnant policewomen, including a review of discrimination cases involved in law enforcement. He also seeks to encourage police agencies to move beyond the minimum protections offered by the Pregnancy Discrimination Act and the Family and Medical Leave Act in order to preserve the valuable diversity of their workforce.

Calloway (1995) revealed that failing to accommodate pregnancy in the workplace exposes 17 – 20 % of all pregnant women each year to health hazards including back injuries, muscle fatigue, falls, torn ligaments, strained muscles, swollen ankles, varicose veins, nausea, toxins and foreign substances. Accommodating pregnancy in the workplace deems to be the approach of choice towards improving the health of pregnant women and their progeny and improving the employment opportunities of single pregnant women as conceived by the author. The Pregnancy Discrimination Act together with the Americans with Disabilities Act should be interpreted to require employers to accommodate pregnancy in the workplace. As a result, workplace rules that prevent accommodating pregnancy can be shown to have a disparate impact on women.

All kinds of working moms have successfully continued child caring after returning to work from teachers and administrative staff to waitresses, sales professionals, and even celebrities where childcare in workplace requires private space, preferably a room. Law offers protections for many working moms so that they can continue to childcare even after they return to work.

Thus the employer must provide a clean, private place, other than a bathroom, for childcare. Reasonable break time (usually unpaid) for them to each time they have the need for childcare at work. (Health Reform, the U.S. government passed the Reasonable Break Time for Nursing Mothers amendment to the Fair Labour Standards Act in, 2010.)

Would-be-mothers, new and child-caring mothers have pretty well-defined legal and constitutional rights in the workplace. Health and Safety Issues for Pregnant Women (Slater and Gordon 2012) in the workplace have scrutinised and emphasized on some of this special privilege and the considerable responsibilities it places on the organisation. The assessment should consider if there were any potential risk to pregnant women at the workplace, new mothers (those returning to work after / upto six months following the birth) or women who need childcare. Officers must be made fully aware of any risks identified and the measures proposed to reduce, remove or control them. The assessment must specifically have examined the workstation and other physical aspects of the workplace. Working hours and workload should also be taken into account. The working conditions could include:

- Mental and physical fatigue
- Hour and shift of work
- Handling of heavy loads
- Movements and postures
- Shock and vibration
- Travelling requirements
- Noise
- Extremes of temperature (hot or cold).

They also mentioned that the organisation should also provide a rest place at work if she is pregnant or child caring. It was also recommended that a private, clean and safe place with fridge facilities is made available if they wish to preserve milk (although this was not a legal requirement).

Support for breastfeeding (childcare) in the workplace includes several types of employee benefits and services, like documented corporate policies to support breastfeeding women; teaching employees about breastfeeding; providing designated private space for breastfeeding; allowing flexible schedules for this purpose during work etc. (The CDC Guide to Breastfeeding Interventions, 2005; Marinelli, 2013; World Health Organization, 2009). Employers who

ensure that, these components are in place, deem eligible to receive 'mother-friendly workplace' designation from the Texas Department of Health. Some major components of the above are as follows:

- Flexible work schedules to provide time for milk expression.
- Access to a private location for childcare.
- Access to a nearby clean and safe water source and sink for washing hands.
- Access to hygienic storage options for the mother to store breast-milk.

Dumas et al. (2009) have reported major problems of pregnant women by (a) comparing posture and muscle activity in the back and upper extremity of women in late pregnancy and non-pregnant controls and (b) evaluating the effect of a concave 'desk board' on the back and upper extremity of women in late pregnancy. Their result showed that pregnant women sat with a more upright posture than non-pregnant controls but the posture of their right arm was not different though the activity of the anterior deltoid muscle was higher. The pregnant women had also reported more discomfort in the lower back and pelvis area. The desk attachment board increased muscle activity in the right trapezius and extensor digitorum, and decreased muscle activity in some back muscles. The desk attachment board may be a useful tool in reducing discomfort in the low back during computer work, but may have adverse effects on the upper extremities.

1.2.5. Handling of Uniforms, Equipment and Fittings in The Police Station: A Part of Duty Rosters

In law enforcement, ergonomics and well-being concerns are approached with three precedence that are vital for their occupation, and sometimes, reciprocal as follows – office survival, public safety and avoidance of litigation. The equipment used by law enforcement to persist these priorities has to be effective, safe, and reliable. Once equipment is selected and issued, it has to be assessed constantly for its reliability, efficacy, risks for acute or chronic injuries, and associated risk for litigation. Suitable equipment and safety procedures should be used to thwart training injuries.

Czarnecki and Janowitz (2003) have studied on Ergonomics and Safety in Law Enforcement and found that the highest risk for injury to anticipatory teams was found during training some

of them are discussed below. In developed countries like in India adoption of similar approach may be looked into in our context and specific to women requirement.

1.2.5.1. Live Firearms Training

The compulsory defensive equipment that is worn by shooters includes eye protection, hearing protection, and appropriate clothing. The Occupational Safety and Health Administration (OSHA) require appropriate eye or face protection whenever eye or face is exposed to hazards from flying particles. Typically, shooters wear wrap-around eyeglasses (Figure.6.) Goggles are also acceptable. Regular eyeglasses or sunglasses should be fitted with side shields, as OSHA requires side protection. Some wraparound glasses fit over prescription eyeglasses. This equipment's will reduce the injury while firing, shooting, noise and other environmental injuries and diseases.

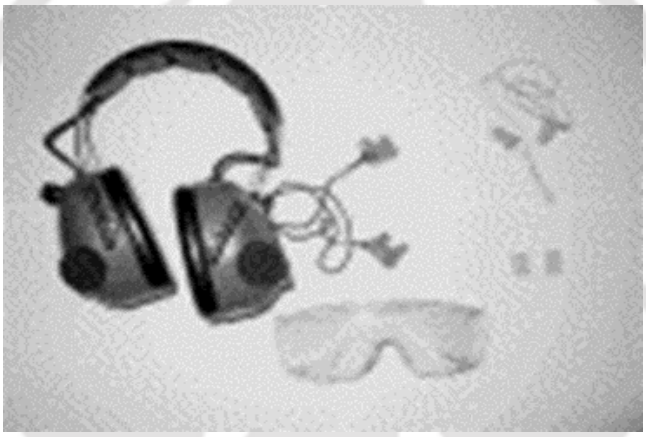


Figure. 6. Accessories for personnel protection during firearms training of police force (Czarnecki and Janowitz 2003)

1.2.5.2. Accidental Shootings and Accessories design

The design of firearms inclines to be universal, but modifications are sometimes necessary for specific groups of users. Law enforcement organizations use handguns and long guns (shotguns, carbines, rifles, submachine guns). Female and short statured personnel may need different handguns with smaller grips and shorter trigger reach. Grip-strengthening exercises seem to help the shooting abilities of female and short statured personnel. The stocks of most shotguns and rifles are too long for ease of handling by police personnel; and need to be shortened, even for average-sized men as recommended by the author.

Police force has been using impact armaments for times. Present batons are lighter, more effective, and more practical than earlier versions. Dimensions characteristically range from 16 to 31 inches when expanded and from 6 to 13 inches when collapsed, depending on the model. Batons are made of polycarbonate, resin composites, wood, plastic, or steel. The Hindi Baton Cap is a half-sphere that can be added to the grip extremity of the baton. The cap helps the officer to retain and control the baton and makes some striking techniques more effective (Figure. 7).

Figure.7. Overview of nonlethal weapons from top to bottom: telescopic side-handle baton, pepper spray, telescopic Auto lock baton with Baton Cap, USA (Czarnecki and Janowitz 2003)

Existing body armour is lighter, comfortable, and more flexible than ever. It is made of synthetic fibres by Kevlar (DuPont Inc., Wilmington, DE), Spectra (Honeywell Inc., Morristown, NJ), or Zyloflex (Toyobo Co. Ltd., Osaka, Japan). More than 2500 officers have been saved from solemn injury or death by ballistic vests. Ballistic vests can be upgraded by fitting a trauma plate (usually 8x5 inches) on the chest. Trauma plates can be soft and made of the same material as the ballistic vest, or rigid and made of ceramic or metal. Ballistic vests have been known to fail during tests. It is endorsed that police departments demeanour their own tests on new vests and on vests that arbitrarily are taken from officers in the arena. Indecorous storage (creating folds), high temperature, and corrosive chemicals could diminish ballistic competencies. The precise longevity of ballistic vests is grossly variable across manufacturers, but some manufacturers recommend changing vests every 5 years.

The enduring equipment of police officers comprises uniform, headgear, boots, or shoes, duty belt, belt accessories, and walkie talkie. Duty belt equipment typically includes handgun, handcuffs, flashlight, latex gloves, baton, radio, and pepper spray canister. Holsters encompass one of several retaining devices to avert criminals from taking the gun from the officer.

Between 1992 and 2001, 594 officers were slain with firearms, and 46 (7.7%) were killed with their own weapon. In the 1970s and early 1980s, about 20% to 25% of officers who were slain with firearms were killed with their own weapons.

Figure. 8. Overview of a ballistic vests: Soft ballistic vests (or body armour) have been accessible to law, USA (left) and India (right) (Czarnecki and Janowitz 2003)

Better-designed holsters and firearm retention training have helped to diminution the number of officers who were killed with their own weapons (Figure. 8). Some modern rigid plastic holsters may not allow the drawing of the firearm from unusual body positions (e.g., while on the ground). New holsters should be tested to make sure that officers can draw from any position, including with the non-dominant hand. Holsters designed for men may not fit female officers because of difference in hip size. Duty belts can be weighty and uncomfortable when copiously loaded; Figure 9 (a), (b). Alternatives to duty belts include suspenders and tactical vests. These alternatives allocate the weight of the equipment over the shoulders and the chest rather than just on the waist. Officers should evade placing hard objects (typically handcuffs) on the lumbar spine. In case of a fall, the spine could be injured sternly by the handcuffs or alike objects. They also could create back pain from constant pressure on the lower back while sitting in a car. It is recommended that a soft pouch (e.g., containing latex gloves) be placed over the lumbar spine. Specific to look into designing women friendly accessories may be looked into.

Duty belt discomfort has been worsening in recent years for several reasons, including the upsurge in time officers spend in vehicles and the heavier gear carried on the duty belt. The adaptation from revolvers to semiautomatic weapons and the included mass of the spare magazines on the belt has added 3 to 4 pounds in many dominions. Additional carried stuffs include radios and extra handcuffs in some jurisdictions. There has been an inclination toward designing fewer supple duty belt holster systems to increase an officer's weapon withholding in

the occurrence of physical encounter with a suspect. The more rigid the duty belt holster system is, the more critical are its shape and location in obtaining a proper fit for an individual

(a) ***(b)***

Figure.9. Overview **(a)** Duty belt for tactical officer. Thigh holster and thigh magazine pouch are shown **(b)** Thigh holster for tactical officer (USA) (Czarnecki and Janowitz 2003)

Discomfort with essential equipment like the duty belt, is a communal complaint and a substantial health and safety issue for police personnel in the uniform. Pain in the low back, hip and pelvis can be caused by pressure exerted by the edges of the duty belt, holster shank and other equipment attached to the belt. This equipment is a necessary part of a job and must be carried on his or her body while working. Duty belt assembly can include a handgun, handcuff; flashlight, latex gloves, baton, walkie talkie etc. and can weigh up to 20 pound when fully loaded (Figure.10.).

Figure.10. Overview of a duty belt India (left) and USA (right) (Czarnecki and Janowitz 2003)

In India duty belt are typically 2.25 inches wide and made of leather. The rectangular brass buckle can be 2 inches wide by nearly 3 inches high and places uncomfortable pressure on the pelvis and abdomen when driving and/or sitting for prolonged periods of time (Figure.10.). Discomfort felt from duty belts gets worse because of the increased time spent in vehicle and

heavier gear carried on the belt (Espinoza, 2010). Espinoza has also recommended that the police organisation should consider different options to reduce duty belt discomfort. Some options to be considered include the following:

- Alternative for duty belt
    - Suspender
    - Tactical Vest or harness
- Loading the duty belt
    - Avoid placing hard object (handcuff) on the lumbar spine
    - Place a soft pouch over the lumbar spine on the duty belt
    - Flashlight should be compact, light and powerful.
- Ergonomics duty belt.
- Plastic buckle are easier to adjust to the officer's natural curve and metal buckle are far more comfortable and fit better when sitting.
- Patrol vehicle seat comfort.
- Adjustable car seat.
- Change posture often.
- Take break

Police duty belts, and the weight and shape of the assembly carried on them, not only cause discomfort and fatigue to the officers wearing them; but over the years of the officer's career, are believed to cause chronic physical problems for some officers. It is believed to result in serious back, leg, and hip and nerve ailments (many of the researchers reported this, as discussed above). Due to the conservative nature of the U.S. police community, and the demand that officers present a traditional and sharp appearance in uniform, the solution to the problems mentioned just above deem most likely to be accepted by the greater number of police agencies. These leads to development of a concealable duty belt suspender system, which is worn underneath the officer's uniform shirt. The suspenders are attached with keepers to the duty belt through small openings sewn into the officer's uniform shirt for this purpose. After considering different conceptual approaches to the load-bearing problem, thereafter creating and analysing prototypes of several of these concepts, Equipment, O.S. (2010) developed two versions of a "concealed" duty belt suspender system. After testing the prototype, they found that concealable duty belt suspenders of the prototype design appear at this point to be a viable

concept that can offer a considerable improvement in comfort to the U.S. police officers at large, who wear equipment-laden duty belts daily throughout their careers.

Figure. 11. Example of Indian policewomen uniform and accessories.

(*source:https://www.google.com/search?hl=enin&q=indian+women+police+officers&tbm=isch&tbs=simg:caqslwej3uecjomb4uuaiwelekju2aqabagvcammcxcwjkcigmikyagdeij)*

In addition, such suspenders may possibly reduce the incidence and/or severity of physical ailments reportedly associated with the wearing of duty belts. While a long-term, scientific study would likely be needed in order to reach a definitive medical supposition (supportive of occupational health, safety and ultimately well-being) in this regard. Feedback from the limited field trials conducted so far indicates that concealable duty belt suspenders can reduce their pain, thus providing many officers with a minimum worth who suffer from such ailments, discomfort, or other symptoms. A significant portion of the duty belt's weight and pressure gets relieved off their hips and waist. Further research is needed to make the prototype suspender system acceptable to a larger number of female officers.

Police uniforms can be made of cotton, synthetic fabrics, wool, and blends. The material is preferred conferring to the weather and the assignment. Cotton uniforms are preferred in a warm environment. Synthetic fibres and blends are more durable than are pure natural fibres. Flame-resistant Nomex uniforms are useful for tactical teams, aviation units, and other specialized assignments. An example of Indian policewomen uniform with vest, boots,

accessories is shown in Figure.11. A holster that holds the armament with the cask in a vertical alignment is most likely to create pressure on the ribs or body armour at the grasp and on the seat of a vehicle at the barrel end. In general, the most-preferred holsters had more cant (Figure.12). Swivel holsters, in which the barrel position can be altered so that it is more horizontal (i.e., in line with the thigh) when seated, offer a form of adjustable cant. The authors (Espinoza, 2010 and Equipment, O.S., 2010) conducted a methodical assessment of the interaction of the duty belt and holster designs with seat cushions that could be added to police cars. Czarnecki and Janowitz (2003) studied that two thirds of the participants requested supplementary back or seat cushions for use in their cars. The most frequently requested items were:

- A seat cushion with upholstered memory foam and a rubber layer underneath to decrease the tendency to slide as the officer enters or exits the vehicle
- A contoured, upholstered lumbar cushion with a plastic insert to maintain its shape and straps to hold it in place around the backrest
- A combination back and seat cushion with hinged back and seat sections. The backrest portion was shaped to the preference of the user and supplemented by an optional upholstered lumbar pad.

Figure.12. Overview of holsters design for carrying guns **(**Czarnecki and Janowitz 2003)

The limitations in police vehicle and equipment design that subsidize to on-the-job injuries, and culminates in a set of recommendations for addressing those apprehensions. While police vehicles are now being used as mobile workstations comprehensive with computers and other new equipment, little has been done to address the ergonomic and safety concerns arising from such changes. Additionally, as the police personnel are inducted more, representing a greater population; therefore, differences related to sex, age, and body size become essential to be taken into consideration while designing police vehicle interiors and belt assemblies. Embarking upon these issues, vehicles and gear can be improved to reduce the rate of equipment-related musculoskeletal injury (MSI) among police officers. Hence Hovbrender and

Raschke (2009) proposed the design for a “dream car.” They noted that items related to personal comfort were ranked significantly lower than ideas aimed at enhancing safety and efficiency. While the research focused on a relatively small group of participants from a single jurisdiction, it was clear that the concerns articulated by the police officers and recruits can be generalized to other regions and policing organizations.

Police organisations report a high prevalence of musculoskeletal problems to the lower back, associated with prolonged driving; and further enquiry is needed to lessening injury risk. A simulated driving study (Holmes et al. 2012) investigated seat and duty belt configuration on biomechanical measures and discomfort. Seat design had the utmost impact, regardless of gender and males benefited more from a reduced belt arrangement (Figure.13). They evaluated the effects of driver seat and duty belt design on posture, pressure and discomfort. Lumbar postures, driver-seat and driver-duty belt pressures and apparent discomfort were dignified. Gender seat interfaces were initiated for pelvic and lumbar postures, since females had more lumbar flexion than males. They also suggested that, some modifications to a police duty belt would provide potential relief from usual musculoskeletal problems associated with prolonged driving. While appraising design adaptations for seat and duty belt, seat design has greater possibility to impact police personnel, predominantly due to enhanced posture and reduced pressure. Their findings also demonstrate that the proposed ergonomic design implementation leads to lessened discomfort by reducing risk of musculoskeletal problems for police personnel.

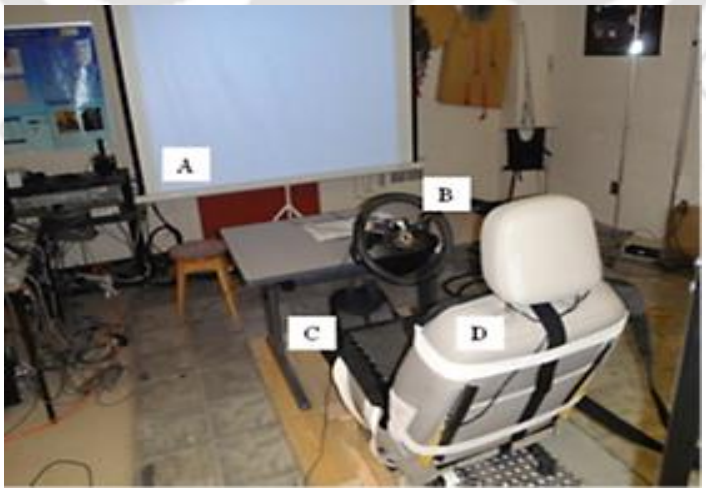


Figure.13. Overview of seat Design for police van (A) Viewing screen (B) Steering wheel (C) Gas and brake pedal assembly (D) Driver Seat (Holmes et al. 2012)

1.2.6. Workplace Amenities: A Possible Stressor for Policewomen

Gradually women are getting involved in male dominated areas, attained dignity; and requires specific women consideration. Thus it can be notified that this group of workforce are more susceptible to health hazards. Along with the above, there are also some fundamental needs for enhancing workplace amenities and facilities for women in the police force to look into (The Hindu Correspondent, 2012). Lack of basic amenities like restroom, crèches and toilets etc. for women in police stations is a major problem for women police personnel in the city. The government is inducting more women into police as a component of its equal opportunity employment empowering initiative as shown in Figure.14. A survey steered among those in service by The Indian Express Correspondent (Deep, 2016) found that, they still face the lack of basic amenities like toilets, uncomfortable duty gear and want of privacy etc., as reported therein.

Figure.14. This picture depicts that government is inducting more women into police force
(sources: https://www.thebetterindia.com/25724/10-amazing-facts-about-sanjukta-parashar-brave-ips-officer-who-is-a-nightmare-for-militants-in-assam/ http://www.indiatvnews.com/news/india/bihar-sps-asked-to-ensure-toilets-for-women-police-personnel-45148.html)

Desai (2016) mentioned that, in the 7th Nation conference of women police conference, for the first time, women personnel across ranks and forces raised for gender-friendly equipment,

ergonomically designed, and urged for design of firearms and uniforms compatible with the body dimensions of women, in addition to construction of toilets, hostels and gender-friendly personnel policies. Additional endorsements were on improving the infrastructure including mobile toilets, sanitary pad disposers and incinerators, conversion of barracks to hostels with private space and rooms for women, health and safety, family and environment. Lack of separate female toilet facilities while on police station, mobile police booth or patrolling duties compel policewomen to drink less water so as to avoid untoward situations. A majority of women suffer from dehydration leading to urinary tract infection (because of no access to restrooms for a prolonged duration). There are concerns of periods (and disposal of sanitary pads) also, which make women police personnel suffer a lot.

Policing is one of the major stressed occupations because of the disproportionate working hours, lack of holidays, hierarchical pressure and, dealing with antisocial elements. For law enforcement, there is an evidence that workplace complications have considerable effect on stress. Rizvi (2015) specified that the following welfare measures are crucial for an amiable workplace –

1. Child care leave as per government norms should be followed by all State Police Organizations.
2. Crèche should be provided wherever women are posted in large numbers.
3. Training during pregnancy for basic courses – Pregnant trainees may be sent home, training to re-commence after 1 year of delivery and this should not affect their seniority in the batch.
4. The duties that can be assigned to pregnant women, and, the duties that should not be assigned to pregnant women, should be clearly specified by the police organization.
5. Basic amenities to women such as separate toilets and rest rooms should be ensured at workplace.

The Ministry of Home Affairs in India told the states and Union Territories to construct toilets and rest rooms for women personnel on "priority" basis in the state action plan for 2014-15 as it is a long pending basic amenity (First post correspondent, 2014). It has also been informed by the committee that, in the existing police stations, outposts and barracks, a provision must be made for basic amenities for women police personnel including separate hand washing and shower facilities with suitable supply of water. Portable toilets should be provided if it is not

possible to afford access to permanent toilets for women, and the same should be mounted firmly, along with lockable doors, lighting and ventilation. Endowment of the conveniences must be ensured in every new police station, outpost or barracks proposed under the modernisation of police force, as said by the Ministry for better working condition and increasing the working capacity of the women police.

According to the report of the Indian Parliamentary Committee (2013-14), the inadequacy/non-availability of toilets and rest rooms and mobile toilets for the women police personnel was identified as a crucial concern; and effective counteractive measures to ensure provision of adequate number of separate toilets/ rest rooms/ mobile toilets for the policewomen was emphasized, which is still in the initial stage. Intruding into contemplation of the lack of residential accommodation which is seen as one of the major impediments faced by women in joining police force, the Committee desired the Government to put up an effective housing policy to boost the availability of residential accommodation too. The Committee also accepted the opinion that, owing to the fundamental nature of women, ethos and value system prevailing in the country, the women police personnel are often reluctant to share toilets with their male counterparts.

Subsequently the Committee in the year 2014-2015, again emphasized that the Government should give paramount importance to the implementation of the recommendations laid in 2013-14 like basic amenities for policewomen. The Committee noticed that although a wave of improvement was initiated by the Government, still lack of basic amenities/rest rooms/mobile toilets is a major problem for the policewomen in many states. The Committee, therefore, once again thrived the Government to work in tandem with the states to formulate an effective housing policy for the police personnel and explore the possibility of introducing separate housing pool for women police personnel.

During the 49th DGs/IGs Annual Conference on 29/11/2014, Hon'ble Prime Minister familiarized the conceptions of SMART Police. The first step concerning smart policing is to design & construct Smart Police Stations which can become the foundation towards Smart Policing. A Smart Police Station should be citizen friendly &hygienic. It should also meet the functioning& welfare prerequisites of the police personnel posted in the respective workplace. There should be some standard norms for construction of police station buildings. However, these norms can always to be exalted by the concerned states in terms of more rooms and adequate space etc. as per their region specific characteristics, availability of land and the funds.

The norms anticipated here are the basic requirements for police stations and may be taken as guidelines only by the Bureau of Police Research and Development (BPRD, 2015).

Civic sanitation services for women in the country are inconsequential in number and of inferior eminence. Women all over in the country, in urban and rural zones, are forced to urinate and evacuate in the open and as well women cops in India are no exception to this. According to a report by Times of India (2014), women police constables face this issue on everyday basis. The report states, that the constables are often arrayed for VIP security duty for a long period on the street. Out of the 15, 000 women in India on duty many agonise from dehydration and urinary infection because they evade drinking water due to lack of proper facilities (Times of India Correspondent, 2014). Woman constable articulated that, they often appeal nearby hotels, restaurants and houses to let them use the toilets of those premises. Some hotels refuse permission saying it will be an inconvenience to their guests. They have also stated some police officers act apathetically when women seek permission to use the toilet during their periods and indicated that they do not understand the womanness issues. As a result, they are unable to use washrooms for hours and this distresses their health severely.

In the past, women constables were inducted exclusively in desk jobs, like managing the wireless system etc. Or they would escort women suspects to court and stand guard during festivals and other public gatherings in the city. But they welcomed the challenge as traffic police also. The foremost challenge for women is the shortage of basic amenities, like toilets. As employing women in the traffic police is a relatively new phenomenon, police stations don't have proper (having privacy) toilets or changing rooms for women. And it is even worse in the field, and they use the bathroom that the watchmen in the building nearby do, which is very dirty (Shreya, 2012).

In several states across the country, basic amenities like restrooms and mobile toilets are still the most important concern for women police personnel. The Parliamentary Committee on Empowerment of Women has noted in its latest report on the 'working conditions of women in police force'. The Committee's report expressed "dismay" at the Union Home Ministry for not meeting the recommendations made in its earlier reports for improving the working conditions of women in the police force. It is has glowered upon the government for failing to ensure 33 % representation of women in the police force and not making provisions for residential accommodation for them as well as the basics needs. This interpretation had also haggard criticism from the Committee; which echoed that central grants under the scheme for

modernisation of State police should be allied with progress achieved by each State in increasing the number of women in the force (Ramachandran, 2016).

According to Rao (2015) one of the crucial preventive issues and a gross human rights violation is the lack of even basic facilities like toilets for women in the police stations. This problem is even worse for Women Traffic Police. Worse is the discernment of basic facilities for the IPS and state cadre officers. The new police headquarters building in Rajasthan has women's toilets only for the use of IPS cadre officers. Under the Modernization of State Police Force Scheme, the Government of India issued guidelines in February 2013, (BPRD, 2016) asking state governments to provide for toilets, crèches, and restrooms for women police personnel. Visibly, yet many things need to be done to bring down the organizational barricades and make women a fundamental part of police force through more advanced policy measures and their effective implementation and monitoring, including police reforms, thus surging the wellness in their workplace.

All the developing countries are entrancing an abrupt action to ensure that the country's female police officers have access to separate, safe, and lockable restroom facilities in police stations. The lack of safe changing rooms and toilets can jeopardise the safety of female police personnel. Providing appropriate amenities is precarious to preventing workplace harassment (in different forms) of female police personnel and generating a non-discriminatory working atmosphere that respects their concealment and self-esteem. Conversely since 2012, installation of basic facilities in police stations have not been implemented despite the promise of government funds to pay for them (Human Rights watch, 2013).

Lack of toilets, sexual harassment, topmost glitches faced by policewomen in India: Report. The CHRI (Gilmore: Commonwealth Human Rights Initiative 2015) report titled 'Rough Roads to Equality' (conducted in police departments in Kerala, Haryana, Meghalaya, Rajasthan and Jharkhand) stated that even in places where toilets were available, they were badly maintained. In the report, "Rough Roads to Equality: Women Police in South Asia," CHRI found that a persistent sight of policing as a job for men was a barrier to policewomen at every stage of their careers. It reported that authorities often fail to identify the contribution women can make to effective law enforcement. A shortage of female officers in India was cited by the report's authors as a major barrier to improving justice for female victims of gender-based violence. If women were part of the traffic department, it became more problematic for them, as public restrooms are not widely predominant. They also revealed that they didn't drink water

even when it was very hot, to get around the issue. While men also had to deal with the similar conditions, the outdoors was yet an option available to them (Srinivasan, 2015).

In India, the Government is cavorting an illimitable role in empowering the women and letting more women to join police organization with less hesitancy on the other hand, as per a review amid those serving is static and besieged with privation of basic amenities like toilets, uncomfortable duty gear, want of privacy and thirsty for long hours basically for women police. As stated by Pushkar (2016) Indian police organizations are in a subnormal condition since there is no venture in basic infrastructure and human resource in policing. Thus the police force continues to lack basic amenities and provision for executing their duties (Indian Samvad, 2017).

1.2.7. Policewomen at All Women Police Station (AWPS), Pan Bazar, Guwahati

With the emphasis on women's safety concerns in the state and demands from various quarters for boosted security for the fair sex, the state government has decided to accelerate its scheme to set up women's cells in all police stations of Assam including (Times of India Correspondent, 2013). Police women are customarily exploited in accomplishing specific jobs of dealing with women and children. According to CHRI report (Commonwealth Human Rights Initiative, 2015) the NPC (National Police Commission) has indicated that women police personnel have not been specified with an equal share in several areas of police job and endorsed that they be more energetically and sprightly involved in police investigations.

Government has anticipated giving 33 % reservation to women in police, probably to tackle specifically ½ of our population that is women. CM (Chief Minister) of Assam Tarun Gogoi on 6th National conference of women police held at Guwahati, 2014, have stated that there is a serious requirement for more induction of women in police force, they should be at least 50% of the force as ‘they are more sensitive and can provide the police force a human touch’. Initiation of more women in the police force would assistance to lessen crimes against women and children. Additional efficiency has to be persuaded by enhancing capacity building, attitudinal and behavioural changes to empower women in police force and to apprehend their full potential to meet the escalating faiths and desires of people,” it has also been added by the State Government that they are making efforts in improving the working conditions in police stations. Mounting role of police in safeguarding well-being of women and averting crimes

against them by some of themselves - Women Police. The IPS (S. Parasar) officers have also advocated the necessity for addition of women police into the mainstream to meet the fast changing times (6th National conference of women police held at Guwahati, 2014).

There is only one edge to counter to crimes against women established in Guwahati – the All Women Police Station Guwahati. Established as far back as 1993, the all women police station was recognised in the office and evidences of the Pan Bazar Police Station and was to appeal its all-women staff from among the women police in Assam.

The women police personnel at Police stations of Guwahati faces several issues that have been recognised as what women police go through comprises of work Stress, Work-family imbalance, occupational stress, lack of Job Satisfaction, sexual harassment and working conditions which embrace insufficient welfare measures, inadequate amenities, vague working hours and leaves rules etc. for motivation and increase the enactment and personal satisfaction of a respondents (Rizvi, 2015). It is remarkable to note that women-specific issues like menstruation and pregnancy were also deliberated hindrances in provocative atmospheres. Women personnel in lower ranks articulated the aspiration to be perceived as contributing more to challenging manoeuvres (North East Network; CHRI, 2016).

Both genders do identify policewomen's contributions to police organizations and believe the women and children teams as well as traffic teams are more appropriate for policewomen, because they are more thoughtful and caring than policemen naturally are and the communal folks can feel the high-quality of police services.

1.2.8. Stress of Policewomen in Assam

According to Mohanraj and Natesan (2015) police occupation is measured as one of the utmost stressful work than the other job and thus they have the superior menace of stress. They have also added that specifically women police personnel facades more stress related complications than their male counterpart as they cope both the family and also working in the police force as shown in Figure. 15.

Along with, stressors such a sexual harassment, gender sensitization etc. inadequate facilities are the repeated concern that are lack of separate toilets for women in the workplace. Most of the police station has no restroom and toilets are unhygienic and gravely maintained. In regards to these voluminous of police women suffers from Urinary Tract Infections for elongated

contaminated working conditions. Hence this becomes one of the solemn well-being concern for women which can be addressed through the desirable infrastructure and maintenance of hygiene in the police station (North East Network; CHRI, 2016).

Figure. 15. Policewomen are in wait in the field (public place) for further order; thus this situation is not motivating to most of the women to join police force. *(Source:http://www.afternoondc.in/special-report/unseen-life-of-mumbai police/article_136833).*

1.2.9. Ergonomics Application in Police Station Towards Improved Occupational Well-Being

In today's scenario women police personnel serving both Indian security and police force are giving their best to the nation but whenever it emanates to training, performing their duty and law enforcement, imprudently they had to step in the shoes of their male counterparts right from body safeguard equipment like bulletproof jackets, head covering to fire arms where all the equipment's are designed and made for men folks only (7th National conference on women police, 2016). Shweta in the year 2016 have reported that in the 7th National conference on women police it has been demanded for the first time by the women personnel that there should be user-friendly apparatus, firearms that are designed with the body essentials of women, ergonomically designed uniforms, toilets in the workplace, adequate accommodation and gender friendly private plans in order to upsurge efficiency of women employees.

Other facilities like improvements in the infrastructure such as toilets in the workplace, sanitary pad disposer, and separate rest room for women, well-being and security, barracks or hostel, private space, family and environment are also claimed in the conference. A facility of mobile toilets and drinking water conveniences in the outdoor duties in order to relieving themselves which causes dehydration and urinary tract infection. A mobile utility van might reduce such causes and overcome with the issues of menstruation and disposal of sanitary pads (Shweta, 2016). The pivotal aim of an ergonomist is to design the workplace, so that it prevents from hostile consequences related to women hood. Well- functioning working environment makes the task better adapted to the capabilities and limitations of the humans, less stressful, discomfort and impose fewer risks performance in the work place.

1.2.9.1. Infrastructure of the AWPS / CPS

The requirements for All Women Police Station (AWPS) and Common Police Station (CPS) may be look into with specific need and additional support for the women police personnel. The infrastructure of police station is not at all conducive for the females to work as stated by Shweta (2016). In the year 2012-2013, and again in 2014-2015, the Parliamentary Committee on Empowerment of Women took up the issue of women police to "review the working conditions of women police in India" found out and recommended that afford a robust impetus to improve the gender ratio within police organisations but also, prominently, point out the deviations in the organisational structure and to play an evocative role in policing.

Women police personnel have been entreating for better policies and amenities to discourse their complications in the service. The conferences (6th and 7th National conference of women Police, 2014 & 2016) have recurrently stressed the requirement for improved representation of women and suggested numerous procedures including 33% reservation, better facilities for women.

The Parliamentary Committee (2014 – 2015) viewed that according to the nature of women and character the women police personnel are habitually reluctant to share toilets with their male counterparts. Hence, the Committee sturdily endorses the government to look into the reasons for inadequacy/non-availability of basic amenities/ rest rooms and to take effective remedial measures to ensure the availability of sufficient number of separate toilets/ rest rooms/ mobile toilets, crèches and accommodations for women police personnel which is still in its primary stage. A well-designed working environment will increase the work performance and

implementation of ergonomic work place will limit the hazards and increase the job satisfaction of the women police personnel.

1.2.9.2. Requirements to Look into Police Station Facilities in Assam

Transversely, the lack of proper and often basic amenities and policies to billet women police and ensure they are able to accomplish their duties to the best of their aptitude was starkly ostensible. The essential requirement emerging are separate restrooms; privacy; toilet, place to sit; availability of drinking water; accommodation; maternity and childcare facilities; and the need for flexible or modular toilet facility and modular utility van are the some.

Separate restrooms: A separate restroom at each and every police station for women personnel is essential. Rooms should be separate from other parts of the workplace and it should be hygienic, safe and situated at a convenient place adjacent to other amenities, such as the lavatory.

Toilets: Appropriate toilets for women police personnel with adequate supply of water at police stations, outposts and barracks were very much crucial. If it is not conceivable to provide access to permanent toilets than portable toilets need to be provided. The portable toilets must be mounted firmly and be provided with lockable doors, lighting and ventilation.

Privacy: One of the issues that the women officials said required improvement was privacy as the "concept of personal space is different for male and females" (The Economic Times, 2016). Privacy is most important for women at police station, where females often come with complaints of domestic violence that are settled calmly. Man counterpart might be comfortable with locker room banters and with the basic amenities provided to them but women require greater privacy.

Place to sit: It has become imperative for the women police personnel to provide facilities in the workplace because standing for prolong hours allied with a number of potentially severe health outcomes such as lower back, cardiovascular problems, exhaustion, discomfort and during womanness issues such as menstruation, breastfeeding mothers and pregnancy related health outcomes (waters and Dick, 2015). Use of interventions of would lessen the health risks from prolonged standing.

Availability of drinking water: In each and every patrolling duty, availability of drinking water supply should be installed which would reduce the urinary tract infection (UTI) and dehydration.

Accommodation: Non-availability of accommodation is one of the contributing factors for low in-take of women in police force (Parliamentary report 2014-2015). Lack of barracks and age old quarters without repairing were some of the issues. The facilities for accommodation in place were in muddle.

Maternity and childcare facilities: Child care facilities are practically non-existent for women in police forces. But modernized police station is also considering the crèches in the police station. The parliamentary reports of 2012 - 2013 and 2014 - 2015have reported that a fund is available for this facility but it is still in its initial stage.

Need for flexible or modular toilet facility: Portable toilets need to be provided for if there is lack of permanent toilet facility in the police station as well as patrolling duty. These must be installed firmly and be provided with lockable doors, lighting and ventilation.

Modular utility van: Modular utility van basically will help the police personnel during the patrolling duty, traffic duty and any outdoor duty as it can move from one place to duty. A mini utility van with a conceptualized interior plan might increase the occupational well-being and increase the working condition of the women police personnel. The developmental approached would be good if it goes in tune to ergonomic and appropriate design intervention.

1.3. Scope of Ergonomic / Design Intervention

Achim (2014) has implemented an inclusive health and safety design standard in police organisations in order to manage properly some ergonomic stressors in police activity and proposed some of the ergonomics possible solutions. According to Fabrice and Ira (2003) ergonomics and safety issues in police force are methodologies with three primacies which are important and sometimes are oppositional such as public safety, officer survival, and avoidance of litigation. They have also added that the equipment used by them to be effective, safe, and reliable. Equipment's that are allotted are to assessed for its efficacy, reliability, risks for acute or chronic injuries, and associated risk for litigation. User friendly bullet proof jackets, sanitary pad dispensers ergonomically designed uniforms, construction of toilets, hostels and gender friendly personal policies are some of the issues that are to be look into to increase the working

capacity and occupational well-being of the women police personnel (Shweta, 2016; Cardoso et al. (2016) has studied to assess the perceived discomfort of patrol officers related to equipment and vehicle design and whether there were discomfort differences between day and night shifts and found out that there were no significant discomfort differences reported between the day and night shifts, perceived discomfort was identified for specific equipment, vehicle design and vehicle configuration, within each 12-h shift. Espinoza (2010) have mentioned that duty belt discomfort is a common complaint and a significant health and safety issue for uniformed police personnel and recommended that Police departments should consider different options to reduce duty belt discomfort such as Alternatives for the duty belt, Loading the duty belt, start with a better belt, Don't forget the buckle. He further added some measures effective in creating comfort while driving that is on Patrol vehicle seat comfort found a solution to change driving habits when on patrol and on the drive home such as adjust the car seat, change posture often, take breaks. There are no studies related to directly to ergonomics intervention and police organization. Hence it is therefore important to implement some of the ergonomics design intervention and knowledge regarding ergonomic risk factors and thus increase the work performance with a comfortable environment.

Some initial studies have been conducted in the police organization of Guwahati city of Assam addressing occupational stress/hazards related issues specific to womanness and a few remedial design attempts have been proposed to improve occupational wellness of women personnel (Bora et al. 2016; Bora et al. 2017)

1.4. Necessities for Ergonomic Evaluation

To scrutinize and evaluate the predominance of ergonomic issues, police station units are selected from Central Guwahati and were visited where meetings were conducted with the commissioner, police officer's, women police personnel. From the initial observation and discussion, it was found that women police personnel suffer due to lack of unavailability of facilities in the police station as well as modular facility while the women police are in patrolling duty. The lack of basic amenities in the workplace reduces the work performance of the women employees. To increase the working condition and occupational well-being of the women personnel it is becoming important to bring pleasure and comfort in the police station considering the specific issues relevant to womanness. Implementation of basic amenities through ergonomics intervention would help the woman police to offer a better workplace and enthusiasm to the job responsibilities. It will thus help policewomen to recognise their

prospective thereby empowering them against various kinds of on-job stress. Understanding the importance, ergonomic study was carried out in details on benefit of women police personnel in the workplace (in the police station and while on patrolling duty) of Assam.

1.5. Research Gap

In the light of the above literature and a ready source on policewomen job relevant information, it became evident that there is sufficient scope (and necessity as well) of a glimpse into the current scenario of police organisation – as far as on-job stress, workplace environment, basic amenities and occupational well-being of women police personnel (and officers also) is concerned. The areas approaching the efforts to improve the working condition, occupational wellness along with various stressors that effects a women police (in Indian context) are also meagre, despite the Government's proposal to embrace the police force with at least 30% of women. Accordingly, keeping in mind the possibilities and feasibilities of exploration and research within a stipulated timeframe, the following gaps were identified, which needs urgent attention with respect to Assam police, in particular, as it has started of its first of kind AWPS at Guwahati city (in the whole northeast region) from there as and whenever necessary arises required force supply is provided. The specific issues come to fore:

- A study requires on context of policewomen comprising job stress, musculoskeletal problems, and psychophysical well-being etc. particularly in Assam.
- Ergonomic design intervention with specific references to address womanness issues would reflect in occupational wellbeing for policewomen.

1.6. Scope of Work and Problem Statement

The review of existing literature helps us to identify the area where substantial work is required in order to ameliorate women police personnel (including officers, cadre and non-cadre) from the on-job stress, get rid them of the obstinate workplace environment and manage the issues like basic amenities, thus leading to hygiene, safety and convenience, thereby holistic occupational well-being. As shown in Figure.16. the police stations are mainly designed for males and their needs, 33% reservation to women where only 5.3% constitute policewomen because of lack of facilities and womanness issues. Therefore, to improve the working conditions of women in the police force basic amenities should be provided.

There is a crucial lack of systematic research approach enumerating occupational well-being and on-job / workplace stress of women in police organization with reference to womanness. Hence my dissertation research attempted to explore the areas where intervention would be needed, and how the situation described above could be improved with the help of ergonomic design interventions.

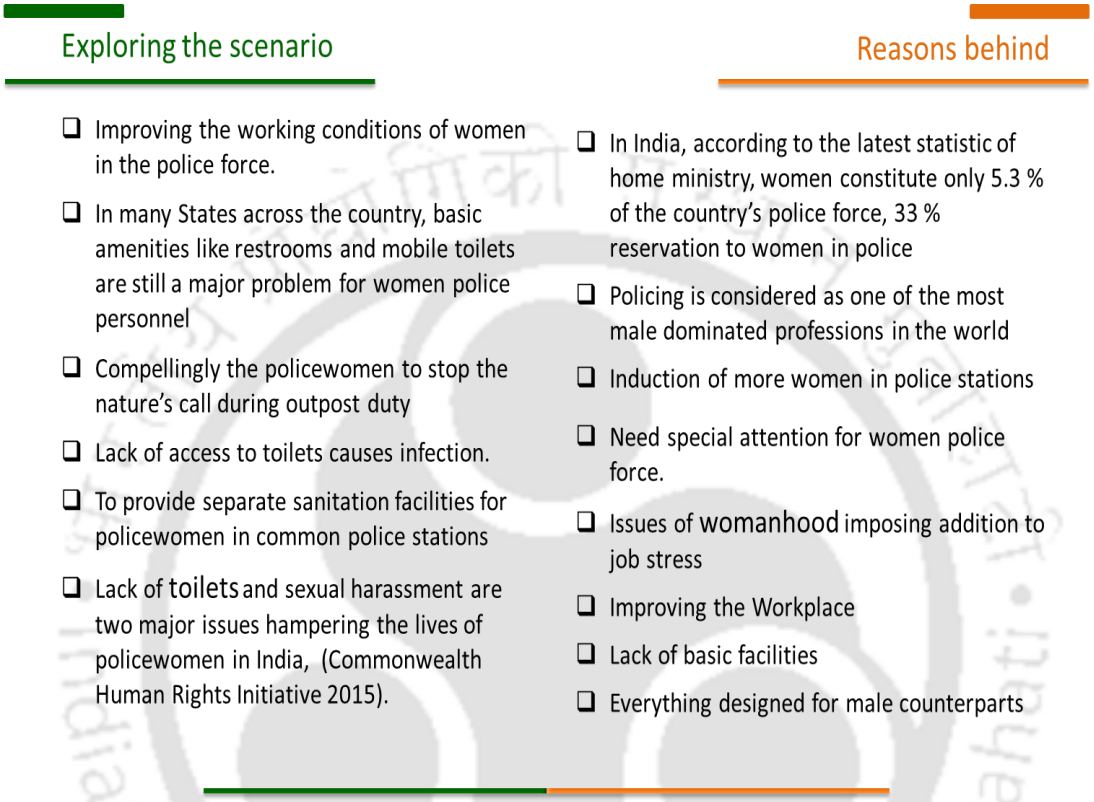


Figure.16. Key scenarios and explanation for current study

1.7. Research Question

With the above observation few research questions appear that framed the current thesis work were:

- What aspects of occupational stress factors, faced by the Assam Policewomen, affect the specific situation of womanness as a result of lack of basic amenities in their workplace?
- What kind of ergonomic design intervention would improve the overall workplace scenario?
- Could anyway the implementation of ergonomics design intervention improve the workplace with planned provision of basic amenities in the workplace (police station / mobile workstation)?

1.8. Motivation of Research in Women Police Force

Generally public (people) enter a profession for diverse motives. As far as joining the police organisation is concerned, exploration shows that the motivations might include opportunity to serve the nation – through serving the elderly, women children, and the really needy, apart from the job benefits and security. Women are not only joining the police service and taking up the challenges at their male counterparts; they are also participating into so-called / predominantly masculine jobs and operations. Therefore, it is required to appraise the enthusiasm, motivation and career cognizance of women in organisations, which were, until recently, the province of men folk. In India, the police job is one such job where women are embracing this service, in greater majority only since recent times. It is relevant to appreciate the motivation of the women to join a male-dominated profession, and their concordant involvements as well as experiences of being in the service with precise reference to womanness issues. These aspects of policewomen found the essence of motivation to pursue this research. Hence, there is a lot of scope for ergonomics intervention as shown in Figure. 17. Presently this study addresses only conveniences, basic amenities, womanness specific issues, and adequate privacy.

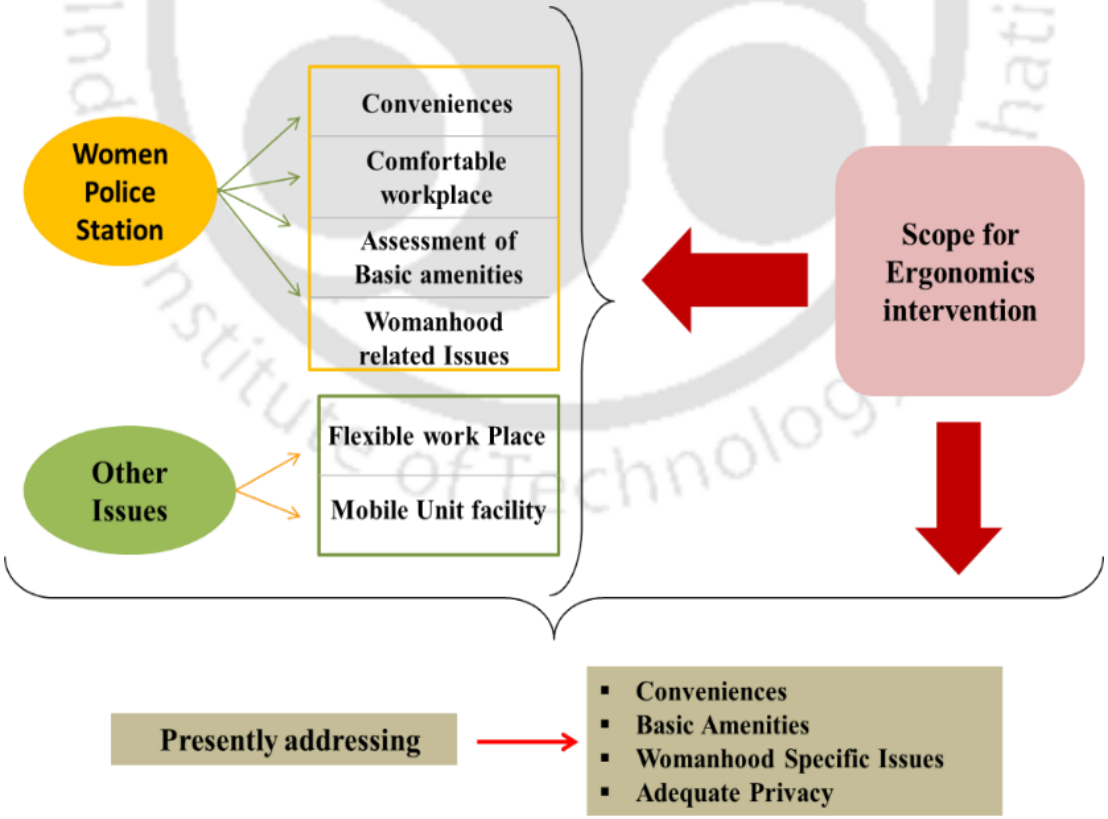


Figure.17. Scope and key issues addressed in current study

1.9. Justification of Research

Commonwealth Human Rights Initiative (2016) reported that, the Police Modernisation scheme has been in existence for more than a year. However, it is continued even today upgrading in flexibility and communication amenities accessible to the police, wherein, however the scheme did not prosper in giving a ubiquitous modern look to the police forces. Thus policewomen feel discordant being a part of the police organization. Lack of basic amenities, privacy, and ergonomic design intervention with specific reference to womanness are the major issues for the inhibition of female staff at the police force. This supports need the ergonomics study in the law enforcement (like the case of Assam Police for this research) specifically for women police personnel to increase the working condition, health hazard and occupational wellness in this male dominated job. Specifically, the study focusses on addressing the following issues:

- Lack of basic infrastructure like toilets, changing rooms in police stations, lack of adequate privacy like separate changing room, comfortable sitting area, crèche etc.
- Mobile toilet facility / mobile utility van (proposal) for policewomen in traffic and patrolling duties for a healthier condition.
- Implementing ergonomic design intervention guidelines / new innovations such as smart police station with all relevant facilities and an amiable workplace encouraging and facilitating the recommended induction of 30% in police force as per Ministry of Home Affairs (central and the state of Assam).

Making policies for human resource management, judicious utilisation and development, with special emphasis on occupational well-being by improvement of existing workplace for women in Police Service is the need-of-the-hour today, as was aptly felt by the parliamentary committees also (vide their reports discussed in the previous chapter). Ergonomic design intervention for improvement of working condition and productivity of women police personnel has not been conducted so far, nor reported anywhere so far. This study would therefore be advantageous in respect of planning and intervening for improvement of the workplace at the police stations, especially for policewomen.

1.10. Hypothesis

Figuring out the possibilities of ergonomic design interventions and their subsequent implementation at workplaces of CPS / AWPS / TSK (Common Police Station / All Women Police

Station / Tinsukia Police Station) would positively contribute to occupational well-being and relief to women relevant issues specific to policewomen of Assam.

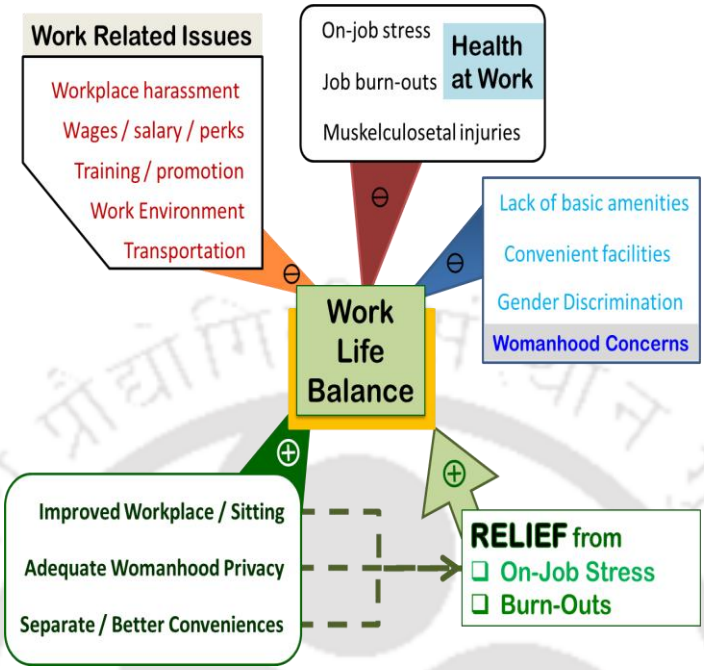


Figure.18. *Major factors that contributes the work life balance*

As shown in Figure.18, there are many issues related to occupational health which affects the policewomen performance at work. By providing basic amenities such as better sitting/privacy/separate conveniences it would provide relief from on-job stress and burn outs and will improve the work efficiency for policewomen.

1.11. Aim and Objectives

The aim of this research work was to identify, examine and express (recommend) the possibilities of ergonomic design interventions (and their implementation subsequently) at workplaces of CPS / AWPS / TSK with special reference to improvement of occupational well-being by relief of on-job stress and related womanness issues specific to policewomen.

1.12. Objectives

Objectives of the study are:

1) To understand the occupational stress factors and well-being issues experienced by Assam policewomen in their respective workplace with specific reference to convenience facilities that are provided to them while they are on duty.

2) To examine the possibilities of ergonomic design intervention for the existing workplace for policewomen, which could improve the overall workplace scenario.

3) To propose the ergonomic design interventions (preliminary recommendations) to address the major inconveniences faced in workplace with specific reference to womanness.

4) To assess the possible impact of implementation of the said interventions on the occupational stress factors and well-being issues.

1.13. Outcome

The present research was expected to come up with some understanding of occupational well-being and womanness issues of women police personnel (in Guwahati metropolitan city), and scope of enhanced occupational well-being with suitable design intervention, which was deemed to bring about relief of on-job stress and related issues specific to policewomen (and their womanness). The objective is described in the flowchart illustrating major investigations involved in this study as shown in Figure.19. *It could be reckoned that considering womanness issues in the male dominated job, allowing them all the essential facilities in their workplace, and thereby considering a stress-free work environment might reduce the workplace hazards.*

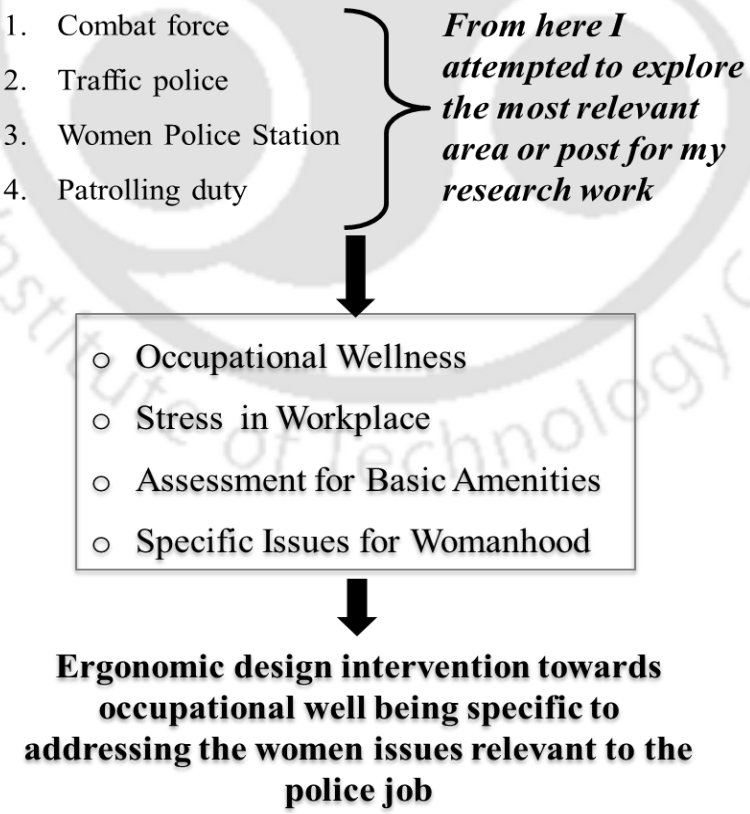


Figure.19. Flowchart illustrating major investigations involved in this study

1.14. Outline of the Thesis

The whole work has been parted into six phrases and the flow of the work is covered in the following chapters.

Chapter 1: Introduction: Women workforce in law enforcement, Assam

Chapter 1 introduces women participation in police job in India with specific to Assam. Stress is one of the major concerns need to be study considering woman relevant issues such as menstruation, pregnancy, breastfeeding mothers, motherhood affecting performance in this male dominated job. It leads to the possibilities of ergonomic appraisal in the working condition and wellness of the policewomen.

Chapter 2: Occupational wellbeing issues and assessment

The design path of this study was composed of three stages including the selection of workplace and assessment through questionnaire, direct observation and photography, and design intervention based on respondent's perception. An assessment was done based on the responses to the survey carried out at AWPS / CPS / TSK before implementing ergonomic design intervention only; while the responses from the same participants after implementation of proposed design interventions were revealed in the next chapter, which also comprised the comparative accounts (before vs after and India vs China) in this regard.

Chapter 3: Design intervention with reference to workstation and amenities

This chapter comprises trails on possible work station design i.e. women police station and police stations with amenities and space layout as perceived by women police personnel. Some of the recommendation were implemented during the study period which confirms the need for such ergonomics design development to improve working condition of women police

Chapter 4: Discussion: key issues for betterment of work situation

This chapter discusses insights from various findings with respect to existing literature and also from other countries. The first section presents the current scenario of Women police in India, where they discuss issues related to women employment including law and enforcement perspective in a relatively male dominated organization. Further, the findings of key issues related to well-being of women in police stations such as AWPS, CPS and TSK were analysed

collectively and differences were discussed. A new framework for police work station is then proposed based on the identified key issues.

Chapter 5: Summary and Conclusion

The last chapter allied together with numerous research verdicts of the study and highlights the impact of the present findings to the frame of acquaintance. Salient research findings were discussed and deliberated about the limitation and interrogation which were elevated for future research work.

CHAPTER 2- OCCUPATIONAL WELLBEING ISSUES AND ASSESSMENT

The design path of this study was composed of three stages including the selection of workplace and assessment through questionnaire, direct observation and photography, and design intervention based on respondent's perception. An assessment was done based on the responses to the survey carried out at AWPS / CPS / TSK before implementing ergonomic design intervention only; while the responses from the same participants after implementation of proposed design interventions were revealed in the next chapter, which also comprised the comparative accounts (before vs after and India vs China) in this regard.

CHAPTER 2

OCCUPATIONAL WELLBEING ISSUES AND ASSESSMENT

2.1. Introduction

This research was conducted using descriptive and analytical design approach. It entailed the collection of primary data and secondary data, by use of structured questionnaires after being tested for validity and reliability. Data validation and drawing of conclusion was done using appropriate statistical methods (described hereunder). This portion of the study was aimed at identifying, examine and express (recommend) the possibilities of ergonomic design interventions (and their implementation subsequently) at workplaces of CPS / AWPS / TSK (Figure.20) with special reference to improvement of occupational wellbeing by relief of on-job stress and related issues specific to policewomen (and their womanness).

A study of occupational and environmental stress, on job-stress, work burnout, job satisfaction and satisfaction index was conducted in AWPS (Pan Bazar, Guwahati), CPS (Pan Bazar, Guwahati) and TSK (police station at district Tinsukia), Assam, India as well as in Women Police Station (WPS) in the city of Hangzhou, (China).

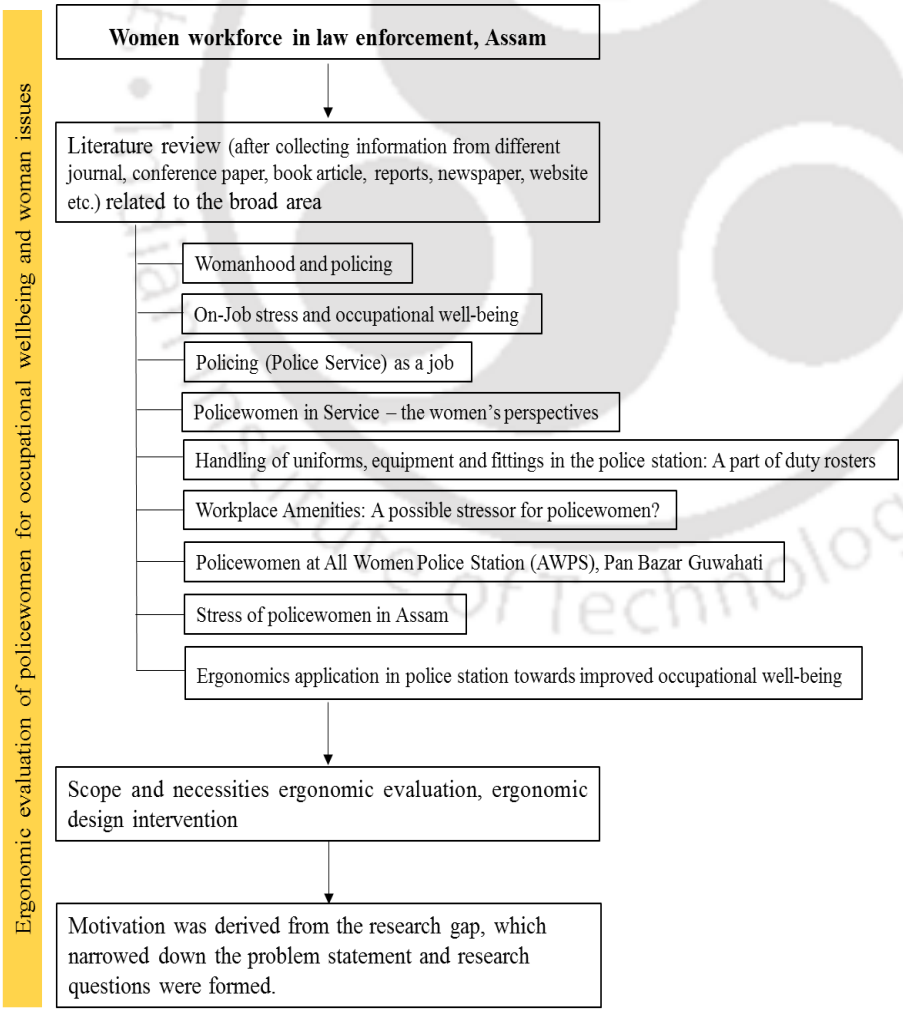
Figure.20. shows Police station **(**CPS / AWPS / TSK) at different location of the study

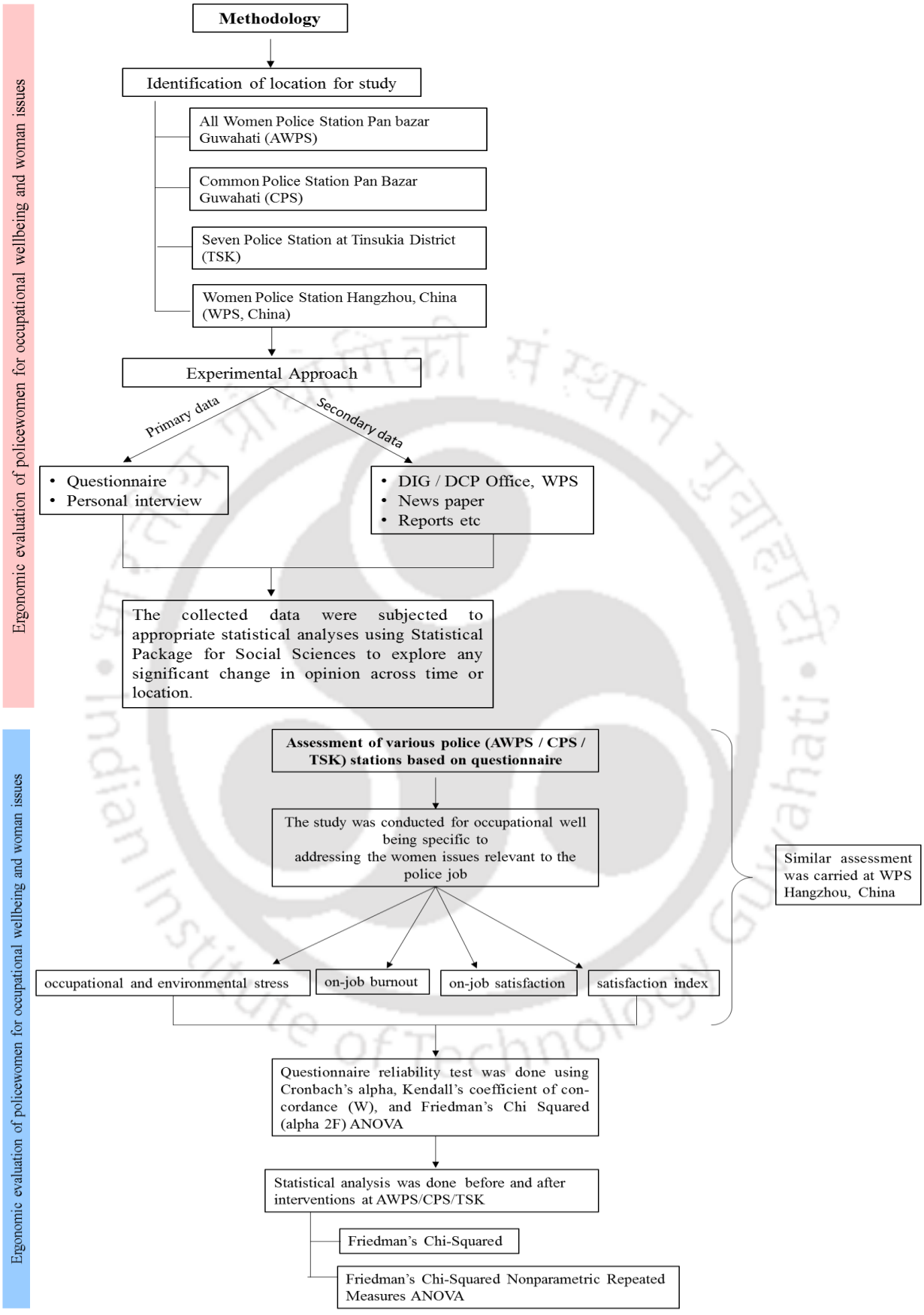
An assessment was carried out for various police stations based on questionnaire for occupational and environmental stress, on-job burnout, on-job satisfaction, and satisfaction index at existing workplace of AWPS/CPS/TSK. Similar assessment was carried at WPS Hangzhou, China. Statistical analysis was done using Friedman's Chi-Squared and Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA before and after interventions at AWPS/CPS/TSK. The formulated questionnaire was subjected to analysis for reliability and preliminary construct validity using Cronbach's alpha. An alpha > 0.89 was considered to have

excellent reliability and validity, while alpha > 0.79 was very good and alpha > 0.69 as average (not acceptable enough). The questionnaire was further subjected to analysis with Kendall's coefficient of con-cordance (W) for agreement of the respondents with respect to the questions in the questionnaire. Friedman's Chi Squared (alpha 2F) ANOVA showed mostly no significant difference of opinion, as was reflected by analyses of questions using 'within people vs. between items.

2.2. Flow Diagram of Overall Study

The study was divided into four specific investigations they are (Figure 21) were (1) Women workforce in law enforcement, Assam, (2) Methodology, (3) Assessment of various police station (AWPS / CPS / TSK) based on questionnaire, (4) Ergonomics design intervention
The study was basically carried out on Assam policewomen to make a comparison with similar nature work context in neighbouring country a brief study was carried out on Chinese policewomen.





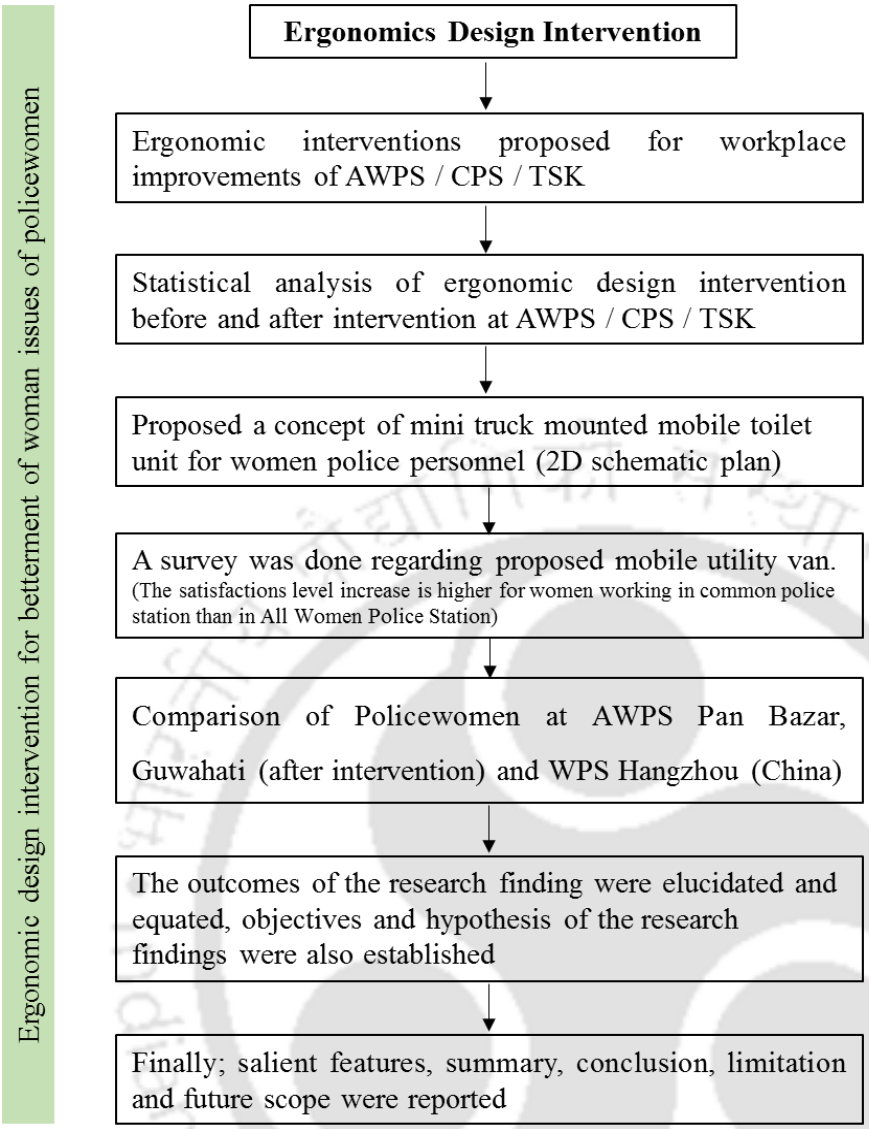


Figure. 21. Flowchart of the strategy followed in this thesis

2.3. Location of the Study

The study was conducted at two places of Assam (India) with differential law and order situations – (1) Guwahati city [Lower Assam; 2 different types of police stations at Pan Bazar, the central part of Guwahati city– All Women Police Station (AWPS) and Common Police station (CPS)],declared as less / undisturbed region and (2) Tinsukia (Upper Assam; (TSK) 7 police stations of Tinsukia district were visited arbitrarily viz., Tinsukia, Magherita, Digboi, Makum, Dhola, Doom Dooma and Talap) declared as disturbed region.

A study was also conducted in Women Police Station (WPS) in the city of Hangzhou, (China). Both the countries have similar social issues related to women (wolf *et al*, 1975), though China

appears to have overcome many of these issues in recent decades (Johnson, 2009). Similar to Guwahati in India, Hangzhou is also one of the metropolitan cities in China.

2.4. Participants

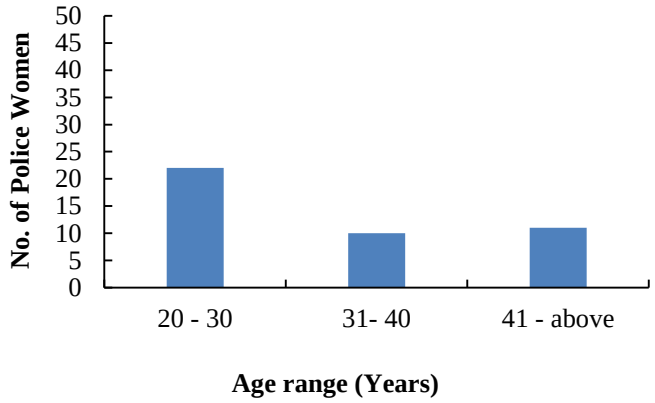
Women police personnel were selected as respondents for participation in the study. It would be noteworthy to mention that there were only 60 policewomen in each of the chosen Indian locations viz. Guwahati and Tinsukia. Few examples of Assam policewomen are shown in Figure.22. The participants were selected on the basis of their availability throughout the duration of the study. The participants of the study aged between 20 years to 45 years. The participants were healthy, young and of mixed ethnicity (Assamese, Bengali, Khasi and Bihar), with no previous specific history of any illness that may apparently restrict their experience based responses against questionnaire, psychosomatic/cardiovascular, neurological or socio-behavioural abnormalities. The respondent was informed about the study and the survey procedure. They were explained in vivid details and the individual written informed consent was obtained from each of them. Since most of the respondents were not well-versed with English, they were explained the questions in their vernacular language and data were filled in by the interviewer in some cases.

Similarly, 31 policewomen were selected as participants at Hangzhou, China within the age group of 20 years to 45 years. Language difference was a minor problem, which was overcome with the help of native friends there, who could understand and speak Chinese well, in addition to English.

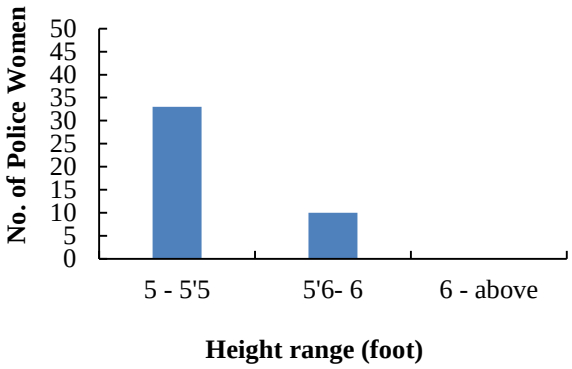
Figure.22. Example participants from Assam policewomen

2.4.1. Demographic and Occupational Information

The below sample selection was conducted for the study:



(a)



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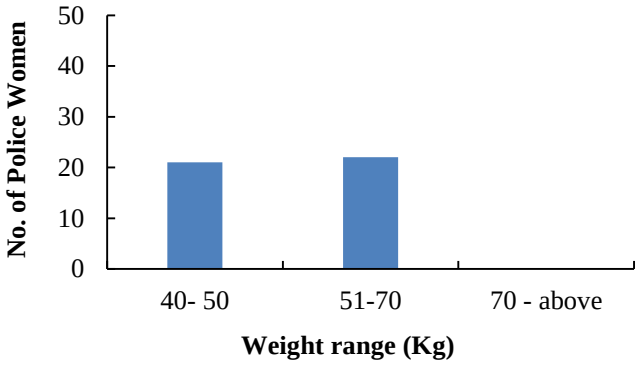

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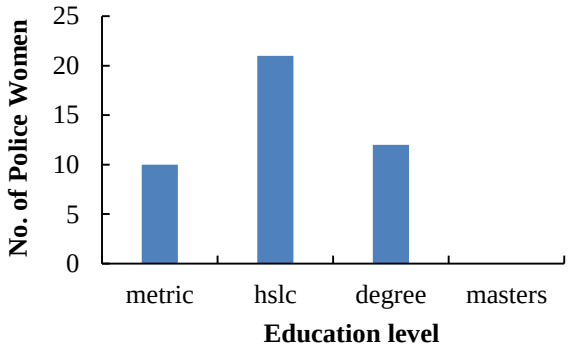

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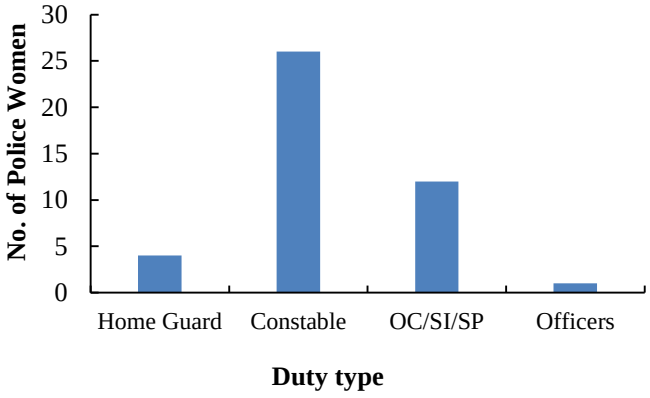

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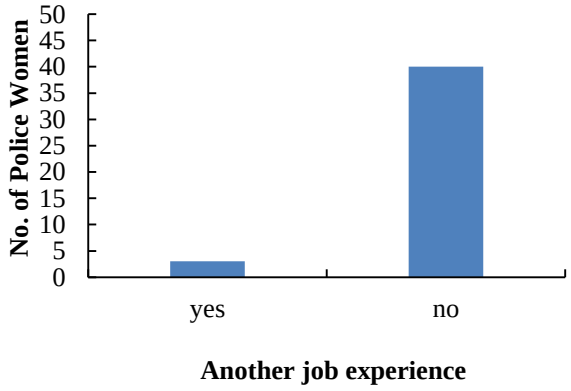

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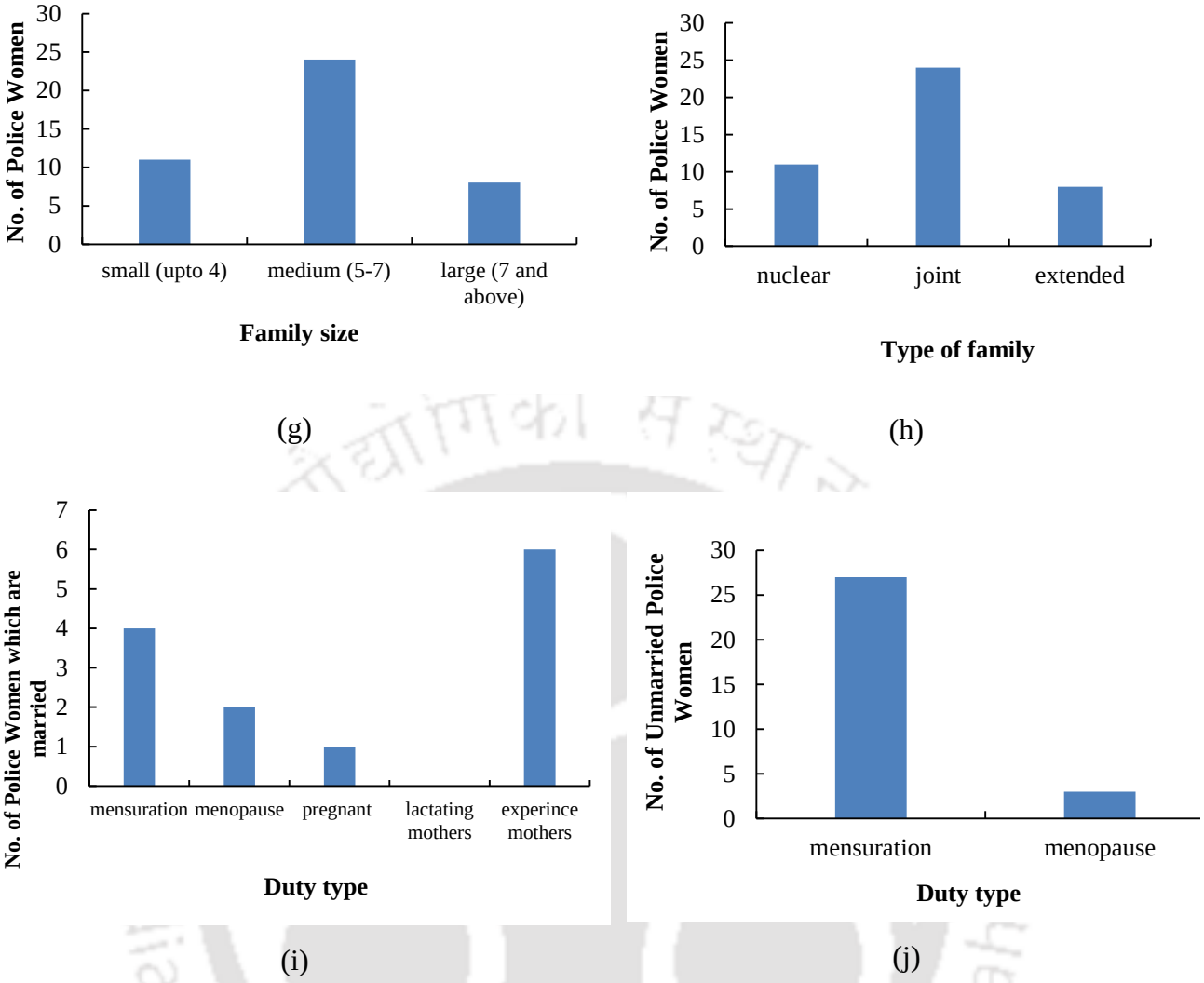

Figure.23. Overview of demographics statistics (a) age (b) height (c) weight d) education level e) duty type f) job experience g) family size h) family type i) womanness status(married women) j) womanness status (unmarried police women)

Figure.23. shows the demographics of participants (policewomen) who participated in survey. These demographics shows that women were relatively younger with majority falling within 30 years. Most of women measured between 5′00″ – 5′5″, with none being taller to 6”00”. They weighed lower than 70 kg, with nearly 50% of lying within 40 – 50 kg and remaining between 51 – 70 kg. Education level for most of women police was HSLC (12+) or below (matriculate, 10+). As a matter of fact, joining as police constable do not require higher education in the police system in India. Normally women join the police service as constables, few as ASI and even fewer as officers. The majority of the participants (37%) taking part in the survey had below 10 years of service in police while, other had above 10, 20 and even 30 years of experience in policing. These women were mostly from joint families of medium size.

Further, among married women, many were experienced mothers while nearly 15% were menstruating, had menopause and one was pregnant. Among unmarried woman, > 60% had menstruation and very few had menopause.

2.4.2. Sampling

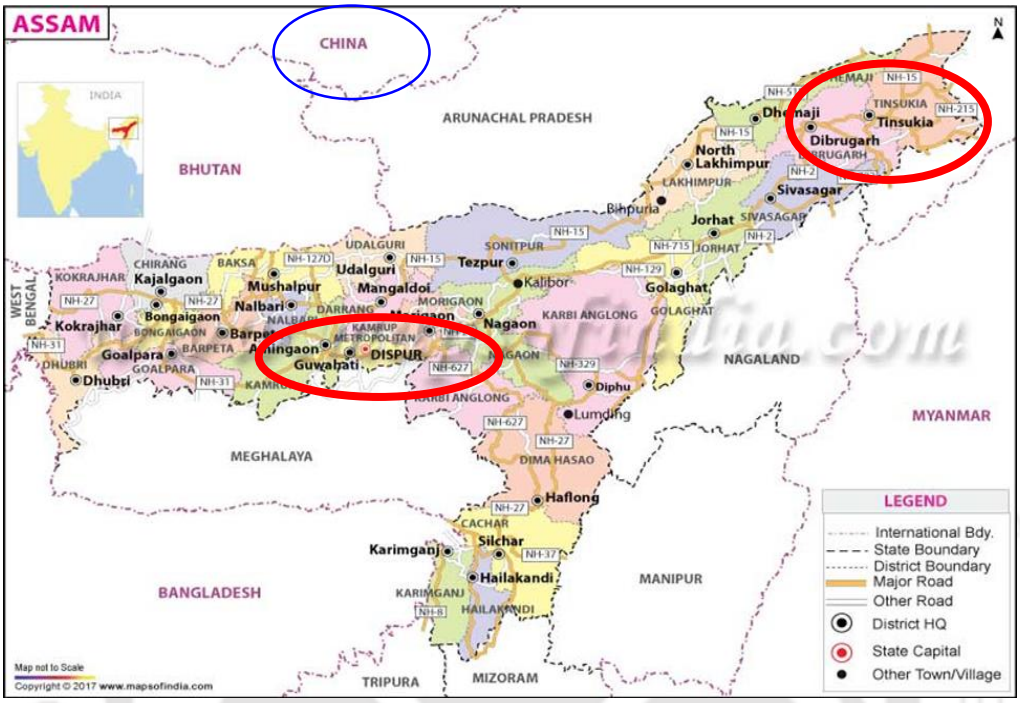

Figure.24. Map of Assam displaying the areas encompassed for the present study *(Source:hhttps://www.google.co.in/search?q=assam+map&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwiL5fjq9qvYAhWJto8KHREmBjsQsAQIJw&biw=1920&bih=974#imgrc=TYVjApBLP3OAv)*

Non-probability purposive / judgemental sampling was adopted for the present research paradigm. CPS, TSK and AWPS was purposively selected for the study as shown in Figure.24. Several interactive and participative discussion with higher authorities at police headquarter took place regarding numbers of respondents available and the occupational issues at workplace were identified for which ergonomic design interventions would be recommended. Similar procedure was adopted for China.

A total of 43 policewomen from Guwahati and 22 policewomen from Tinsukia cooperated with different ranks as shown in Figure. 24 & Figure. 25. Basically policewomen working in both the stations i.e. CPS Guwahati and AWPS Pan bazar were selected; but due to shortage of them, the women police personnel were informed to participate in the study from North and South Guwahati also (since in each police station, there was only one women police posted).

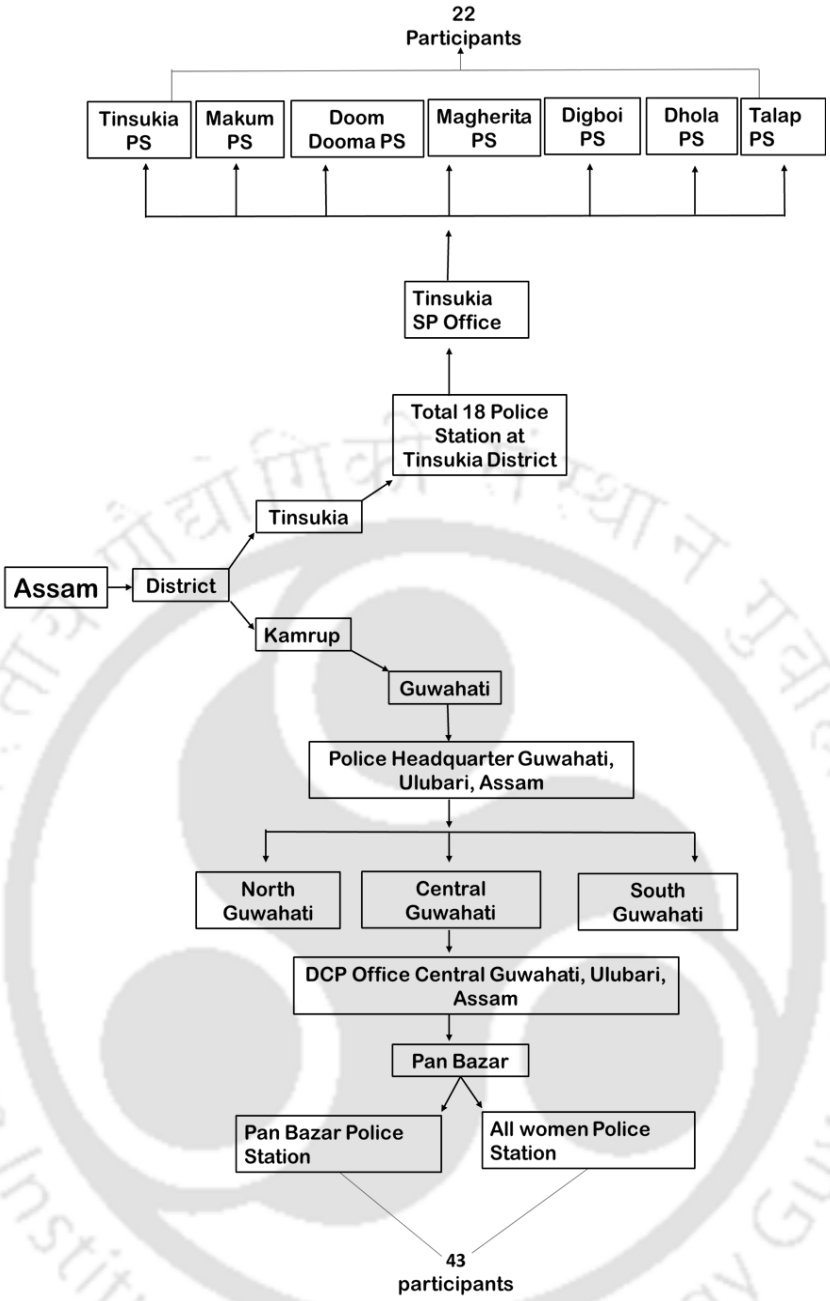

Figure.25. Sampling procedure adopted for survey

2.5. Study Design

This research adopted a persuasive analytical approach leading to proposition of some design interventions. The study design was split into three stages as shown in Figure. 26. Stage one consists of two process i.e. selection of workplace condition / workstation at police station and assessment through questionnaire. Stage two involves direct observation and photography followed by stage three based assessments of design interventions. It brought about the collection of primary data using structured questionnaires (after being tested for validity and

reliability) and personal interviews followed by visual interpretations of the workplace. The preliminary survey was carried out in AWPS Pan Bazar Guwahati under Kamrup district of Assam, to find out primary work and workplace related problems prevailed amid women police personnel. Respondents were explained the purpose of research in detail and explore the scope of improvement through questionnaire and personal interviews. All the respondents were administered the questionnaire individually to have the individual opinion with confidentiality assured. The AWPS and CPS Pan Bazar was venue of the interaction / interview / discussion for Guwahati; while in Tinsukia, meeting was conducted in all the TSK locations mentioned earlier.

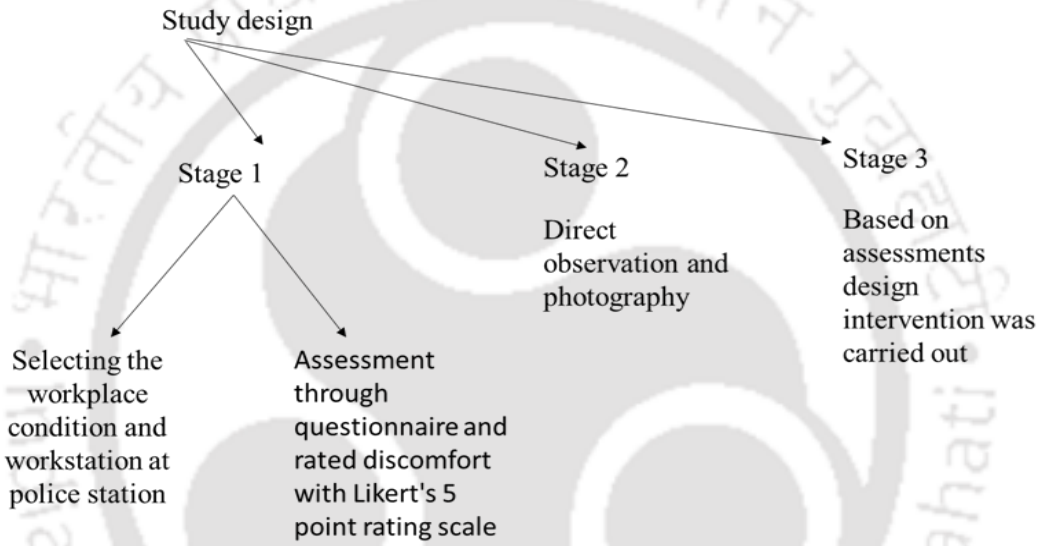

Figure.26. schematic representation of study design

2.6. Research Paradigm

The paradigm used for assessing womanness issues of women police personnel comprised four modest and resourceful tools (shown in Figure.27.), as described hereunder.

2.6.1. Questionnaire: Questionnaire is a generous technique for initial screening, appraising and highlighting the workstation. This was a useful resource of information for understanding the issues like occupational well-being as measured by job satisfaction, work burnout and workstation comfort and conveniences of the women police personnel. A field study was also conducted and an open-ended question was asked to the respondents. The questionnaire supported to focus on what we want to know and get the relevant information with this easy technique about the respondents.

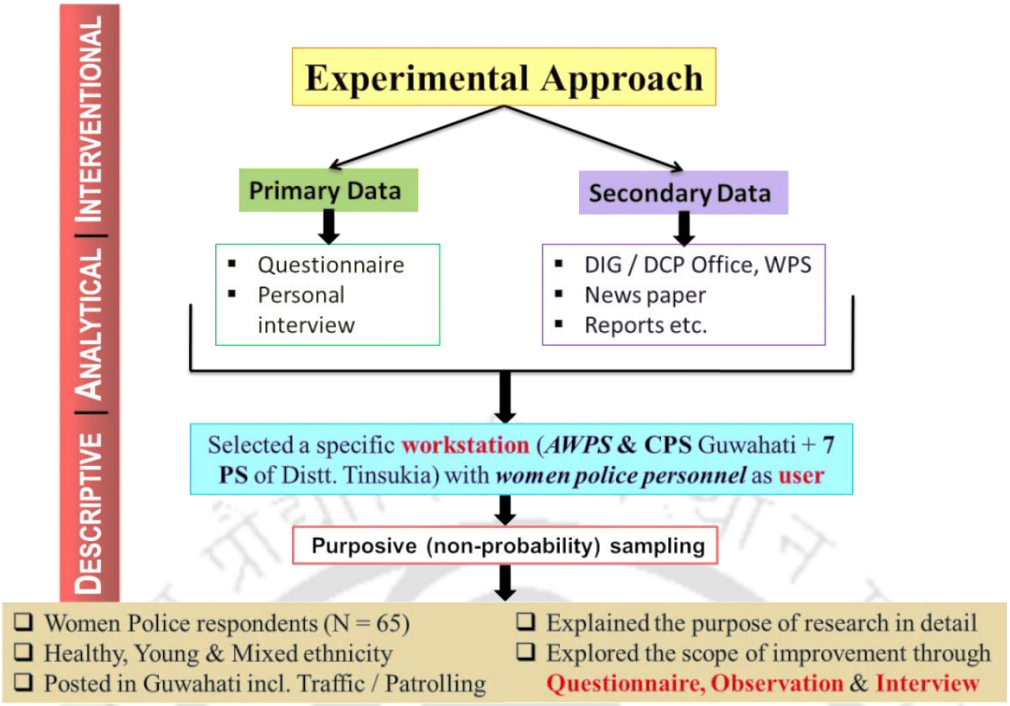

Figure.27. Strategy for data collection

The questionnaire, constructed keeping in mind the objectives of the study, consisted of two main parts. The first part of the questionnaire had three sub-parts in turn viz. 1A, 1B, and 1C considering participants' response for subjective assessment of workplace and on-job amenities. The introductory page of the questionnaire dealt with the background characteristic such as name, date of birth, job details, any other job experience, family details and womanness status; followed by signed written informed consent. Part 1A was constructed to find out exposure to occupational and environmental stress and perceived well-being of the women police personnel. Part 1B included perceptions on job satisfaction of the women police personnel at the work place. Part 1C consisted of on- job burn-out of the women police personnel at the work place. The part 2 of the questionnaire incorporated the survey results on on-job satisfaction. The questionnaire was designed in both English and Chinese languages as shown in Appendix A and Appendix B.

2.6.2. Interactive Personal Interview and Discussion: Personal interview (strictly one to one, and the interactive discussion therein) with the policewomen regarding the workplace and the risk factors due to the issues faced by the policewomen pointed out the lack of facilities in the workplace as one of the major issues to upsurge with the occupational

wellness of the women police personnel. All the women police personnel were asked about their insights, opinions, views, and approaches towards the job that they are involved. Throughout this process, the researcher recorded the important points that came up in the course of discussion, with consent from the interviewee. A few examples of personal interviews are shown in Figure.28.

Figure.28. Overview of personal interview with policewomen

2.6.3. Direct Observation: This process involved close observation of the workplace and exploration of the present scenario, which might contribute to employee stress / dissatisfaction. The researcher observed the ongoing behaviour of the women police personnel and the way they feel if there were any anomaly in the work environment. From the direct observations it was noticed that the policewomen need considerable modification in workplace environment including very basic workplace amenities.

2.6.4. Experts Views and Existing Document Search: The researcher surveyed and explored the documents / reports available in literature, including the articles published in news media and reports from Bureau of Police Research & Development (BPRD) in the context of research.

2.7. Work Plan

The present research envisioned to bring about some understanding of the on-job stress and job satisfaction in the workplace due to the prevalent factors with reference to policing occupation, which might deem discernible upgrading of working condition and workplace amenities of the women police personnel. The present study, to pursue its aim through the objectives

reconnoitred, was conducted in phase-wise manner (in order to come up with some valuable recommendations and / or subsequent implementation) as described below.

2.7.1. Phase 1. Exploratory Study

- Location and fields were selected and contacts were established covering the (1) Guwahati metropolitan city [Lower Assam; 2 different types of police stations at Pan Bazar, the central part of Guwahati city– All Women Police Station (AWPS) and Common Police station (CPS)], declared as less / undisturbed region and (2) Tinsukia. A study was also conducted in AWPS in the city of Hangzhou, (China).
- Overall exploration of working environment and work process being practice in police station were undertaken.
- Observation was through (following administration of the questionnaire to women police personnel) to look into womanness specific issues, working condition and occupational wellness which would help to identify specific problem areas.

2.7.2. Phase 2. On-job Stress and its Causative Factors Vs Occupational Well-being

- The interviewing and by photography was carried out to perceive the real-time scenario of workplace and causative factors were recognised.
- Workplace condition and occupational wellness was evaluated using direct observations, interviewing and photography along with assessment of work burnout and job satisfaction through questionnaire.

2.7.3. Phase 3. Ergonomic Design Intervention

- Qualitative approach was carried out for design ideation and expert opinion was utilised to accomplish the design, scrutinising for an enhanced working condition, thus reducing various stress and leading to occupational wellness.
- Recommendations along with the respondent's opinion was proposed, followed by assessment of the efficiency and comfort in the work place as a consequence of implantation of the ergonomic design interventions.
- Benefits appeared out of ergonomics design intervention in combination of before and after interventions responses were presented in Chapter 3.

2.8. Statistical Analysis

The collected data were subjected to appropriate statistical analyses using Statistical Package for Social Sciences (SPSS for windows, v.22.0.0) to explore any significant change in opinion across time or location. The level of significance was set at $P \leq 0.05$ for all statistical tests.

Data regarding the impact of well-being issues, on-job stress and work burnout of participants; as well as job satisfaction were recorded in the questionnaire. On a 5-point Likert scale (where 1 represents strongly disagree, 2 disagree, 3 neither agree nor disagree, 4 agree and 5 strongly agree), policewomen rated their responses to the prevailing and intervened conditions of the workplace.

2.8.1. Reliability of Questionnaire

All the questions of the questionnaires regarding on-job stress and occupational well-being in this research were constructed using the standard procedure and their administration reliability was examined by subjecting them through Cronbach's Alpha ('α') for their reliability and internal consistency of the scales. The questionnaire was adopted only when Cronbach's α achieved ≥0.8 (α≥0.8) and the inter-item covariance matched across the corresponding values. After validation of the reliability of the questionnaire, they were scored in terms of the number of responses; and the generated data then underwent Friedman's Chi-Squared test (χ^2_F) for independence. For every case, statistical significance was set at $P \leq 0.05$.

2.8.2. Friedman's Chi-Squared (χ^2_F) Test for Independence

The questions contained in questionnaire were subjected to Friedman's Chi- Squared (χ^2_F) test for independence between workplace condition (on-job stress and work burn-out) and psycho-physiological stress / perceived well-being, to explore whether the questions were independent of said conditions; because a significant association between questions and conditions would bias the respondent while registering their responses to the questions in the questionnaires.

2.8.3. Correlation Between Environmental Factors and Their Subjective Perception

To explore whether the factors (on-job stress, work burn-out and job satisfaction) contributed to the subjective responses to the exposure of policewomen to their respective workplace were

evaluated (through the questionnaire) using Pearson's product moment correlation coefficient (r). To enumerate these observations a correlation matrix was analysed using independent calculations of r (without considering other variables for that particular variable).

2.9. Assessment of Environmental and Occupational Stress of Policewomen

The survey on occupational and environmental stress at the workplace as well as perceived well-being of policewomen was conducted in AWPS (Pan Bazar, Guwahati), CPS (Pan Bazar, Guwahati) and district Tinsukia, Assam, India. A similar survey was also conducted in WPS Hangzhou (China). It was known that for any CPS in Assam, only one policewoman was posted for each CPS or TSK across Assam, specifically deployed to assist in the cases related to women and children. However, for survey in CPS and AWPS, policewomen from various police stations (total 43) were interviewed together at one place. Observations on occupational and environmental stress, on job-stress, work burnout and job satisfaction were explored, examined and manifested hereunder for both from Assam (India) and Hangzhou (China).

2.10. Exposure to Environmental and Occupational Stress and Perceived Well-Being of Policewomen at the Existing Workplace

To look into exposure to environmental and occupational stress and perceived well-being of policewomen at the existing workplace of AWPS / CPS / TSK.

2.10.1. AWPS Pan Bazar, Guwahati

Table1summarized the observations on exposure to occupational and environmental stress and perceived well-being of policewomen across different police stations namely, AWPS Guwahati, CPS Guwahati and all 7 PS combined for district Tinsukia (TSK).

Table 1. Comparative observations on exposure to occupational and environmental stress and perceived well-being of policewomen across the various police stations

Q Sl No	AWPS Pan Bazar Guwahati					CPS Pan Bazar Guwahati					All PS combined for Distt. Tinsukia				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Q1	43					43					22				
Q2	43						20	23			5	13	4		
Q3	43					35	8				22				

Q4	43					30	13				22				
Q5	43					31	12				20	2			
Q6	18		16		9	36	7				14	8			
Q7	26	17				23	24	15	4		10	9	3		
Q8	21	14		8		25	18				8	14			
Q9		16		11	16	40	3				2	20			
Q10	20	23				33	10				15	7			
Q11	43					33	10				8	14			
Q12	43					43					22				
Q13	8	12	18	5		3	13	6	21		8	2		9	3
Q14				43					3	40				12	12
Q15		24		19		43						9	10	3	
Q16	43					3	25		10	5	9	13		5	
Q17	43					9	34				22				
Q18	27	10		6		43					11	8	3		
Q19	43									43					22
Q20	43					12	31				12	10	2		
Q21	43					43					22				
Q22	43					43					22				
Q23	43					43					22				
Q24	43					43					22				
Q25	33	10				43					22				
Q26	37	6				43					22				
Q27	30	13				43					22				

(1) represents Strongly Agree, **(2)** Agree, **(3)** Neutral, **(4)** Disagree and **(5)** Strongly Disagree

Tabulated representation of the questionnaire-based survey on exposure to occupational and environmental stress and perceived well-being. Q 1–27 represents the questions from the questionnaire (Part 1A, explained in the methodology section).

(**Q1)** Law enforcement is generally regarded as a masculine profile, therefore we who are inducted in this job, felt that convenience is equally important for us.

(Q2) Administrative over shifting is common.

(Q3) Staff shortages cause stress.

(Q4) Lack of resources cause stress.

(**Q5)** In equal sharing of work responsibilities cause stress.

(Q6) Shift work causes stress for special cases like pregnancy, expecting mother, lactating mother, menstruation period.

(Q7) Traumatic events affects psychophysical health.

(Q8) Social life outside the job is impacted by duty regimen

(Q9) Occupation-related health issues in special cases like pregnancy, expecting mother, lactating mother, menstruation period.

(Q10) Not finding time to stay in good physical condition.

(Q11) Feelings like you are always on the job and other responsibilities are compromised.

(Q12) Working beyond working hours brings boredom.
(Q13) Noisy work area.
(Q14) Frequent interruptions brings disturbance in the work place.
(Q15) Inadequate or poor quality equipment/maintenance.
(Q16) Unfair work environment in this job.
(Q17) Lack of a modern system/apparatus on duty.
(Q18) Occupational health issues (e.g. back pain, neck pain, and joint pain).
(Q19) A good infrastructure brings satisfactions while doing work.
(Q20) Lack of resources in professional/promotional.
(Q21) Working alone at night is risky and I don't feel good.
(Q22) Prolong standing affects physical health.
(Q23) Lack of separate modular convenience/prompt service utilities in every police station.
(Q24) Basic amenities like isolated /separate restrooms and child care units are still a major requirement for women police personnel.
(Q25) Lack of residential accommodation which is seen as one of the major impediments faced by women in joining police force.
(Q26) While I am involved in outdoor activities such as patrolling, security duty on several occasions, touring in and outside the district where mobile convenience facility is a compulsory requirement.
(Q27) Crèches/day care centre in the police station for working mother will help them to take care of their children.

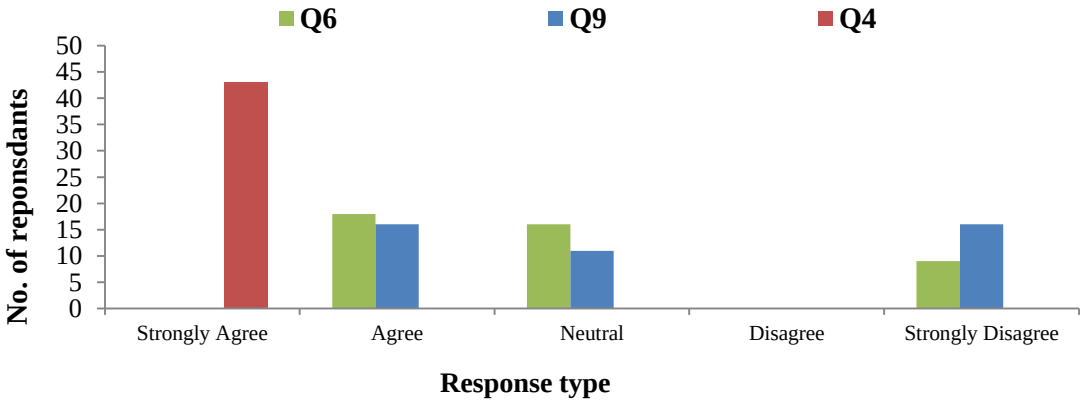

Figure.29. Overview of major findings from Table.1, it shows major agreement and disagreement on occupational well-being issues faced by policewomen at AWPS Guwahati.

It could be noted that, in some of the cases, overall response was somewhat inconclusive (Figure.29.), as described hereafter. When enquired of whether shift work causes stress for special cases like pregnancy, expecting mother, lactating mother and menstruation period, around 43% of policewomen agreed, 20% disagreed and nearly 37% preferred to hold onto neutral. Likewise, inconclusiveness also existed for aspects like equipment purchase and

maintenance. In short, it could be said that, lack of basic amenities, improper night shift policy and shortage of staff were identified as the major factors resulting occupational stress in policewomen of AWPS Guwahati.

2.10.2. CPS Pan Bazar, Guwahati

Similar to AWPS, occupational well-being, environmental stress and perceived well-being was also scrutinised for CPS. This was done since it was important to know the existing amenities and needs (if any) for policewomen in any CPS / TSK, where except one policewoman, all are policemen. In this case 43 policewomen (Table 1) participated in the survey. Table 1 summarized the observations of exposure of policewomen to environmental stress and occupational well-being in CPS. Similar to AWPS, lack of equipment, resources, shortage of staff, night shift policies and basic amenities etc. were identified to be the major reasons for causing stressful environment among policewomen. Also, it was mentioned strongly in case of CPS that special circumstances for women such as pregnancy, lactating mother, menstruation period etc. add to environmental stress and occupational well-being. Unlike APWS, there was agreement on lack of quality equipment and also its poor maintenance. This indicated probably of somewhat better maintenance of equipment in APWS as compared to that in CPS. Further, as in case of AWPS, there was strong agreement among policewomen in CPS (Figure.30) that presence of basic amenities, modular Van, residential accommodation and child care units will increase satisfaction.

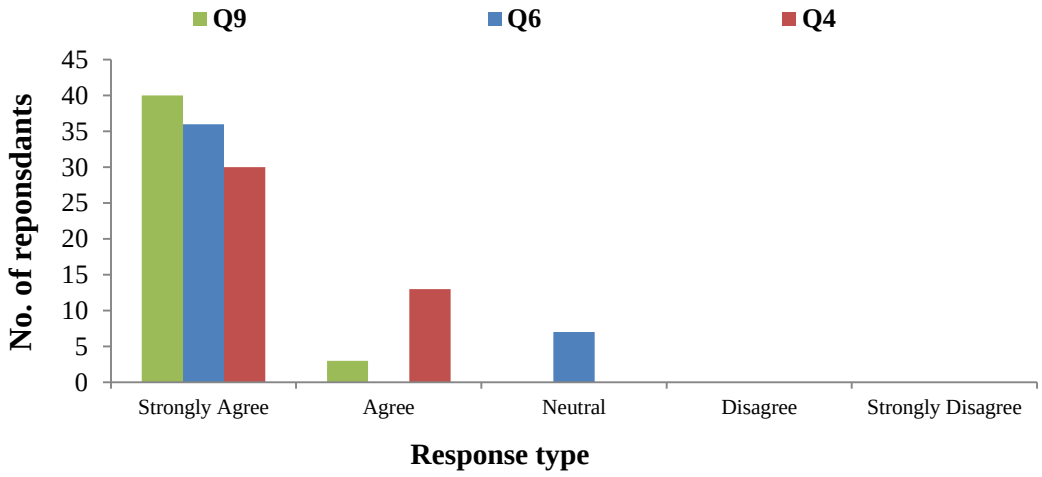

Figure.30. Overview of major findings from Table.1, it shows major agreement and disagreement on occupational well-being issues faced by policewomen at CPS Guwahati.

2.10.3. All 7 Police Stations of Distt. Tinsukia, combined (TSK)

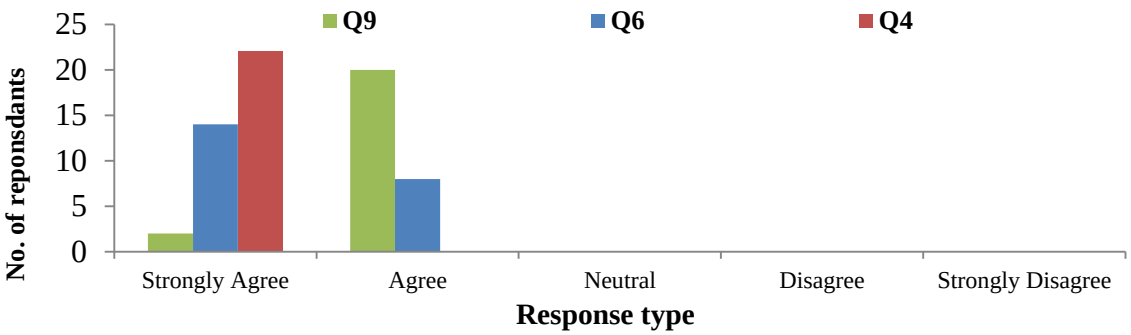

Figure.31. Overview of major findings from Table.4, it shows major agreement and disagreement on occupational well-being issues faced by policewomen at Tinsukia.

Compared to APWS and CPS, many differences were found in factors causing occupational and environmental stress among policewomen in Tinsukia district (Figure.31). Unlike in AWPS and CPS, policewomen in Tinsukia agreed to special cases (pregnancy, expecting mother, lactating mother and menstruation period) being some of the major reasons causing stress on-job. Further, there was also agreement with regards to the suggestion that, presence of modular multi-utility vehicles, residential accommodation and child care centre would increase their satisfaction. Many agreed that, there was lack of resource, staff and mostly tiresome night shift policies, which in turn, instigate occupational and environmental stress.

2.10.4. Policewomen at Hangzhou, China

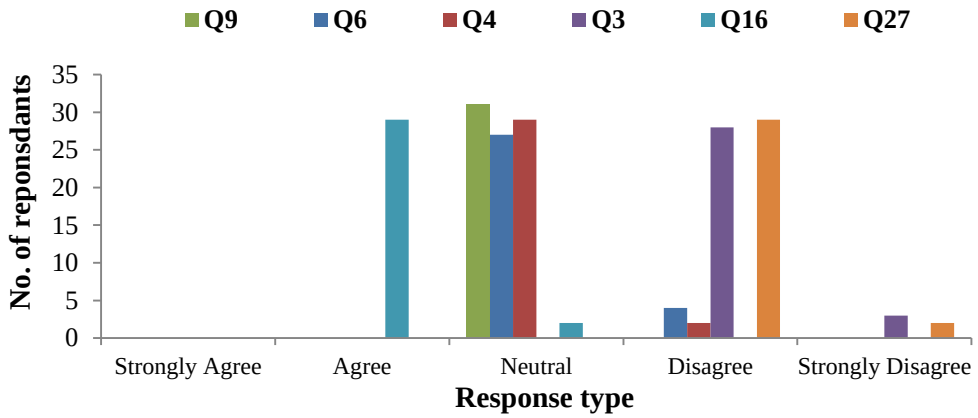

Figure.32. Overview of major findings, it shows major agreement and disagreement on occupational well-being issues faced by policewomen at Hangzhou, China

Graphical representation of the questionnaire-based survey on exposure to occupational and environmental stress and perceived well-being. Q 1–27 represents the questions (Table 1) from the questionnaire (Part 1A, explained in the methodology section).

Analysis of environmental and occupational stress among 31policewomen in China was shown in Figure.32. As could be observed from Figure.19 unlike in TSK studied in India, there was less scarcity of resources, staff and modern equipment in PS in China. It was also perceived from interview that, there were around 400 policewomen in WPS in Hangzhou, China – more than eight times the policewomen in AWPS Guwahati! This was, however, consistent with the overall record of greater women workforce in China than India.

2.11. Observations of Survey On-Job Burnout Across Various Police Stations

Table 2. Comparative observations on on-job burnout of policewomen across the various police stations

Q Sl No	AWPS Pan Bazar Guwahati					CPS Pan Bazar Guwahati					All PS combined for Distt. Tinsukia (TSK)				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Q1		10	33				20		21	2		11	11		
Q2	26	17				43					16	6			
Q3	26	17				18	17			8	12	10			
Q4	20	23								43	9	13			
Q5	20	9	4	5	5	43					11	8	1	1	1
Q6	43					43					22				

(1) represents Strongly Agree, **(2)** Agree, **(3)** Neutral, **(4)** Disagree and **(5)** Strongly Disagree

Tabulated representation of the questionnaire-based survey on job burnout. Q 1–6 represents the statements from the questionnaire (Part 1B, explained in the methodology section).

(Q1) My work is emotionally exhaustive.
(Q2) I feel burnt out because of my work.
(Q3) My work frustrates me.
(Q4) I feel burn out at the end of the working day.
(Q5) I feel exhausted in the morning only by the thought of another similar day at work.
(Q6) I feel quite energetic while passing time with family, friends and relations.

2.11.1. AWPS Pan Bazar, Guwahati

As was evinced from Table 2, in terms of exhaustion, the response of policemen in AWPS was mixed, revealing a variable trend. Some agreed that policing was an exhaustive job; however, many opted to stay neutral, for reasons whatsoever. Most of them agreed with the fact that, the work frustrates them and they feel burnt out due to work. During discussion, they mentioned that they feel proud of their job. However, they agreed upon that, the regular duty roster did

make them feel burnt out, even whenever they thought of the duty for next morning also. This indicated that there was noticeable scope for improvement to make the policing more motivating and encompassing, as a job. This might be useful for restructuring the policies and norms. Further, there would be more satisfaction and enjoyment to have meetings with family and friends. This again was a useful consideration, which might lead to strategy of extra-curricular activities to make them feel relaxed apart from their hectic job duties.

2.11.2. CPS Pan Bazar, Guwahati

Similar to AWPS, response was mixed in terms of tiredness. Though it was strongly indicated by all the policewomen that, the work was frustrating for them; still they felt proud of their role and contribution in the police service. As compared to APWS, (Table 2) there was greater agreement regarding job exhaustion. Policewomen at CPS stating that they feel exhaustive of work. This could be possible for CPS, as the number of policewomen there was nominal and their role therein was very limited, like mainly they had to assist other policemen in cases related to women and children. Similar to AWPS, there was an increase in satisfaction during their family and friends meets. This observation deemed to suggest that, it was an organisation's need to create some relaxing space like norms for family meets, organize extracurricular activities to name a few.

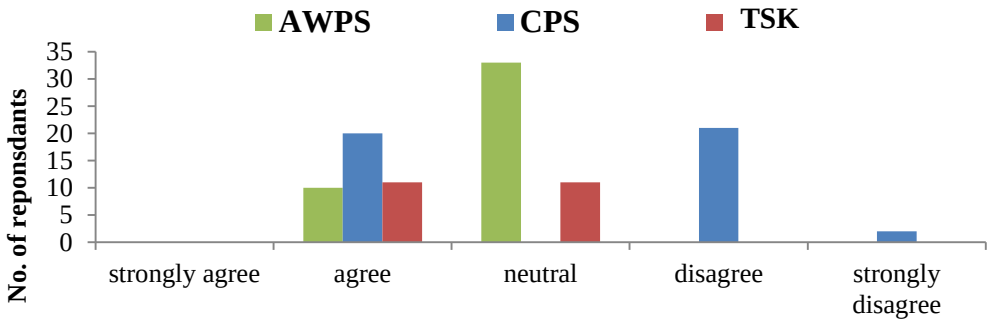

Figure 33 (a)

Figure. 33 (a) and (b) compares the responses for queries related to job burn out survey between AWPS, CPS and TSK. It can be noted that for query related to emotionally exhaustive (Q1. In Table 2) and burnt out at end of day (Q2 in Table 2) is shown. This is because for other queries, the responses are similar among women police in all the stations. It can be seen that for women in AWPS feel exhaustive and burnt out at end of day whereas women in CPS do not. This might be because role of women in CPS is very limited and is only to assist during women and

children cases, whereas, in AWPS, role of women police has to deal completely with all the cases. The responses among women police in All PS combined were found to be similar to that of CPS Guwahati

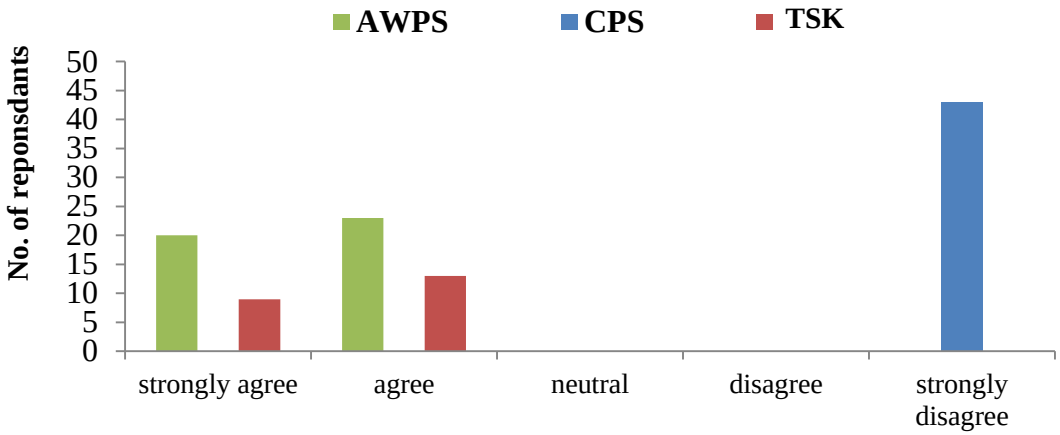

Figure 33 (b)

Figure. 33. Comparison of responses for a) emotionally exhaustive and b) burnt out (Table 2) between AWPS, CPS and TSK

2.11.3. All 7 Police Stations of Distt. Tinsukia, combined (TSK)

On-job burnout surveys across the 7 TSK in district Tinsukia (unlike Guwahati, these cities are not metros, and above that, earmarked as disturbed regions) demonstrated that, many policewomen were to believe that the policing is an exhaustive job. This was in accordance with the views of policewomen in APWS and CPS in Guwahati. For other aspects, responses were found to be similar to that of AWPS and CPS (Table 2).

2.11.4. Policewomen at Hangzhou, China

Figure.34. shows the On-Job burnout survey results obtained from policewomen in China. It could be seen that there was somewhat similar type of stress faced by policewomen in China, as far as policing as a profession was concerned. Though, the work did not frustrate them, still they reported to feel tired sometimes thinking about work, especially in the morning following consecutive day-night combined shifts. Based on interview, the women were found to be less interactive as compared to that in India. This could however be contributed to by language issues. Nevertheless, despite substantial staff of over 400, there was still noteworthy work stress faced by women. They also expressed pleasure on their meets with family and friends.

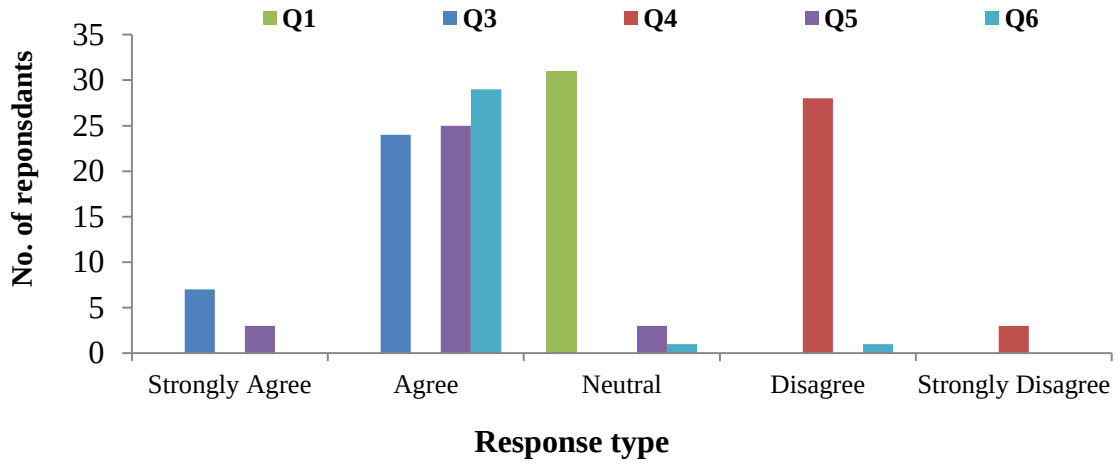

Figure.34. Overview of on-the-job Burn-Out survey for Policewomen in China

Graphical representation of the questionnaire-based survey on job burnout. Q 1–6 represents (questions from Table 2) the statements from the questionnaire (Part 1B, explained in the methodology section).

2.12. Observations Related to On-Job Satisfaction Survey Results Across Police Stations

Table 3. Comparative observations on job satisfaction of policewomen across the various police stations

Q Sl No	AWPS Pan Bazar Guwahati					CPS Pan Bazar Guwahati					All TSK combined for Distt. Tinsukia				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Q1	2		3	15	23	9	24			10					22
Q2	4	17	12	10						43	3	13		6	
Q3		37	1	5						43		2		10	10
Q4		10		11	22	41	2				22				
Q5		8	5	13	11		9	10	24			4	4	11	3
Q6				36	7				8	35				22	

(5) represents Strongly Agree, **(4)** Agree, **(3)** Neutral, **(2)** Disagree and **(1)** Strongly Disagree

Tabulated representation of the questionnaire-based survey on job satisfaction. Q 1–6 represents the statements from the questionnaire (Part 1C, explained in the methodology section).

(Q1) I feel I am being paid a fair amount for the work I do.
(Q2) My supervisor is quite competent in doing his/her job.
(Q3) When I do a good job, I receive the recognition for it that I should receive.
(Q4) The benefits we receive are as good as most other organizations offer.
(Q5) Many of our rules and procedures make doing a good job simple.
(Q6) Those who do well on the job stand a fair chance of being promoted

2.12.1. AWPS Pan Bazar, Guwahati

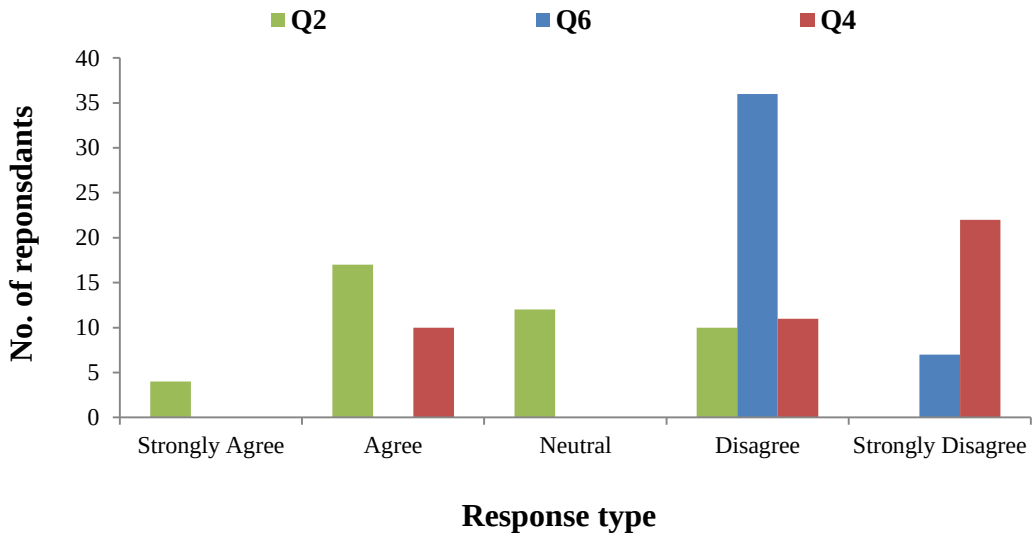

Figure.35. Overview of major findings from job satisfaction survey conducted among policewomen in AWPS Guwahati from Table 3

Table 3 summarized the results of job satisfaction of policewomen. It could be seen from the result that the policewomen at AWPS were not satisfied with their pay (compared to work), benefits of job, and chance of promotion and recognition of good work. In all these cases, most of policewomen (> 90%) expressed dissatisfaction. However, the response was mixed, with 4 strongly agreed, 17 agreed, 10 disagreed and 12 being neutral, with respect to the competency of the supervisor. While mostly opined, in terms of %, their supervisor to be competent, there was still uncertainty when it comes to the understanding of supervisor with respect to womanness issues. The major findings from job satisfaction survey for AWPS were summarized in Figure.35.

2.12.2. CPS Pan Bazar, Guwahati

Observations of on-job satisfaction for CPS (summarized in Table 3, Figure.36), there was agreement with that of APWS in respect of 'fair' pay with respect to work, competency of the supervisor and job benefits. It should be noted that the policewomen in CPS, were less in number with no major role except handling cases related to women and children. However, since policewomen work in a CPS with many male colleagues, they might find their supervisor (mostly male) not professional enough to understand their womanness issues. Further, they also felt that chances of promotion were not much due to the particular nature of responsibilities

being assigned to them on-duty in the CPS. In a nutshell, it indicated that the overall job satisfaction of policewomen in CPS might be better than AWPS to some extent, while limited to certain assignments, yet chances of promotion were not copious.

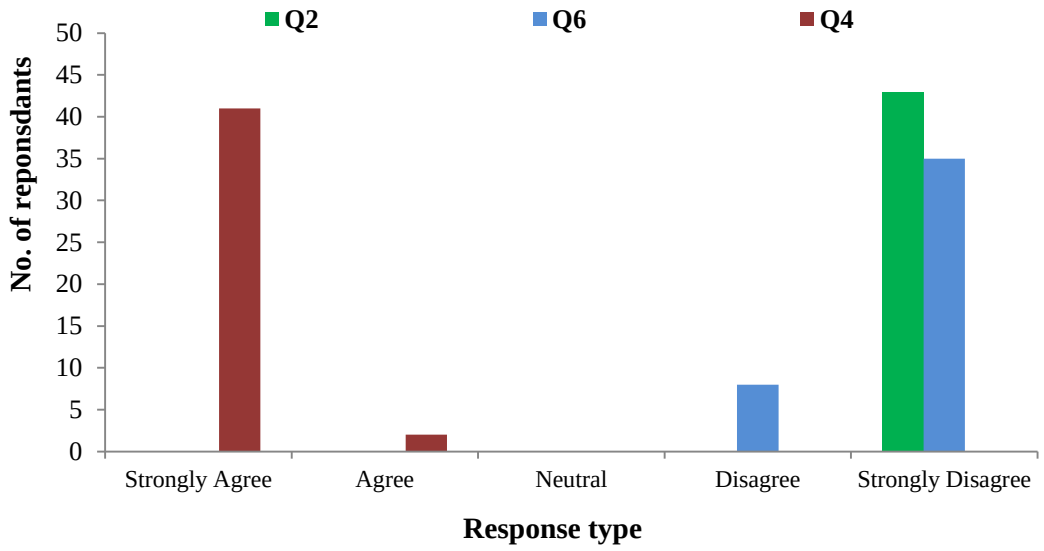

Figure.36. Overview of major findings from job satisfaction survey conducted among policewomen in CPS Guwahati from Table 3

2.12.3. All 7 Police Stations of Distt. Tinsukia, Combined (TSK)

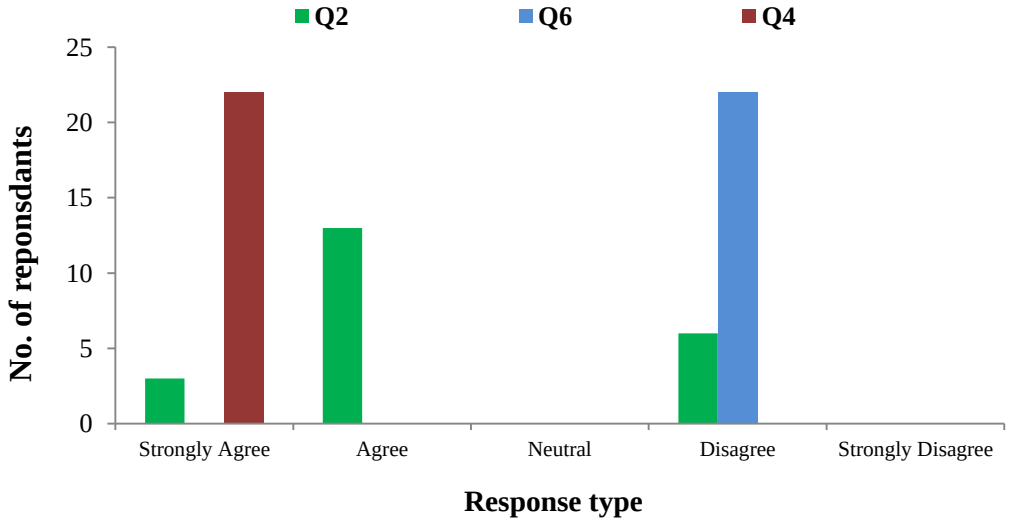

Figure.37. Overview of major findings from job satisfaction survey conducted among policewomen in Tinsukia from Table 3

As per the results (Figure. 37) of on job satisfaction among policewomen in PS of district Tinsukia, most of policewomen were found to be satisfied with fair pay and job benefits (while some appeared to be scared with such questions). This was somewhat consistent with that of

CPS Guwahati but different from AWPS Guwahati. Further, they also felt that supervisor was not fully able to understand issues of womanness. They were not satisfied with scope of promotion. This substantiated that, across all the PS in Assam including APWS, CPS, there was a resilient concern of job benefits like promotion etc. For other on-job benefits, there was overall mixed response considering all the PS in Assam

2.12.4. Policewomen at Hangzhou, China

Figure. 38 presented job satisfaction responses in China. It could be seen that, the response with respect to competency of supervisor regarding perception and feelings about womanness related concerns was neutral. However, for job benefits and fair pay, the response was similar to that of CPS in India. These suggested that in terms of income, policewomen in China were more satisfied, which was consistent with the reported higher economic growth than India. However, there was some degree of discontent in terms of job promotion opportunities for policewomen. This could be due to differentiation in job duties consigned to policewomen in China as compared to policemen.

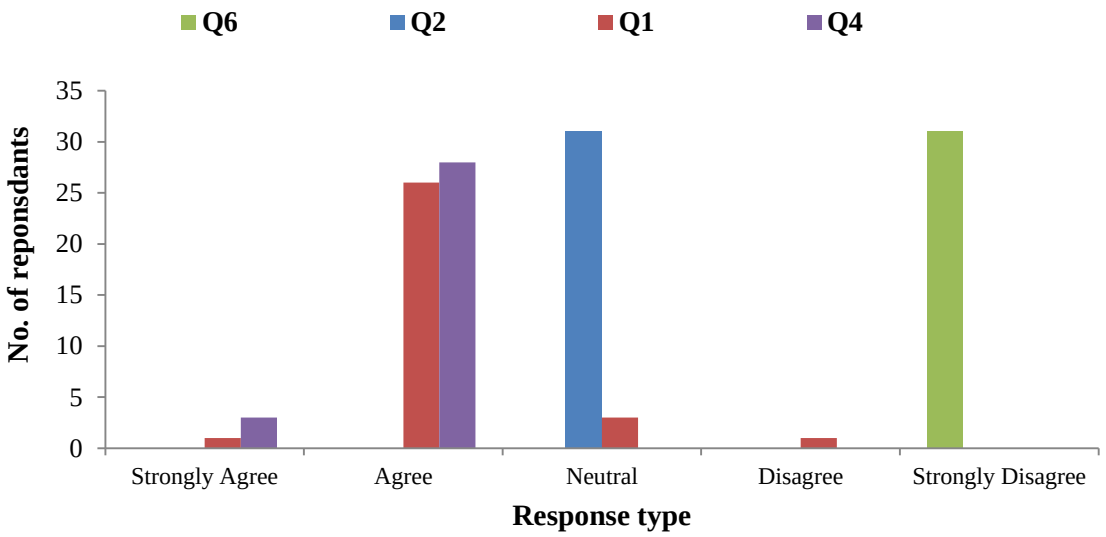

Figure.38. Overview of major findings from job satisfaction survey conducted among policewomen in Hangzhou, China

Graphical representation of the questionnaire-based survey on job satisfaction. Q 1–6 represents the statements (Table 3) from the questionnaire (Part 1C, explained in the methodology section).

2.13. Comparative Notes Regarding Satisfaction Index of Policewomen Across the Various Police Stations

Table 4. Comparative observations on exposure to satisfaction index of policewomen across the various police stations.

Q Sl No	AWPS Pan Bazar Guwahati		CPS Pan Bazar Guwahati		All TSK combined for Distt. Tinsukia	
	Yes	No	Yes	No	Yes	No
Q1	33	10	33	10	16	6
Q2	43		43		22	
Q3	9	34	28		18	4
Q4	43		43		22	
Q5	43		43		22	
Q6	43		43		22	
Q7	43		43		22	
Q8	43		43		22	

Tabulated representation of the questionnaire-based survey on satisfaction index. Q No 1–8 represents the questions from the questionnaire (Part 2, explained in the methodology section).

(Q1) Public attitude towards women police is awkward.
(Q2) Lack of separate utility facilities in police stations.
(Q3) Problems related to training.
(Q4) Govt accommodation for womanness related issues.
(Q5) Difficulties faced in upbringing of children – day care centre is essential.
(Q6) Need to have a better working environment in terms of infrastructure.
(Q7) Provision of separate toilet facility at all offices / outpost.
(Q8) A modular mobile convenience facility while outdoor duty an immediate need.

2.13.1. AWPS Pan Bazar, Guwahati

Table 4 summarized the results of satisfaction index of policewomen in AWPS Guwahati. Most of them agreed that public perception towards policewomen is awkward. For some policewomen (23%), the view was however different. It was also noted consequently that for the opinion of 23% policewomen, husband and wife both were in police service. All of them pointed out that the job stress was higher and they specified that, it was difficult to manage household activities simultaneously. Most of them revealed no problems related to training. From the survey (Figure. 26, Table.4.) it was brought about to notice that there was lack of modular mobile utility facility, space essential for womanness specific concerns and even lack

of basic facilities in AWPS. There was strong support for provision of separate toilet facility and modular utility van across all offices and outpost.

2.13.2. CPS Pan Bazar, Guwahati

In case of CPS Guwahati, it was manifested that the policewoman (one policewoman per CPS on shift basis) therein had problems related to training. Since, the role of policewoman in CPS was very specific, they opined of need for special training in making them work together with policemen in handling cases such as of children and women. Apart from that, there was no difference in satisfaction index with those of policewomen in AWPS. Policewomen at CPS Guwahati also suggested improvement of infrastructure with inclusion of basic amenities, residential accommodation, separate toilet facilities and modular utility van. There was strong need of these facilities at CPS Guwahati as currently (based on interview), many of them have to go to another police station nearby (of women) for restrooms.

2.13.3. All 7 Police Stations of Distt. Tinsukia, Combined (TSK)

The satisfaction index (Table 4) judgements of policewomen in Tinsukia was similar to that of CPS Guwahati. The policewomen in Tinsukia, in line with other policewomen in the study, had concerns related to provisions of training and lack of separate toilet facilities. It was perceived that, the facilities already existed in Tinsukia. However, they emphasized on the need of improvement of these facilities strongly.

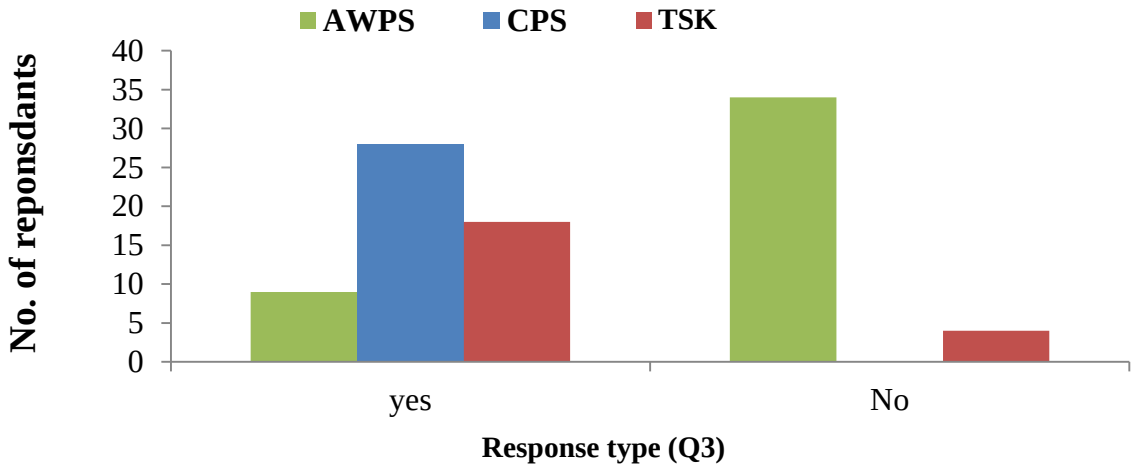

Figure.39. Responses of women police for exposure to satisfaction index. Query related to problems in training is shown from Table 4

Figure. 39 shows the comparison of responses by women police in AWPS, CPS and all TSK combined. Graph for only query third (i.e., problems related to training) is shown. It is because for other queries, the responses were similar. It can be seen from the figure that women police in AWPS expressed dissatisfaction with training whereas, it was not the issue among women police in CPS and TSK. This might be because the role of women police in CPS and TSK might be limited whereas, in case of AWPS, they require substantial training for specific cases of children and women. This might be the case that problems related to training must be looked at.

2.13.4. Policewomen at Hangzhou, China

Based on Figure. 40 it could be seen that in China, though existing facilities were better, still there was provision for improvement of infrastructure (residential accommodation, separate toilet facility etc.). They also expressed further need to improve training to cope up with changing patterns of crime and with advancement of technology. The job satisfaction regarded to be similar to that of AWPS in Guwahati (India), but the demand of improvement was sophisticated, as they already had basic infrastructure / facilities and amenities.

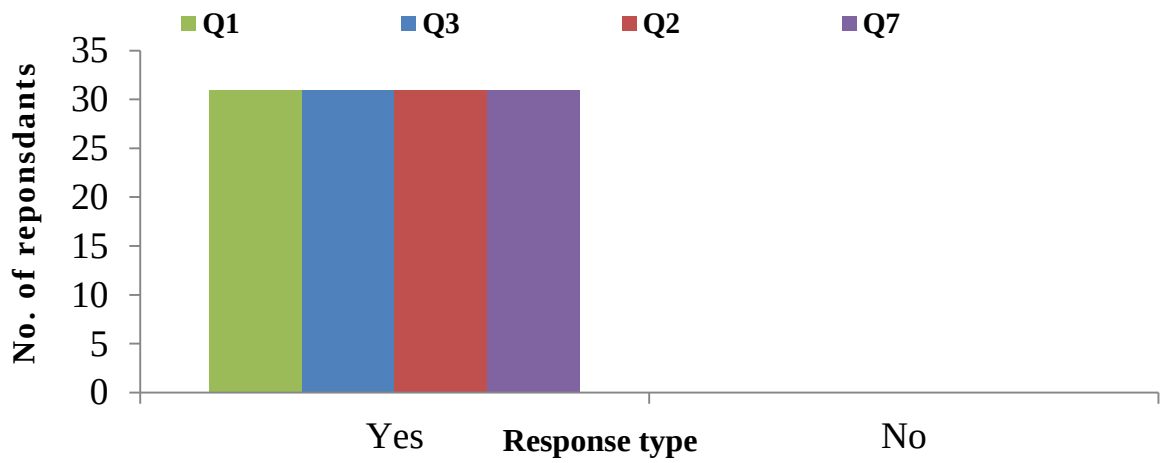

Figure. 40. Overview of job satisfaction index in China

Graphical representation of the questionnaire-based survey on satisfaction index. Q No 1–8 represents (Table 4) the questions from the questionnaire (Part 2, explained in the methodology section).

2.14. Reliability of Questionnaire for Subjective Assessment of Workplace and On-Job Amenities

The questionnaire, before administering to the respondents was analysed for validity and test-retest reliability statistic – Cronbach's Alpha (α), using Statistical Package for Social Sciences (SPSS v.22.0.0 for windows). Reliability analyses were done for all the parts of the said questionnaire, viz. Part 1A, 1B, 1C and 2. However, the significance in case of 'within people vs. residual non-additivity' adds to the point of concordance in line with Tukey's tests of non-additivity.

Part 1A: Comparative observations on exposure to occupational and environmental stress and perceived well-being of policewomen across the various police stations:

Reliability assessment for Part 1A of the questionnaire administered revealed excellent internal consistency thereby ensuring justified reliability of questions asked through the questionnaire (Cronbach's α = 0.994; α based on standardized items= 0.995). This was further confirmed by inter-item correlation and covariance matrices, which showed periodicity and regularity across rows and columns. The variance and covariance of the scores, were found to be within normal ranges with a precise α. Friedman's Chi-Squared (χ^2_F) ANOVA for between people and between items analysis showed no significant association [$\chi^2_{F\ (BP\text{-}BI)}$: 13.364, NS], and significant variation within people with residual component of non-additivity [$\chi^2_{F\ (WP\text{-}RNA)}$: 1.850, $p < 0.001$]. However, Kendall's coefficient of concordance represented little agreement between preference of ratings of the questions in the questionnaire rated by the respondents (W=0.03), thus indicating that, the respondents fairly understood the rating /scoring of the questionnaire and marked their score after understanding the questions properly.

Part 1B: Comparative observations on on-job burnout of policewomen across the various police stations:

Reliability assessment for Part 1B of the questionnaire administered revealed excellent internal consistency thereby ensuring justified reliability of questions asked through the questionnaire (Cronbach's α = 0.950; α based on standardized items= 0.949). This was further confirmed by inter-item correlation and covariance matrices, which showed periodicity and regularity across rows and columns. The variance and covariance of the scores, were found to be within normal ranges with a precise α. Friedman's Chi-Squared (χ^2_F) ANOVA for between people and

between items analysis showed no significant association [$\chi^2_{F(BP\text{-}BI)}$: 18.800, NS] and significant variation within people with residual component of non-additivity [$\chi^2_{F\ (WP\text{-}RNA)}$: 36.160, $p < 0.001$]. However, Kendall's coefficient of concordance represented little agreement between preference of ratings of the questions in the questionnaire rated by the respondents (W=0.132), thus indicating that, the respondents fairly understood the rating /scoring of the questionnaire and marked their score after understanding the questions properly.

Part 1C: Comparative observations on job satisfaction of policewomen across the various police stations:

Reliability assessment of Part 1C of the questionnaire administered revealed excellent internal consistency thereby ensuring justified reliability of questions asked through the questionnaire (Cronbach's α = 0.992; α based on standardized items= 0.993). This was further confirmed by inter-item correlation and covariance matrices, which showed periodicity and regularity across rows and columns. The variance and covariance of the scores, were found to be within normal ranges with a precise α. Friedman's Chi-Squared (χ^2_F) ANOVA for between people and between items analysis showed no significant association [$\chi^2_{F\ (BP\text{-}BI)}$: 19.788, NS] and significant variation within people with residual component of non-additivity [$\chi^2_{F\ (WP\text{-}RNA)}$: 7.411, $p < 0.01$]. However, Kendall's coefficient of concordance represented little agreement between preference of ratings of the questions in the questionnaire rated by the respondents (W=0.030), thus indicating that, the respondents fairly understood the rating /scoring of the questionnaire and marked their score after understanding the questions properly.

Part 2: Comparative observations on exposure to satisfaction index of policewomen across the various police stations:

Reliability assessment of Part 2 of the questionnaire administered revealed excellent internal consistency thereby ensuring precise reliability of questions asked through the questionnaire (Cronbach's α = 0.919; α based on standardized items= 0.916). This was further confirmed by inter-item correlation and covariance matrices, which showed periodicity and regularity across rows and columns. The variance and covariance of the scores, were found to be within normal ranges with an excellent α. Friedman's Chi-Squared (χ^2_F) ANOVA with for between people and between items analysis showed no significant association [$\chi^2_{F\ (BP\text{-}BI)}$: 3.294, NS] significant variation within people with residual component of non-additivity [$\chi^2_{F(WP\text{-}RNA)}$: 6.489, $p <$

0.01]. However, Kendall's coefficient of concordance represented little agreement between preference of ratings of the questions in the questionnaire rated by the respondents (W=0.021), thus indicating that the respondents fairly understood the rating /scoring of the questionnaire and marked their score after understanding the questions properly.

2.15. Friedman's Chi-Squared (χ^2_F) Test for Independence of Association Between the Questions Within the Questionnaire

In this chapter all table contains before and after interventions. Interventions were presented in chapter 3, where responses are presented herein for comparative result along with before interventions. The analyses of independence of association of the questions in the questionnaire and their respective subjective ratings were performed using Friedman's Chi-Squared test (χ^2_F) for independence of association for the Parts 1A, 1B and 1C of the questionnaire and discussed below. However, this analysis was not executed for Part 2 of the questionnaire, as Part 2 consisted of assessment of subjective perception of some relevant notions / apprehensions regarding policing as a job; while 1A, 1B and 1C presented subjecting ratings of different aspects with respect to workplace environment.

2.15.1. AWPS (Before and After Intervention)

Table 5. Independence of questions in questionnaire with relation to the concerned subjective rating with respect to AWPS

Condition	***Before Intervention***			***After Intervention***		
Parameter	χ^2_F	**df**	**Significance**	χ^2_F	**df**	**Significance**
Part 1A	2788.3	1092	***	2506.2	1092	***
Part 1B	1569.0	1092	***	1579.3	1092	***
Part 1C	1099.0	546	***	1328.8	546	***

AWPS: All Women Police Station. χ^2_F*: Friedman's Chi-squared; df: degrees of freedom*; *** = $p < 0.001$;*NS: Not Significant.*

Table 5 revealed significant independence of association in Friedman's Chi-Squared test (χ^2_F) for independence of association of the questions in the questionnaire and the corresponding subjective ratings of AWPS respondents both before intervention [χ^2_F: 2788.3; ($p < 0.001$) for Part 1A; χ^2_F:1569.0; ($p < 0.001$) for Part 1B and χ^2_F: 1099.0 ($p < 0.001$) for Part 1C] and after physical intervention in the all women police station [χ^2_F: 2506.2 ($p < 0.001$) Part 1A;

χ^2_F:1579.3 ($p < 0.001$) for Part 1B; and χ^2_F: 1328.8 ($p < 0.001$) for Part 1C], indicating that the questions contained in the questionnaire were all independent (unbiased) to the subjective responses of AWPS participants, reconfirming once again the construct validity of the questionnaire and methodological attributes of its administration procedure.

2.15.2. CPS (Before and After Intervention)

Table 6 revealed significant independence of association in Friedman's Chi-Squared test (χ^2_F) for independence of association of the questions in the questionnaire and the corresponding subjective ratings of CPS respondents both before intervention [(χ^2_F): 617.45 ($p < 0.001$) for Part 1A ; (χ^2_F): 674.80 ($p < 0.001$) for Part 1B; and (χ^2_F): 286.35 ($p < 0.001$) for Part 1C] and after physical interventions in the police station [χ^2_F: 630.18 ($p < 0.001$) for Part 1A; (χ^2_F): 809.13 ($p < 0.001$) for Part 1B; and (χ^2_F): 257.93 ($p < 0.001$) for Part 1C], indicating that the questions contained in the questionnaire were all independent (unbiased) to the subjective responses of CPS participants, reconfirming once again the construct validity of the questionnaire and methodological attributes of its administration procedure.

Table 6. Independence of questions in questionnaire with relation to the concerned subjective rating with respect to CPS

Condition	***Before Intervention***			***After Intervention***		
Parameter	χ^2_F	**df**	**Significance**	χ^2_F	**df**	**Significance**
Part 1A	617.45	168	***	630.18	168	***
Part 1B	674.80	168	***	809.13	168	***
Part 1C	286.35	84	***	257.93	84	***

CPS: *Common Police Station.* χ^2_F: *Friedman's Chi-squared*; *df*: *degrees of freedom*; *** = $p < 0.001$; *NS*: *Not Significant.*

2.15.3. TSK (Before and After Intervention)

Table 7 revealed significant independence of association in Friedman's Chi-Squared test (χ^2_F) for independence of association of the questions in the questionnaire and the corresponding subjective ratings of TSK respondents both before intervention [χ^2_F: 395.95 ($p < 0.001$) for Part 1A; (χ^2_F): 742.64 ($p < 0.001$) for Part 1B; and (χ^2_F): 364.86 ($p < 0.001$) for Part 1C] and after interventions in the police station [(χ^2_F): 418.72 ($p < 0.001$) for Part 1A; (χ^2_F): 742.64 ($p < 0.001$) for Part 1B; and (χ^2_F): 378.90 ($p < 0.001$)for Part 1C], indicating that the questions contained in the questionnaire were all independent (unbiased) to the subjective responses of

TSK participants, reconfirming once again the construct validity of the questionnaire and methodological attributes of its administration procedure.

Table 7. Independence of questions in questionnaire with relation to the concerned subjective rating with respect to TSK

Condition	***Before Intervention***			***After Intervention***		
Parameter	χ^2_F	**df**	**Significance**	χ^2_F	**df**	**Significance**
Part 1A	395.95	210	***	418.72	210	***
Part 1B	742.64	210	***	742.64	210	***
Part 1C	364.86	105	***	378.90	105	***

TSK: Tinsukia District common Police station. χ^2_F*: Friedman's Chi-squared; df: degrees of freedom*; *** = $p < 0.001$*; NS: Not Significant.*

2.16. Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA

Before and after Intervention of AWPS / CPS / TSK significance table were formulated for questionnaire Part 1A, Part 1B and Part 1C.

2.16.1. Before Intervention of AWPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for Questionnaire Part 1A

- Table 8 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1A of the questionnaire by AWPS respondents before physical implementation of ergonomics design intervention.
- It was observed that, there was significant difference at $p < 0.001$ between most of the pairs of questions, when subjected to between-group analyses.
- It was also noted that, before intervention for AWPS responses, there was significant difference at $p < 0.01$ between some pairs of questions; whereas for few pairs of questions the difference was significant at $p < 0.05$.
- For all other questions there was no significant difference ($p > 0.05$) was found before physical implementation of the design intervention. The detail resemblance between pairs of questions are shown in Appendix C-1.1.

Table 8. Significance Table of before intervention AWPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6	Q_7	Q_8	Q_9	Q_{10}	Q_{11}	Q_{12}	Q_{13}	Q_{14}	Q_{15}	Q_{16}	Q_{17}	Q_{18}	Q_{19}	Q_{20}	Q_{21}	Q_{22}	Q_{23}	Q_{24}	Q_{25}	Q_{26}	Q_{27}
Q_1	—	NS	NS	NS	NS	**	NS	NS	***	NS	NS	NS	***	***	***	NS	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_2		—	NS	NS	NS	**	NS	NS	***	NS	NS	NS	***	***	***	NS	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_3			—	NS	NS	**	NS	NS	***	NS	NS	NS	***	***	***	NS	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_4				—	NS	**	NS	NS	***	NS	NS	NS	***	***	***	NS	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_5					—	**	NS	NS	***	NS	NS	NS	***	***	***	NS	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_6						—	NS	NS	NS	NS	**	**	NS	NS	NS	**	**	NS	***	***	**	**	***	***	**	**	*
Q_7							—	NS	***	NS	NS	NS	NS	***	**	NS	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_8								—	***	NS	NS	NS	NS	**	*	NS	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_9									—	***	***	***	NS	NS	NS	***	***	***	NS	NS	***	***	NS	NS	NS	NS	NS
Q_{10}										—	NS	NS	NS	***	*	NS	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_{11}											—	NS	***	***	***	NS	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_{12}												—	***	***	***	NS	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_{13}													—	NS	NS	***	***	NS	***	***	***	***	***	***	*	**	*
Q_{14}														—	NS	***	***	**	NS	NS	***	***	NS	NS	NS	NS	NS
Q_{15}															—	***	***	*	NS	NS	***	***	NS	NS	NS	NS	NS
Q_{16}																—	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_{17}																	—	NS	***	***	NS	NS	***	***	***	***	***
Q_{18}																		—	***	***	NS	NS	***	***	***	***	***
Q_{19}																			—	NS	***	***	NS	NS	NS	NS	NS
Q_{20}																				—	***	***	NS	NS	NS	NS	NS
Q_{21}																					—	NS	***	***	***	***	***

Q_{22}																						—	***	***	***	***	***
Q_{23}																							—	NS	NS	NS	NS
Q_{24}																								—	NS	NS	NS
Q_{25}																									—	NS	NS
Q_{26}																										—	NS
Q_{27}																											—

*Significances expressed by * against the pair of questions, where *, ** and *** denotes significant difference by $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively. NS-No significant difference ($p > 0.05$).*

2.16.2. After Intervention of AWPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for Questionnaire Part 1A

- Table 9 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1A of the questionnaire by AWPS respondents after physical implementation of ergonomics design intervention.
- It was observed that, there was significant difference at $p < 0.001$ between most of the pairs of questions, when subjected to between-group analyses.
- It was also noted that, after intervention for AWPS responses, there was significant difference at $p < 0.01$ between few pairs of questions; whereas there was no significant difference at $p < 0.05$.
- For all other questions there was no significant difference ($p > 0.05$) was found after physical implementation of the design intervention. The detail resemblance between pairs of questions are shown in Appendix C-1.2.

Table 9. Significance Table of after intervention AWPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27
Q_1	—	NS	NS	***	NS	***	NS	NS	***	NS	NS	NS	***	***	***	***	NS	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_2		—	NS	***	NS	***	NS	NS	***	NS	NS	NS	***	***	***	***	NS	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_3			—	***	NS	***	NS	NS	***	NS	NS	NS	***	***	***	***	NS	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_4				—	***	NS	***	**	NS	**	***	***	NS	NS	NS	NS	***	***	***	NS	***	***	***	***	***	***	***
Q_5					—	***	NS	NS	***	NS	NS	NS	***	***	***	***	NS	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_6						—	NS	NS	NS	NS	***	***	NS	NS	NS	NS	***	NS	***	***	***	***	***	***	***	***	***
Q_7							—	NS	***	NS	NS	NS	NS	***	***	***	NS	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_8								—	***	NS	NS	NS	NS	***	**	***	NS	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_9									—	***	***	***	NS	NS	NS	NS	***	***	***	NS	***	***	***	***	***	***	***
Q_{10}										—	NS	NS	NS	***	**	***	NS	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_{11}											—	NS	***	***	***	***	NS	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_{12}												—	***	***	***	***	NS	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_{13}													—	NS	NS	NS	***	NS	***	**	***	***	***	***	***	***	***
Q_{14}														—	NS	NS	***	***	***	NS	***	***	***	***	***	***	***
Q_{15}															—	NS	***	***	***	NS	***	***	***	***	***	***	***
Q_{16}																—	***	***	***	NS	***	***	***	***	***	***	***
Q_{17}																	—	NS	NS	***	NS	NS	NS	NS	NS	NS	NS

Q_{18}																		—	**NS**	***	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Q_{19}																			—	***	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Q_{20}																				—	***	***	***	***	***	***	***
Q_{21}																					—	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
Q_{22}																						—	**NS**	**NS**	**NS**	**NS**	**NS**
Q_{23}																							—	**NS**	**NS**	**NS**	**NS**
Q_{24}																								—	**NS**	**NS**	**NS**
Q_{25}																									—	**NS**	**NS**
Q_{26}																										—	**NS**
Q_{27}																											—

*Significances expressed by * against the pair of questions, where *, ** and *** denotes significant difference by $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively. NS-No significant difference ($p > 0.05$).*

2.16.3. Before and After Intervention of AWPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for Questionnaire part 1B

Table 10. Significance table of before intervention AWPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire part 1B

Before Intervention at AWPS

	Q_1	Q_2	Q_3	Q_4	Q_5
Q_1	–	***	***	NS	***
Q_2		–	NS	***	***
Q_3			–	***	***
Q_4				–	NS
Q_5					–

After Intervention at AWPS

	Q_1	Q_2	Q_3	Q_4	Q_5
Q_1	–	***	***	NS	***
Q_2		–	NS	***	***
Q_3			–	***	***
Q_4				–	NS
Q_5					–

*Significances expressed by * against the pair of questions, where *, ** and *** denotes significant difference by $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively. NS-No significant difference ($p > 0.05$).*

Table 10 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1B of the questionnaire by AWPS respondents before physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q2, Q1 vs. Q3, Q1 vs. Q5, Q2 vs. Q4, Q2 vs. Q5, Q3 vs. Q4, Q3 vs. Q5 there was significant ($p < 0.001$) difference. It has also been observed that before intervention in AWPS there was no significant difference at $p < 0.01$ and $p < 0.05$ levels. For Q1 vs. Q4, Q2 vs. Q3, and Q4 vs. Q5 there was no significant ($p > 0.05$) difference was found before physical implementation of the design intervention before intervention.

Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1B of the questionnaire by AWPS respondents before physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q2, Q1 vs. Q3, Q1 vs. Q5, Q2 vs. Q4, Q2 vs. Q5, Q3 vs. Q4, Q3 vs. Q5 there was significant ($p < 0.001$) difference. It has also been observed that after intervention in AWPS there was no significant difference at $p < 0.01$ and $p < 0.05$ levels. For Q1 vs. Q4, Q2 vs. Q3, and Q4 vs. Q5 there was no significance ($p > 0.05$) difference after intervention.

2.16.4. Before and after intervention of AWPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for Questionnaire Part 1C

Table 11. Significance table of before intervention AWPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1C

Before Intervention at AWPS

	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6
Q_1	–	***	***	NS	NS	***
Q_2		–	NS	***	***	NS
Q_3			–	***	***	NS
Q_4				–	***	***
Q_5					–	***
Q_6						–

After Intervention at AWPS

	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6
Q_1	–	***	***	NS	**	***
Q_2		–	NS	***	***	NS
Q_3			–	***	*	NS
Q_4				–	***	***
Q_5					–	*
Q_6						–

*Significances expressed by * against the pair of question, where *, ** and *** denotes significant difference by $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively. NS-No significant difference ($p > 0.05$).*

Table 11 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1C of the questionnaire by AWPS respondents before physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q2, Q1 vs. Q3, Q1 vs. Q6, Q2 vs. Q4, Q2 vs. Q5, Q3 vs. Q4, Q3 vs. Q5, Q4 vs. Q5, Q4 vs. Q6, and Q5 vs. Q6. It has also been observed that before intervention in AWPS there was no significant difference at $p < 0.01$ and $p < 0.05$ levels. For Q1 vs. Q4, Q1 vs. Q5, Q2 vs. Q3, Q2 vs. Q6, and Q3 vs. Q6 there was no significant difference ($p > 0.05$) was found before physical implementation of the design intervention.

Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1C of the questionnaire by AWPS respondents before physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q2, Q1 vs. Q3, Q1 vs. Q6, Q2 vs. Q4, Q2 vs. Q5, Q3 vs. Q4, Q4 vs. Q5 and Q4 vs. Q6 there was significant difference ($p < 0.001$). It was also noted that after intervention in AWPS there was significant difference at $p < 0.01$ for questionQ1 vs. Q5 whereas for pair of question viz. Q3 vs. Q5, Q5 vs. Q6 found to be significance at $p < 0.05$. For Q1 vs. Q4, Q2 vs. Q3, Q2 vs. Q6, and Q3 vs. Q6 there was no significant difference ($p > 0.05$) was found after physical implementation of the design intervention.

2.16.5. Before Intervention of CPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for Questionnaire Part 1A

- Table 12 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1A of the questionnaire by CPS respondents before physical implementation of ergonomics design intervention.
- It was observed that, there was significant difference at $p < 0.001$ between most of the pairs of questions, when subjected to between-group analyses.
- It was also noted that, before intervention for CPS responses, there was significant difference at $p < 0.01$ between few pairs of questions; whereas for some of the pairs of questions, the difference was significant at $p < 0.05$.
- For all other questions there was no significant differences ($p > 0.05$) was found before physical implementation of the design intervention. The detail resemblance between pairs of questions are shown in Appendix C-1.3.

Table 12. Significance Table of before intervention CPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6	Q_7	Q_8	Q_9	Q_{10}	Q_{11}	Q_{12}	Q_{13}	Q_{14}	Q_{15}	Q_{16}	Q_{17}	Q_{18}	Q_{19}	Q_{20}	Q_{21}	Q_{22}	Q_{23}	Q_{24}	Q_{25}	Q_{26}	Q_{27}
Q_1	—	***	NS	NS	NS	NS	***	NS	NS	NS	**	NS	***	***	NS	***	*	NS	***	NS	NS	NS	***	***	***	***	***
Q_2		—	***	***	***	***	NS	*	***	***	NS	***	NS	NS	***	NS	NS	***	*	NS	***	***	*	*	*	*	*
Q_3			—	NS	NS	NS	***	NS	NS	NS	NS	NS	***	***	NS	***	NS	NS	***	NS	NS	NS	***	***	***	***	***
Q_4				—	NS	NS	**	NS	NS	NS	NS	NS	***	***	NS	**	NS	NS	***	NS	NS	NS	***	***	***	***	***
Q_5					—	NS	***	NS	NS	NS	NS	NS	***	***	NS	**	NS	NS	***	NS	NS	NS	***	***	***	***	***
Q_6						—	***	NS	NS	NS	NS	NS	***	***	NS	***	NS	NS	***	NS	NS	NS	***	***	***	***	***
Q_7							—	*	***	***	NS	***	NS	NS	***	NS	NS	***	*	NS	***	***	*	*	*	*	*
Q_8								—	NS	NS	NS	NS	*	***	NS	NS	NS	NS	***	NS	NS	NS	***	***	***	***	***
Q_9									—	NS	*	NS	***	***	NS	***	*	NS	***	NS	NS	NS	***	***	***	***	***
Q_{10}										—	NS	NS	***	***	NS	***	NS	NS	***	NS	NS	NS	***	***	***	***	***
Q_{11}											—	**	NS	***	**	NS	NS	**	***	NS	**	**	***	***	***	***	***
Q_{12}												—	***	***	NS	***	*	NS	***	NS	NS	NS	***	***	***	***	***
Q_{13}													—	NS	***	NS	NS	***	NS	NS	***	***	NS	NS	NS	NS	NS
Q_{14}														—	***	*	***	***	NS	***	***	***	NS	NS	NS	NS	NS
Q_{15}															—	***	*	NS	***	NS	NS	NS	***	***	***	***	***
Q_{16}																—	NS	***	*	NS	***	***	*	*	*	*	*
Q_{17}																	—	*	***	NS	*	*	***	***	***	***	***
Q_{18}																		—	***	NS	NS	NS	***	***	***	***	***
Q_{19}																			—	***	***	***	NS	NS	NS	NS	NS
Q_{20}																				—	NS	NS	***	***	***	***	***

Q_{21}																					—	**NS**	***	***	***	***	***
Q_{22}																						—	***	***	***	***	***
Q_{23}																							—	**NS**	**NS**	**NS**	**NS**
Q_{24}																								—	**NS**	**NS**	**NS**
Q_{25}																									—	**NS**	**NS**
Q_{26}																										—	**NS**
Q_{27}																											—

*Significances expressed by * against the pair of question, where *, ** and *** denotes significant difference by $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively. NS-No significant difference ($p > 0.05$).*

2.16.6. After Intervention of CPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for Questionnaire Part 1A

- Table 13 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1A of the questionnaire by CPS respondents after physical implementation of ergonomics design intervention.
- It was observed that, there was significant difference at $p < 0.001$ between most of the pairs of questions, when subjected to between-group analyses.
- It was also noted that, after intervention for AWPS responses, there was significant difference at $p < 0.01$ between some pairs of questions; whereas for few pair of questions the difference was significant at $p < 0.05$.
- For majority of the questions there was no significant difference ($p > 0.05$) was found after physical implementation of the design intervention. The detail resemblance between pairs of questions are shown in Appendix C-1.4.

Table 13. Significance Table of after intervention CPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6	Q_7	Q_8	Q_9	Q_{10}	Q_{11}	Q_{12}	Q_{13}	Q_{14}	Q_{15}	Q_{16}	Q_{17}	Q_{18}	Q_{19}	Q_{20}	Q_{21}	Q_{22}	Q_{23}	Q_{24}	Q_{25}	Q_{26}	Q_{27}
Q_1	—	***	NS	NS	NS	NS	***	NS	NS	NS	***	NS	***	***	NS	***	***	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_2		—	***	***	***	***	NS	***	***	***	NS	***	NS	NS	***	NS	NS	***	***	NS	***	***	***	***	***	***	***
Q_3			—	NS	NS	NS	***	NS	NS	NS	**	NS	***	***	NS	***	**	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Q_4				—	NS	NS	***	NS	NS	NS	NS	NS	***	***	NS	***	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Q_5					—	NS	***	NS	NS	NS	*	NS	***	***	NS	***	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Q_6						—	***	NS	NS	NS	**	NS	***	***	NS	***	**	NS	NS	*	NS	NS	NS	NS	NS	NS	NS
Q_7							—	***	***	***	NS	***	NS	NS	***	NS	NS	***	***	NS	***	***	***	***	***	***	***
Q_8								—	NS	NS	NS	NS	***	***	NS	**	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Q_9									—	NS	***	NS	***	***	NS	***	***	NS	NS	**	NS	NS	NS	NS	NS	NS	NS
Q_{10}										—	*	NS	***	***	NS	***	*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Q_{11}											—	***	NS	**	***	NS	NS	***	***	NS	***	***	***	***	***	***	***
Q_{12}												—	***	***	NS	***	***	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_{13}													—	NS	***	NS	NS	***	***	NS	***	***	***	***	***	***	***
Q_{14}														—	***	NS	**	***	***	***	***	***	***	***	***	***	***
Q_{15}															—	***	***	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_{16}																—	NS	***	***	NS	***	***	***	***	***	***	***
Q_{17}																	—	***	***	NS	***	***	***	***	***	***	***
Q_{18}																		—	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_{19}																			—	***	NS	NS	NS	NS	NS	NS	NS
Q_{20}																				—	***	***	***	***	***	***	***
Q_{21}																					—	***	***	***	***	***	***
Q_{22}																						—	NS	NS	NS	NS	NS
Q_{23}																							—	NS	NS	NS	NS

Q_{24}																								—	NS	NS	NS
Q_{25}																									—	NS	NS
Q_{26}																										—	NS
Q_{27}																											—

*Significances expressed by * against the pair of question, where *, ** and *** denotes significant difference by $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively. NS-No significant difference ($p > 0.05$).*

2.16.7. Before and After Intervention of CPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire part 1B

Table 14. Significance table of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA for questionnaire part 1B

Before Intervention at CPS

	Q_1	Q_2	Q_3	Q_4	Q_5
Q_1	—	***	NS	***	***
Q_2		—	***	NS	NS
Q_3			—	***	***
Q_4				—	NS
Q_5					—

After Intervention at CPS

	Q_1	Q_2	Q_3	Q_4	Q_5
Q_1	—	***	NS	***	***
Q_2		—	***	NS	NS
Q_3			—	***	***
Q_4				—	NS
Q_5					—

*Significances expressed by * against the pair of question, where *, ** and *** denotes significant difference by $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively. NS-No significant difference ($p > 0.05$).*

Table 14 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1B of the questionnaire by CPS respondents before physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q2, Q1 vs. Q4, Q1 vs. Q5, Q2 vs. Q3, Q3 vs. Q4, and Q3 vs. Q5. It has also been observed that before intervention in CPS there was no significant difference at $p < 0.01$ and $p < 0.05$. For Q1 vs. Q3, Q2 vs. Q4, Q2 vs. Q5 and Q4 vs. Q5 there was no significant difference ($p > 0.05$) was found before physical implementation of the design intervention.

Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1B of the questionnaire by CPS respondents after physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q2, Q1 vs. Q4, Q1 vs. Q5, Q2 vs. Q3, Q3 vs. Q4, and Q3 vs. Q5 there was significant ($p < 0.001$) difference. It has also been observed that after intervention in CPS there was no significant difference at $p < 0.01$and $p < 0.05$. For Q1 vs. Q3, Q2 vs. Q4, Q2 vs. Q5 and Q4 vs. Q5 there was no significant difference ($p > 0.05$) after intervention.

2.16.8. Before and After intervention of CPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1C

Table 15. Significance table of before intervention CPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1C

Before Intervention at CPS

	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6
Q_1	—	***	***	NS	NS	***
Q_2		—	NS	***	***	NS
Q_3			—	***	***	NS
Q_4				—	***	***
Q_5					—	***
Q_6						—

After Intervention at CPS

	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6
Q_1	—	***	*	NS	NS	***
Q_2		—	NS	***	*	NS
Q_3			—	***	NS	NS
Q_4				—	***	***
Q_5					—	NS
Q_6						—

*Significances expressed by * against the pair of question, where *, ** and *** denotes significant difference by $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively. NS-No significant difference ($p > 0.05$).*

Table 15 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1B of the questionnaire by CPS respondents before physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q2, Q1 vs. Q3, Q1 vs. Q6, Q2 vs. Q4, Q2 vs. Q5, Q3 vs. Q4, Q3 vs. Q5, Q4 vs. Q5, Q4 vs. Q6 and Q5 vs. Q6. Was also observed that before intervention in CPS there was no significant difference at $p < 0.01$ and $p < 0.05$. For Q1 vs. Q4, Q1 vs. Q5, Q2 vs. Q3, Q2 vs. Q6, and Q3 vs. Q6 was found before physical implementation of the design intervention.

Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1C of the questionnaire by CPS respondents after physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q2, Q1 vs. Q6, Q2 vs. Q4, Q3 vs. Q4, Q4 vs. Q5 and Q4 vs. Q6 there was significant ($p < 0.001$) difference. There was no significant difference at $p < 0.01$ levels. It was also noted that after intervention in CPS there was significant difference for Q1 vs. Q3, and Q2 vs. Q5 at $p < 0.05$. For Q1 vs. Q4, Q1 vs. Q5, Q2 vs. Q3, Q2 vs. Q6, Q3 vs. Q5, Q3 vs. Q6 and Q5 vs. Q6 there was no significant difference ($p > 0.05$) after intervention.

2.16.9. Before Intervention of TSK (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

- Table 16 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1A of the questionnaire by TSK respondents before physical implementation of ergonomics design intervention.
- It was observed that, there was significant difference at $p < 0.001$ between most of the pairs of questions, when subjected to between-group analyses.
- It was also noted that, before intervention for TSK responses, there was significant difference at $p < 0.01$ between few pairs of questions, whereas for some pair of questions the difference was significant at $p < 0.05$.
- For majority of the questions there was no significant ($p > 0.05$) differences were found before physical implementation of the design intervention. The detail resemblance between pairs of questions are shown in Appendix C-1.5.

Table 16. Significance Table of BEFORE intervention TSK (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6	Q_7	Q_8	Q_9	Q_{10}	Q_{11}	Q_{12}	Q_{13}	Q_{14}	Q_{15}	Q_{16}	Q_{17}	Q_{18}	Q_{19}	Q_{20}	Q_{21}	Q_{22}	Q_{23}	Q_{24}	Q_{25}	Q_{26}	Q_{27}
Q_1	—	*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	***	NS	NS	*	NS	***	***	NS	NS	***	***	***	***	***
Q_2		—	*	*	NS	*	NS	NS	*	NS	NS	*	NS	NS	NS	NS	NS	*	NS	NS	*	*	NS	NS	NS	NS	NS
Q_3			—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	***	NS	NS	*	NS	***	***	NS	NS	***	***	***	***	***
Q_4				—	NS	NS	NS	NS	NS	NS	NS	NS	NS	***	NS	NS	*	NS	***	***	NS	NS	***	***	***	***	***
Q_5					—	NS	NS	NS	NS	NS	NS	NS	NS	***	NS	NS	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_6						—	NS	NS	NS	NS	NS	NS	NS	***	NS	NS	*	NS	***	***	NS	NS	***	***	***	***	***
Q_7							—	NS	NS	NS	NS	NS	NS	*	NS	NS	NS	NS	*	*	NS	NS	*	*	*	*	*
Q_8								—	NS	NS	NS	NS	NS	**	NS	NS	NS	NS	**	**	NS	NS	**	**	**	**	**
Q_9									—	NS	NS	NS	NS	***	NS	NS	*	NS	***	***	NS	NS	***	***	***	***	***
Q_{10}										—	NS	NS	NS	*	NS	NS	NS	NS	*	*	NS	NS	*	*	*	*	*
Q_{11}											—	NS	NS	***	NS	NS	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_{12}												—	NS	***	NS	NS	*	NS	***	***	NS	NS	***	***	***	***	***
Q_{13}													—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Q_{14}														—	***	NS	NS	***	NS	NS	***	***	NS	NS	NS	NS	NS
Q_{15}															—	NS	NS	NS	***	***	NS	NS	***	***	***	***	***
Q_{16}																—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Q_{17}																	—	*	NS	NS	*	*	NS	NS	NS	NS	NS
Q_{18}																		—	***	NS	NS	***	***	***	***	***	***
Q_{19}																			—	NS	***	***	NS	NS	NS	NS	NS
Q_{20}																				—	***	***	NS	NS	NS	NS	NS
Q_{21}																					—	NS	***	***	***	***	***

Q_{22}																						—	***	***	***	***	***
Q_{23}																							—	NS	NS	NS	NS
Q_{24}																								—	NS	NS	NS
Q_{25}																									—	NS	NS
Q_{26}																										—	NS
Q_{27}																											—

Significances expressed by * against the pair of question, where *, ** and *** denotes significant difference by $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively. NS-No significant difference ($p > 0.05$).

2.16.10. After Intervention of TSK (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

- Table 17 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1A of the questionnaire by TSK respondents after physical implementation of ergonomics design intervention.
- It was observed that, there was significant difference at $p < 0.001$ between most of the pairs of questions, when subjected to between-group analyses.
- It was also noted that, before intervention for TSK responses, there was significant difference at $p < 0.01$ between few pairs of questions; whereas for some pair of questions the difference was significant at $p < 0.05$.
- For majority of the questions there was no significant differences ($p > 0.05$) was found after intervention. The detail resemblance between pairs of questions are shown in Appendix C-1.6.

Table 17. Significance Table of after intervention TSK (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6	Q_7	Q_8	Q_9	Q_{10}	Q_{11}	Q_{12}	Q_{13}	Q_{14}	Q_{15}	Q_{16}	Q_{17}	Q_{18}	Q_{19}	Q_{20}	Q_{21}	Q_{22}	Q_{23}	Q_{24}	Q_{25}	Q_{26}	Q_{27}
Q_1	—	NS	NS	NS	NS	NS	*	NS	NS	*	NS	NS	**	***	NS	***	***	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_2		—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Q_3			—	NS	NS	NS	*	NS	NS	*	NS	NS	**	***	NS	***	***	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_4				—	NS	NS	*	NS	NS	*	NS	NS	**	***	NS	***	***	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_5					—	NS	NS	NS	NS	NS	NS	NS	NS	***	NS	NS	*	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_6						—	*	NS	NS	*	NS	NS	**	***	NS	***	***	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_7							—	NS	*	NS	NS	*	NS	NS	NS	NS	NS	*	*	NS	*	*	*	*	*	*	*
Q_8								—	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Q_9									—	*	NS	NS	**	***	NS	***	***	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_{10}										—	NS	*	NS	NS	NS	NS	NS	*	*	NS	*	*	*	*	*	*	*
Q_{11}											—	NS	NS	***	NS	*	**	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_{12}												—	**	***	NS	***	***	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_{13}													—	NS	NS	NS	NS	**	**	NS	**	**	**	**	**	**	**
Q_{14}														—	***	NS	NS	***	***	NS	***	***	***	***	***	***	***
Q_{15}															—	NS	NS	NS	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_{16}																—	NS	***	***	NS	***	***	***	***	***	***	***
Q_{17}																	—	***	***	NS	***	***	***	***	***	***	***
Q_{18}																		—	NS	***	NS	NS	NS	NS	NS	NS	NS
Q_{19}																			—	***	NS	NS	NS	NS	NS	NS	NS
Q_{20}																				—	***	***	***	***	***	***	***
Q_{21}																					—	NS	NS	NS	NS	NS	NS

Q_{22}																						—	**NS**	**NS**	**NS**	**NS**	**NS**
Q_{23}																							—	**NS**	**NS**	**NS**	**NS**
Q_{24}																								—	**NS**	**NS**	**NS**
Q_{25}																									—	**NS**	**NS**
Q_{26}																										—	**NS**
Q_{27}																											—

*Significances expressed by * against the pair of question, where *, ** and *** denotes significant difference by $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively. NS-No significant difference ($p > 0.05$).*

2.16.11. Before and After Intervention of TSK (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire part 1B

Table 18. Significance table of TSK (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire part 1B

Before Intervention at TSK

	Q_1	Q_2	Q_3	Q_4	Q_5
Q_1	–	NS	**	NS	NS
Q_2		–	***	NS	NS
Q_3			–	**	***
Q_4				–	NS
Q_5					–

After Intervention at TSK

	Q_1	Q_2	Q_3	Q_4	Q_5
Q_1	–	NS	**	NS	NS
Q_2		–	***	NS	NS
Q_3			–	**	***
Q_4				–	NS
Q_5					–

*Significances expressed by * against the pair of question, where *, ** and *** denotes significant difference by $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively. NS-No significant difference ($p > 0.05$).*

Table 18 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1B of the questionnaire by TSK respondents before physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q2 vs. Q3, and Q3 vs. Q5 there was significance ($p < 0.001$) difference. It was also observed that before intervention in TSK there was significant difference at $p < 0.01$ between questions Q1 vs. Q3, and Q3 vs. Q4; whereas there was no significant difference at $p < 0.05$. For Q1 vs. Q2, Q1 vs. Q4, Q1 vs. Q5, Q2 vs. Q4, Q2 vs. Q5 and Q4 vs. Q5 there was no significant difference ($p > 0.05$) before intervention.

Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1B of the questionnaire by TSK respondents after physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q2 vs. Q3, and Q3 vs. Q5 there was significance ($p < 0.001$) difference. It was observed that there was significant difference at $p < 0.001$between the question when subjected to between group analyses of questions such as Q2 vs. Q3, and Q3 vs. Q5 there was significance ($p < 0.001$) difference. It was also observed that before intervention in TSK there was significant difference at $p < 0.01$ between questions Q1 vs. Q3, and Q3 vs. Q4; whereas there was no significant difference at $p < 0.05$. For Q1 vs. Q2, Q1 vs. Q4, Q1 vs. Q5, Q2 vs. Q4, Q2 vs. Q5 and Q4 vs. Q5 there was no significant difference ($p > 0.05$) after intervention.

2.16.12. Before and After Intervention of TSK (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire part 1C

Table 19. Significance table of TSK (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1C

Before Intervention at TSK

	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6
Q_1	–	***	**	NS	NS	NS
Q_2		–	NS	***	**	**
Q_3			–	***	NS	NS
Q_4				–	***	***
Q_5					–	NS
Q_6						–

After Intervention at TSK

	Q_1	Q_2	Q_3	Q_4	Q_5	Q_6
Q_1	–	***	*	NS	NS	***
Q_2		–	NS	***	*	NS
Q_3			–	***	NS	NS
Q_4				–	***	***
Q_5					–	NS
Q_6						–

*Significances expressed by * against the pair of question, where *, ** and *** denotes significant difference by $p < 0.05$, $p < 0.01$ and $p < 0.001$ respectively. NS-No significant difference ($p > 0.05$).*

Table 19 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1C of the questionnaire by TSK respondents before physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q2, Q2 vs. Q4, Q3 vs. Q4, Q4 vs. Q5, and Q4 vs. Q6. It was also observed that before intervention in TSK there was significant difference $p < 0.01$ between question Q1 vs. Q3, Q2 vs. Q5, and Q2 vs. Q6; whereas there was no significant difference at $p < 0.05$. For Q1 vs. Q4, Q1 vs. Q5, Q1 vs. Q6, Q2 vs. Q3, Q3 vs. Q5, Q3 vs. Q6 and Q5 vs. Q6 there was no significant difference ($p > 0.05$) before intervention.

Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1 of the questionnaire by TSK respondents after physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – between the question when subjected to between group analyses of questions such as Q1 vs. Q2, Q1 vs. Q6, Q2 vs. Q4, Q3 vs. Q4, Q4 vs. Q5 and Q4 vs. Q6. It was observed that after intervention in TSK there was no significant difference at $p < 0.01$; whereas there was significant difference at $p < 0.05$ for Q1 vs. Q3, and Q2 vs. Q5. For Q1 vs. Q4, Q1 vs. Q5, Q2 vs. Q3, Q2 vs. Q6, Q3 vs. Q5, Q3 vs. Q6 and Q5 vs. Q6 there was no significant difference ($p > 0.05$) after intervention.

2.17. Conclusion

This chapter scrutinizes the occupational well-being and job stress of women police at AWPS, CPS and TSK in India. The findings were also compared with that of AWPS located in metropolitan city of China (i.e., Hangzhou). It was found from survey that women police in all police stations in Assam need appropriate basic facilities for performing their job. The conditions of basic facilities were much poorer in CPS followed by AWPS and TSK. Specifically, women police expressed their job is as 'exhaustive', and were also concerned about job promotion and benefits in all police stations in India in tune to male counterparts. Due to lesser number of woman-staff in CPS, the dominance of male staff was noticed and hence, women police were dissatisfied (in comparison to AWPS). As compared to India, women police in China was found to be relatively more comfortable with the infrastructure. It was also noted that they were satisfied with wages and also the job appeared to be less exhaustive due to presence of higher number of women police. This is consistent with their size of economy and also higher gross domestic product (GDP) per capita. However, similar to India, they were also concerned about the rules for job promotion and also facilities (child care centre etc.) and transport convenience specifically designed for women. On field accessories and need for basic amenities this survey expresses for further study need and ergonomic design intervention may be looked into with specific context.

CHAPTER 3- DESIGN INTERVENTION WITH REFERENCE TO WORKSTATION AND AMENITIES

This chapter comprises trails on possible work station design i.e. women police station and police stations with amenities and space layout as perceived by women police personnel. Some of the recommendation were implemented during the study period which confirms the need for such ergonomics design development to improve working condition of women police.

CHAPTER 3

DESIGN INTERVENTION WITH REFERENCE TO WORKSTATION AND AMENITIES

3.1. Introduction

Government is inducting more and more women into police as a part of its empowerment obliged; a survey conducted among those serving has found that they still tackle with lack of basic amenities like toilets, want of privacy, accommodation and lack of staff. These personnel have to go thirsty for long hours while on duty as there are scarcely any toilets around. A familiar problem faced by women coming to the woman police station in the Guwahati city and Tinsukia district of Assam is the lack of basic amenities including toilets, a place to sit, availability of drinking water, etc. For improving the working condition of women personnel and augment the representation of women in the police force to tackle the specific requirements of women in the fast changing society. Hence ergonomic design intervention is becoming important to introduce among the women police personnel and thus increase the productivity.

3.2. Proposal regarding Ergonomics Design Intervention for AWPS / CPS / TSK in India and Implementation at AWPS

3.2.1. Ergonomics Design Intervention for AWPS, Pan Bazar, Guwahati

A vivid, interactive interview with policewomen of AWPS (Pan Bazar, Guwahati) and the questionnaires they responded to, revealed a gross mixed trend of opinions regarding the current scenario in terms of exposure to environmental and occupational stress and perceived well-being, conveniences and job satisfaction. The survey reports, collected before proposing the ergonomic design interventions, revealed a gross dissatisfaction identifying some real-time inadequacies pertaining to womanness issues like basic amenities, privacy, proper sitting area, convenience facilities etc. Focusing on the gross scenario posed a need of ergonomic interventions leading to a healthier work environment. So this study proposed to approach with some ergonomic intervention in the area of basic amenities for occupational well-being like convenience facilities, adequate privacy, etc. to the higher authority, which resulted in the development of infrastructure pertaining to convenience /amenities. This in turn resulted in the

betterment of than existing workplace with improved morale and comfortable working condition and reduced stress.

Figure.ure.41. Overview of an existing layout of AWPS before intervention

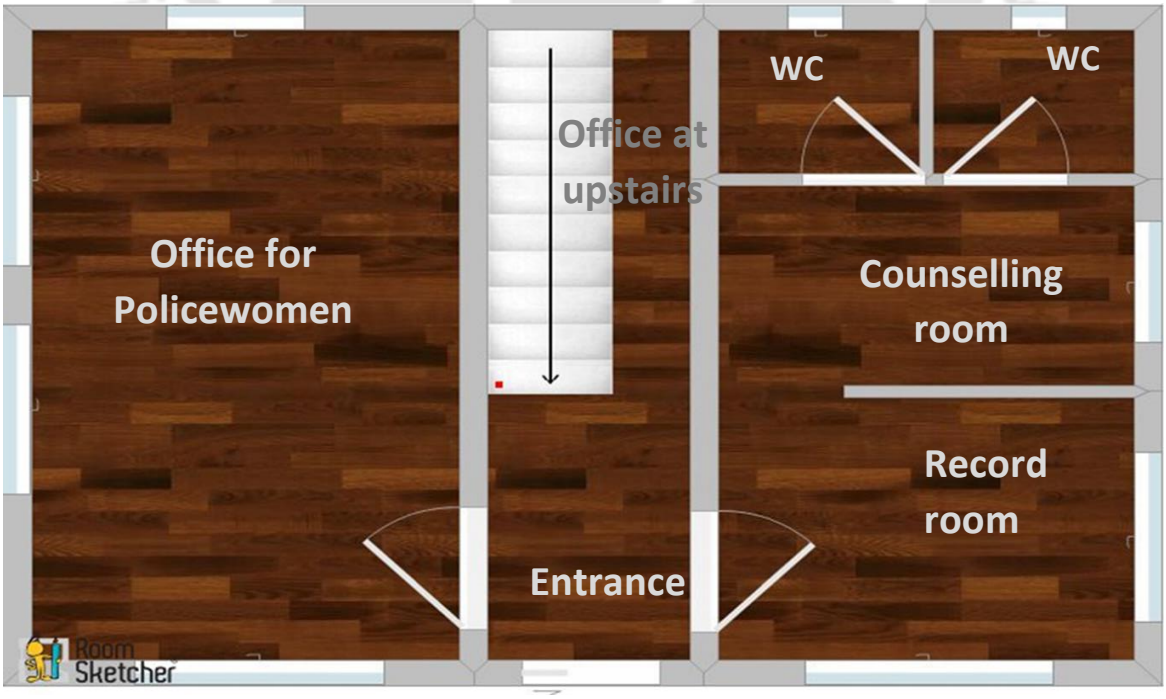

Figure. 42. Overview of a proposed AWPS after ergonomic design intervention

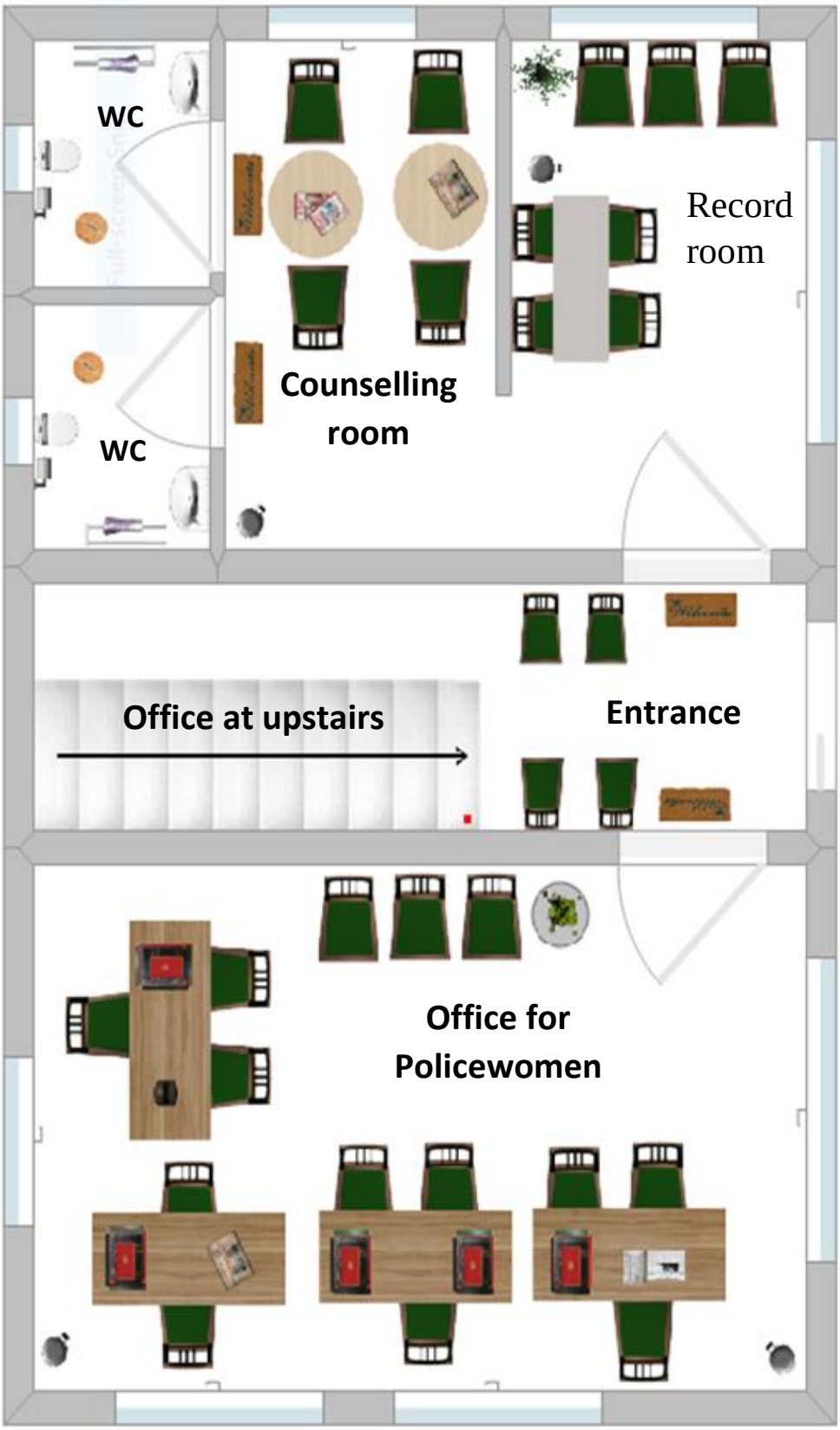

Figure. 43. overview of a proposed AWPS with furniture arrangement for betterment of the Policewoman for increasing their productivity hence reducing occupational hazards and stress in the workplace

***Physical Implementation of Ergonomics Design Intervention proposed for AWPS, Pan Bazar, Guwahati*:**

Ergonomic interventions embrace the concern of entire work place, work methods as well as the work organization, etc. Moreover, ergonomic intervention would probably facilitate the individuals for prevention of various health hazards which may cause due to improper working environment. The present study proposed implementation of some useful ergonomic interventions approached for the AWPS to manoeuvre the physical susceptibilities relevant to physical hazards. The intervention was designed after survey of the present situation through the questionnaire in detail following personnel interview with working individuals (highlighting various occupational and environmental issues in their workplace). During the investigation, lack of basic amenities, poor design and age-old furniture, along with improper sitting posture was found to be the prime reason behind the reported issue. Therefore, a design incorporating suitable ergonomic interventions was proposed for the existing AWPS, which they implemented accordingly (Figure. 41, 42, 43 also schematic diagram of Figure. 52, 53, 54, 55 and 56). In addition to it, individuals were made aware of proper sitting posture in order to work comfortably for prolonged time.

Analysis of the questionnaire revealed that, the police stations as workstation had a significant influence on employee's efficiency. With a virtuous work environment, women police could accomplish stress-free workplace, which could in turn enhance the overall efficiency. The workplace before and after implementing ergonomic design interventions was shown in the Figure. 43. Analysis of the situation in AWPS before the intervention elucidated that, the space was too clumsy, lacking proper sitting area with age-old furniture; while after implementation of the proposed intervention, fully modernised furniture at office, sitting area and counselling desk were allotted in the workplace for better working conditions of the women police personnel.

Table 20. Comparative observations on exposure to occupational and environmental stress and perceived well-being of policewomen across the AWPS Pan Bazar Guwahati before and after intervention

Q Sl No	BEFORE INTERVENTION					AFTER INTERVENTION				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Q1	43					43				
Q2	43					43				
Q3	43					43				

Q4	43						**25**		**18**	
Q5	43					43				
Q6	18		16		9	18		16		9
Q7	26	17				26	17			
Q8	21	14		8		21	14		8	
Q9		16		11	16		16		11	16
Q10	20	23				20	23			
Q11	43					43				
Q12	43					43				
Q13	8	12	18	5		8	12	18	5	
Q14				43					43	
Q15		24		19			24		19	
Q16	43						**6**		**37**	
Q17	43					43				
Q18	27	10		6		27	10		6	
Q19	43									43
Q20	43									43
Q21	43									43
Q22	43									43
Q23	43									43
Q24	43									43
Q25	33	10							33	10
Q26	37	6								43
Q27	30	13								43

(1) represents Strongly Agree, **(2)** Agree, **(3)** Neutral, **(4)** Disagree and **(5)** Strongly Disagree

Tabulated representation of the questionnaire-based survey on exposure to occupational and environmental stress and perceived well-being. Q 1–27 represents the questions from the questionnaire (Part 1A, explained in the methodology section).

(Q1) Law enforcement is generally regarded as a masculine profile, therefore we who are inducted in this job, felt that convenience is equally important for us.

(Q2) Administrative over shifting is common.

(Q3) Staff shortages cause stress.

(Q4) Lack of resources cause stress.

(Q5) In equal sharing of work responsibilities cause stress.

(Q6) Shift work causes stress for special cases like pregnancy, expecting mother, lactating mother, menstruation period.

(Q7) Traumatic events affects psychophysical health.

(Q8) Social life outside the job is impacted by duty regimen.

(Q9) Occupation-related health issues in special cases like pregnancy, expecting mother, lactating mother, menstruation period.

(Q10) Not finding time to stay in good physical condition.

(Q11) Feelings like you are always on the job and other responsibilities are compromised**.**

(Q12) Working beyond working hours brings boredom.

(Q13) Noisy work area.
(Q14) Frequent interruptions brings disturbance in the work place.
(Q15) Inadequate or poor quality equipment/maintenance.
(Q16) Unfair work environment in this job.
(Q17) Lack of a modern system/apparatus on duty.
(Q18) Occupational health issues (e.g. back pain, neck pain, and joint pain).
(Q19) A good infrastructure brings satisfactions while doing work.
(Q20) Lack of resources in professional/promotional.
(Q21) Working alone at night is risky and I don't feel good.
(Q22) Prolong standing affects physical health.
(Q23) Lack of separate modular convenience/prompt service utilities in every police station.
(Q24) Basic amenities like isolated /separate restrooms and child care units are still a major requirement for women police personnel.
(Q25) Lack of residential accommodation which is seen as one of the major impediments faced by women in joining police force.
(Q26) While I am involved in outdoor activities such as patrolling, security duty on several occasions, touring in and outside the district where mobile convenience facility is a compulsory requirement.
(Q27) Crèches/day care centre in the police station for working mother will help them to take care of their children.

Table 20 summarized the environmental stress and occupational well-being results before and after design interventions among policewomen at AWPS Guwahati. As could be observed from the table, there were major changes in responses related to satisfaction with respect to basic amenities and also fair work environment. The response was optimistic after interventions (Figure. 43, 44 including Figure.52, 53, 54, 55 and 56). Feedback in respect of fair work environment, which was negative before intervention, became positive afterwards with intervention. The results indicated that there was definitely a big role of the ergonomic design interventions contributing to an improved work environment for policewomen at AWPS.

As compared to major changes in environmental stress and occupational well-being, the change was comparatively not as much of when on-job burnout (Table 21) responses were concerned. It appeared that the design intervention in improving basic facilities had less impact on their job stress. This further implied that alone design interventions in basic amenities would not suffice. More was needed, especially in terms of job tasks policy, to improve the work environment of policewomen and thereby their productivity at AWPS Guwahati. Similarly, there were almost no changes in job satisfaction (Table 22) among policewomen before and after design interventions. Differences were however found among satisfaction index (Table 23) before and after design interventions. The differences were reflected in queries related to

basic facilities and utilities. Policewomen were found to be satisfied with the facilities and there was change in perception towards policewomen job.

Table 21. Comparative observations on on-job burnout of policewomen across AWPS Pan Bazar Guwahati before and after intervention

Q Sl No	Before Intervention					After Intervention				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Q1		10	33				**3**	**40**		
Q2				26	17				26	17
Q3				26	17				26	17
Q4	20	23				20	23			
Q5	20	9	4	5	5	20	9	4	5	5
Q6	43					43				

(1) represents Strongly Agree, **(2)** Agree, **(3)** Neutral, **(4)** Disagree and **(5)** Strongly Disagree

Tabulated representation of the questionnaire-based survey on job burnout. Q 1–6 represents the statements from the questionnaire (Part 1B, explained in the methodology section).

(Q1) My work is emotionally exhaustive.
(Q2) I feel burnt out because of my work.
(Q3) My work frustrates me.
(Q4) I feel burn out at the end of the working day.
(Q5) I feel exhausted in the morning only by the thought of another similar day at work.
(Q6) I feel quite energetic while passing time with family, friends and relations.

Table 22. Comparative observations on job satisfaction of policewomen across AWPS Pan Bazar Guwahati before and after intervention

Q Sl No	Before Intervention					After Intervention				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Q1	2		3	15	23	2		3	15	23
Q2	4	17	12	10		4	17	12	10	
Q3		37	1	5			37	1	5	
Q4		10		11	22		10		11	22
Q5		8	5	13	11		8	5	13	11
Q6				36	7				36	7

(1) represents Strongly Agree, **(2)** Agree, **(3)** Neutral, **(4)** Disagree and **(5)** Strongly Disagree

Tabulated representation of the questionnaire-based survey on job satisfaction. Q 1–6 represents the statements from the questionnaire (Part 1C, explained in the methodology section).

(Q1) I feel I am being paid a fair amount for the work I do.
(Q2) My supervisor is quite competent in doing his/her job.
(Q3) When I do a good job, I receive the recognition for it that I should receive.
(Q4) The benefits we receive are as good as most other organizations offer.
(Q5) Many of our rules and procedures make doing a good job simple.
(Q6) Those who do well on the job stand a fair chance of being promoted.

Greater body force, repetition, long term static postures, prolonged sitting or standing, exposure to heat and fatigue were among the frequently identified physical risk factors in the police job. The visual observation revealed that women in police stations were suffering from the inconveniences and discomforts due to the age-old design of their workstation. It was also found that the higher authorities preferred restricted workplace comfort in the police station. Mostly the respondents reported to suffer from musculoskeletal disorders in the shoulders, arms and neck at the respective workplace, considering the physical risk factors in the police station while on duty.

Table 23. Comparative observations on exposure to satisfaction index of policewomen across AWPS Pan Bazar Guwahati before (BI) and after intervention (AI)

Q Sl No	Yes		No	
	BI	**AI**	**BI**	**AI**
Q1	10	33	36	7
Q2		43	43	
Q3	34	9	34	9
Q4			43	
Q5			43	
Q6		43	43	
Q7		43	43	
Q8		43	43	

Tabulated representation of the questionnaire-based survey on satisfaction index. Q No 1–8 represents the questions from the questionnaire (Part 2, explained in the methodology section).

(Q1) Public attitude towards women police is awkward.
(Q2) Lack of separate utility facilities in police stations.
(Q3) Problems related to training.
(Q4) Govt accommodation for womanness related issues.
(Q5) Difficulties faced in upbringing of children – day care center is essential.
(Q6) Need to have a better working environment in terms of infrastructure.
(Q7) Provision of separate toilet facility at all offices / outpost.
(Q8) A modular mobile convenience facility while outdoor duty an immediate need.

Workplace of the AWPS suffered from low maintenance, resulting in the negative consequences, and thereby reducing the job satisfaction. Subsidence of these risk factors was the major goal to render utmost precautionary approaches in the work environment. Several respondents stated that policing is not an easy occupation for females because of insufficiency of resources, separate arrangement and amenities and communal gravities (Haider, 2015). Figure.43 & 44 showed the overview of furniture that were required for women with knee pain (elderly), prolonged sitting and pregnant women. This furniture could be utilized for AWPS and also for CPS / TSK for reducing various stress among women.

(a) Women Police Station – before study

(b) Women Police Station – now

(c) Rest room was common for all, and inside the prisoners' cell

(d) Modernized rest rooms for police, built outside the prisoners' cell

(e) Office furniture's – before study

(f) Office furniture's – now

(g) Office and sitting area – before study

(h) Office and sitting area – now

Figure. 44. Ergonomic interventions proposed for workplace improvements of Women Police Station, Pan bazar, Guwahati and some of their implementations towards facilitating the workplace environment and basic amenities. The Figure depict the conditions prior to [(a), (c), (e), (g)] and after [(b), (d), (f), (h)] ergonomic interventions.

In many of the developing countries, it is evident that the office workstation design is at the initial stage as long as a police station is concerned. The Parliamentary Committee of India on 'Empowerment of Women' also documented the working conditions of women in the police force (in its 2013-14 and 2014-15 reports) referring to this lack of facilities for the women. The Committee articulated that, these issues can only be tackled through persistent efforts and constant follow up by the government along with time bound action plans. Occupational stress occurred due to lack of amenities and resources available in the AWPS / CPS / TSK. One of the foremost apprehension stated by the policewomen was the necessity to improve privacy in the workplace (Bora et al, 2016; The Economic Times, 2016; Police and Nation, 2016). The survey found the almost all the policewomen suffered from occupational health consequences like back pain, neck pain, joint pain mostly due unavailability of resources in the workstation, most importantly, proper furniture.

Intensive discussions with women police officers manifested that, the hygienic condition of the existing washrooms was in good condition. The women mentioned about the shortage of well trained staff, competent to maintain hygienic conditions of facilities inside. However, the furniture used in the office was broken and was highly uncomfortable for women, especially during special cases such as pregnancy and menstruation period. They have even reported this to their senior officers. There was no separate furniture for visitors or police women. The area and number of furniture kept was much less than required. There was no privacy / facilities catering special womanness concerns in AWPS. Facilities shown in Figure.43 & 44 could be explored for improving physical comfort of women on duty.

Figure. 44 shows the comparison of the interior of AWPS before and after implementation of certain design interventions. These interventions were similar to the one proposed further. It could be observed that there was improved and upgraded basic amenities like toilets, modern furniture in both office and visitors' room. In addition, as was observed visually, the cleanliness and hygiene also improved considerably. These interventions were designed based on the difficulties perceived while surveying the police personnel. Though, some interventions were implemented, amenities related to child care, reception area, restrooms, and canteen were not modified, which while interacting with policewomen at AWPS, was found to be because of lack of space. In order to quantify and assess their satisfaction after implementation, questionnaire was administered again after intervention.

3.2.3. CPS Pan Bazar Guwahati

To address the observations regarding CPS Guwahati (vide Chapter 5), a 2-D (Dimensional) schematic layout (Figure.45, 46, 47) for design of a police station (incorporating ergonomic interventions) was prepared as per recommendations of Bureau of Police Research and Development (BPRD, 2015), taking the workplace comfort and basic amenities for both women and men into consideration (on special request from CPS respondents). The design included separate restrooms with toilet facilities, officers' rooms, canteen, jail, day-care centre, office space for male and female police, reporting room, a records room and reception with toilet for visiting men /women. A layout of the CPS Pan Bazar was generated, including the interior with the arrangement of furniture, fitting and fixtures (Figure. 47 also Figure.52, 53, 54, 55, 56). As mentioned earlier, these plans were shared with the higher authorities of Assam Police and the designs were provisionally approved. Some of them have been implemented as the component of the preliminary stage action plan for AWPS. Womanness-specific utilities were considered in the police station to enhance their occupational well-being and on-job performance. The entire CPS was redesigned ergonomically (Figure.46, 47 also Figure.52, 53, 54, 55, 56) and all the expedient facilities were consented as per the proposed layout.

Table 24. Comparative observations on exposure to occupational and environmental stress and perceived well-being of policewomen for CPS Pan Bazar Guwahati before and after intervention

Q	Before Intervention					After Intervention				
Sl No	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Q1	43					43				
Q2		20	23				20	23		
Q3	35	8				35	8			
Q4	30	13				30	13			
Q5	31	12				31	12			
Q6	36	7				36	7			
Q7		24	15	4			24	15	4	
Q8	25	18				24	18	1		
Q9	40	3				40	3			
Q10	33	10				33	10			
Q11	33	10				11	30		2	
Q12	43					43				
Q13	3	13	6	21			15	8	20	

Q14				3	40				3	40
Q15	43					43				
Q16	3	25		10	5	5	25		10	3
Q17	9	34				9	34			
Q18	43					43				
Q19					43	43				
Q20	12	31				12	31			
Q21	43					43				
Q22	43					43				
Q23	43									43
Q24	43									43
Q25	43									43
Q26	43									43
Q27	43									43

(1) represents Strongly Agree, **(2)** Agree, **(3)** Neutral, **(4)** Disagree and **(5)** Strongly Disagree

Tabulated representation of the questionnaire-based survey on exposure to occupational and environmental stress and perceived well-being. Q 1–27 represents the questions (Table 20) from the questionnaire (Part 1A, explained in the methodology section).

Table 24 summarized the responses of CPS respondents' environmental stress and occupational well-being before and after intervention (proposed) among policewomen in CPS Guwahati. It could be seen that based on the proposed design, there was significant change in perceptions related to requirement of basic amenities, lack of residential accommodation, requirement of separate utility and also day care centre. The views changed from strong negation to confident assertive. It appeared that, the proposed design intervention appeared to minimize their occupational stress expressively. However, it was also noted that despite this change, there was stress due to unfair work environment and also shortage of staff. Hence, there was a need to re-formulate the policy of staff hiring and also their job duties in CPS to further minimize occupational stress.

Table 25 summarized the results of survey for on-job burnout before and after intervention among policewomen in CPS Guwahati. It was realized that, based on the proposed design, policewomen at CPS would tend to consider their work emotionally less exhaustive and also less frustrating. There were, however, some policewomen, for whom their job was still exhaustive. This implied that, proposed design interventions would render some relief of on-job burnout, even if they might not completely minimize the burnout stress.

Table 25. Comparative observations on on-job burnout of policewomen for CPS Pan Bazar Guwahati before and after intervention

Q Sl No	BEFORE INTERVENTION					AFTER INTERVENTION				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Q1	21	20		2		9	14		20	
Q2	43					43				
Q3	18	17		8		8	18		16	
Q4	43					43				
Q5	43					28	15			
Q6	43					43				

(1) represents Strongly Agree, **(2)** Agree, **(3)** Neutral, **(4)** Disagree and **(5)** Strongly Disagree

Tabulated representation of the questionnaire-based survey on job burnout. Q 1–6 represents the statements (Table 21) from the questionnaire (Part 1B, explained in the methodology section).

Table 26. Comparative observations on job satisfaction of policewomen for CPS Pan Bazar Guwahati before and after intervention

Q Sl No	BEFORE INTERVENTION					AFTER INTERVENTION				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Q1	9	24			10	23	9			11
Q2	43					43				
Q3	43					43				
Q4	41	2							3	40
Q5		9	10	24			22	11	9	
Q6				8	35				14	8

(1) represents Strongly Agree, **(2)** Agree, **(3)** Neutral, **(4)** Disagree and **(5)** Strongly Disagree

Tabulated representation of the questionnaire-based survey on job satisfaction. Q 1–6 represents the statements from the questionnaire (Table 22) (Part 1C, explained in the methodology section).

Table 26 summarized the responses of policewomen in CPS Guwahati for on-job satisfaction before and after intervention. It revealed that there was no major change in views based on proposed design. This implied that proposed design interventions have little effect on job satisfaction aspects mentioned in the Table 26.

Table 27. Comparative observations on exposure to satisfaction index of policewomen for CPS Pan Bazar Guwahati before (BI)and after intervention (AI)

Q Sl No	YES		NO	
	BI	AI	BI	AI
Q1	10	33	20	23
Q2		43	43	
Q3		43	43	
Q4		43	43	
Q5		43	43	
Q6		43	43	
Q7		43	43	
Q8		43	43	

Tabulated representation of the questionnaire-based survey on satisfaction index. Q No 1–8 represents the questions (Table 23) from the questionnaire (Part 2, explained in the methodology section).

Table 27 summarized the responses of policewomen in CPS Guwahati for satisfaction index among policewomen before and after intervention. It was seen that with the proposed design, there were noteworthy enhancements in perception of policewomen towards opinions on lack of utilities, government residential accommodation, separate modular utility van, and also public stances for them. Majority of policewomen at CPS expressed of further necessity of basic utilities. They also opined that, even the public perception would change considerably with appointment of more policewomen, and this would perhaps make their representation sounder in public. This entailed the positive influence of the proposed design interventions on satisfaction index. The impact was higher than on-job satisfaction and on-job burnout.

It was perceived that as compared to the AWPS, the CPS was much larger and more comprehensive. In AWPS, there was no provision of kitchen, separate officers' room, separate lock up, barracks, etc. However, it was noted that, though there are both women and men in CPS, there was no separate toilets and washroom allotted for them. Women working in this police station either used AWPS or sometimes the common washroom only. This resulted in severe inconvenience to policewoman posted at CPS, ultimately leading to greater environmental stress (as revealed from survey and described in results). Likely due to lesser number of policewoman at CPS, there was no separate workplace for police women along with sitting area nor any specific room for women visitors, unlike other public organizations such as government hospitals, much better equipped with such facilities**.**

There is no privacy for women at all in CPS. This was one of the chief distresses for woman working in CPS. As compared to AWPS, where hygiene and also lack of specific infrastructure was of concern, here, privacy (lack of separate facilities) was perceived as the main issue. There was no separate changing room, rest room and also store room for women. This suggested lack of concern for basic infrastructure for woman working in CPS. One of the perceived reasons (stated by a respondent) for that was insignificant number of policewomen as compared to policemen there. One advantage of policewomen on duty at CPS was the aspect of their safety in CPS as compared to AWPS, as there was no night duty of women at CPS – pointed as a vulnerable threat during their interview. In terms of furniture, similar to AWPS, here also it was old and was not in good condition. For woman, there was no provision for furniture for special cases nor even for her baby care.

For improving workplace amenities in common police station, sketch of 2-D (Dimensional) plan [Figure.ure.46, 47 also Figure.ure.52, 53, 54, 55, 56] was proposed that consisted of Women rest room, Officer's room, supporting room, Officers room, Office for male, Officers room, Office for female, Canteen, Male rest room, Lock up, Crèches (Day care centre), Record room (RD1, RD2), Reception area and WC (Toilet). It could be noted from Figure.ure.47 that separate rooms such as rest room, office for female, child day care centre and toilet was allotted for women, whereas a common supporting room was allotted. These amenities were proposed and designed based on the responses obtained from surveys. These separate rooms would allow women, especially married, to manage their personal life and would further assist them to improve their concentration in their professional life. Separate office for female was provided based on the suggestions opined in course of the survey. The separate office for policewomen would ensure more privacy and ease while handling cases related to women and children, in addition to discussion with women visitors. Day care unit would be useful for women to provide proper care and nutrition of kids of especially from 6 months to 4 years old. Supporting room was common to both male and female, to provide intermediary support related to counselling, discussion and well-being of all policewomen and also visitors. Reception area was also proposed to ensure proper communication between visitors and office personal. This was not observed in most of the existing police stations. A separate WC was designed, common to both women visitors and policewomen. This would provide comfort to visitors, who sometimes have to wait for longer time at police stations for meeting regarding their cases.

A more detailed schematic layout (Figure.ure.47), that included placement of furniture, fittings and fixtures was also proposed. As observed from Figure.ure.47, there were separate restrooms allotted for ladies and gents. Their restrooms had beds also, essential for taking rest, especially during menstruation cycle. Other major differences included presence of crèche or day care centre in Police Station. These would provide lot of relief to women with younger kids. A common canteen was also proposed. A separate women office room was proposed to ensure privacy and convenience for handling cases related to women and children. This design based on the interviews and discussion with policewomen especially in CPS. An attached toilet with every office is proposed to improve work environment and comfort during office hours.

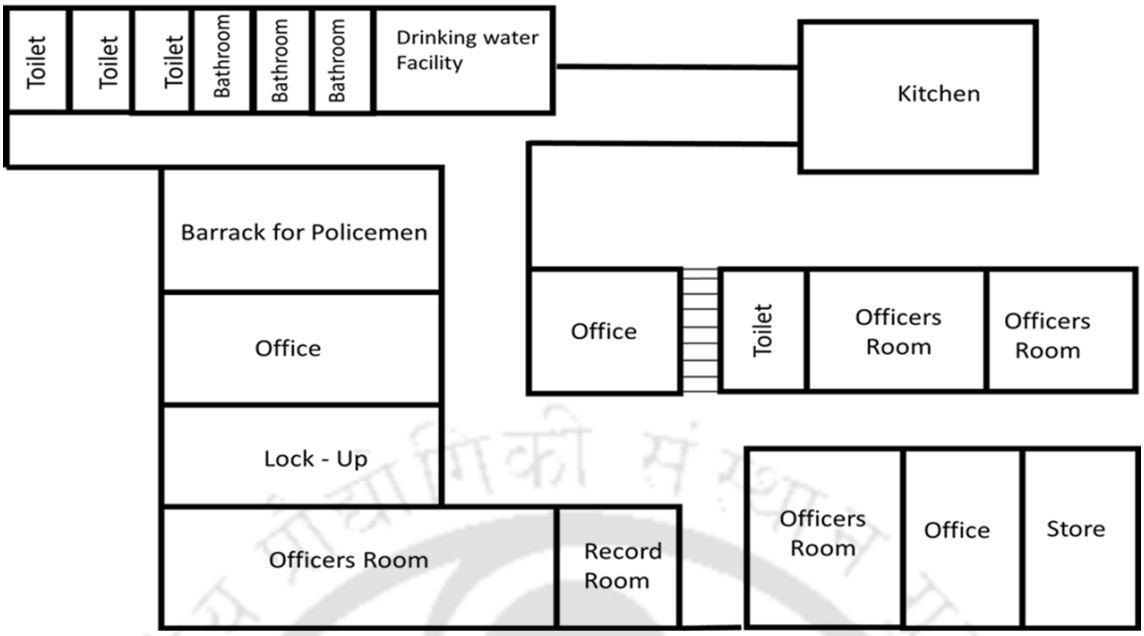

Figure.45 Overview of an existing CPS Pan Bazar Guwahati with the floor plans

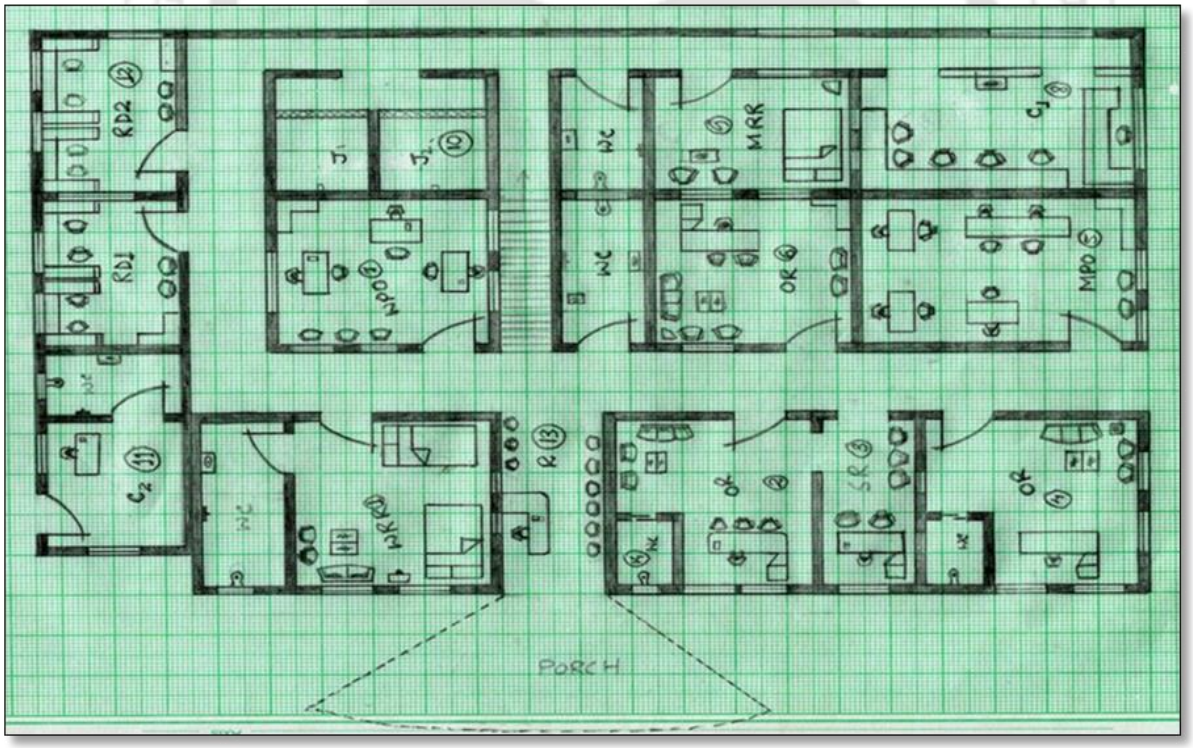

Figure.46. Overview of a schematic layout of after implementation of proposed design intervention. Layout under consideration: concept, (Design layout of a Pan Bazar police station along with arrangement of furniture, fittings and fixtures)

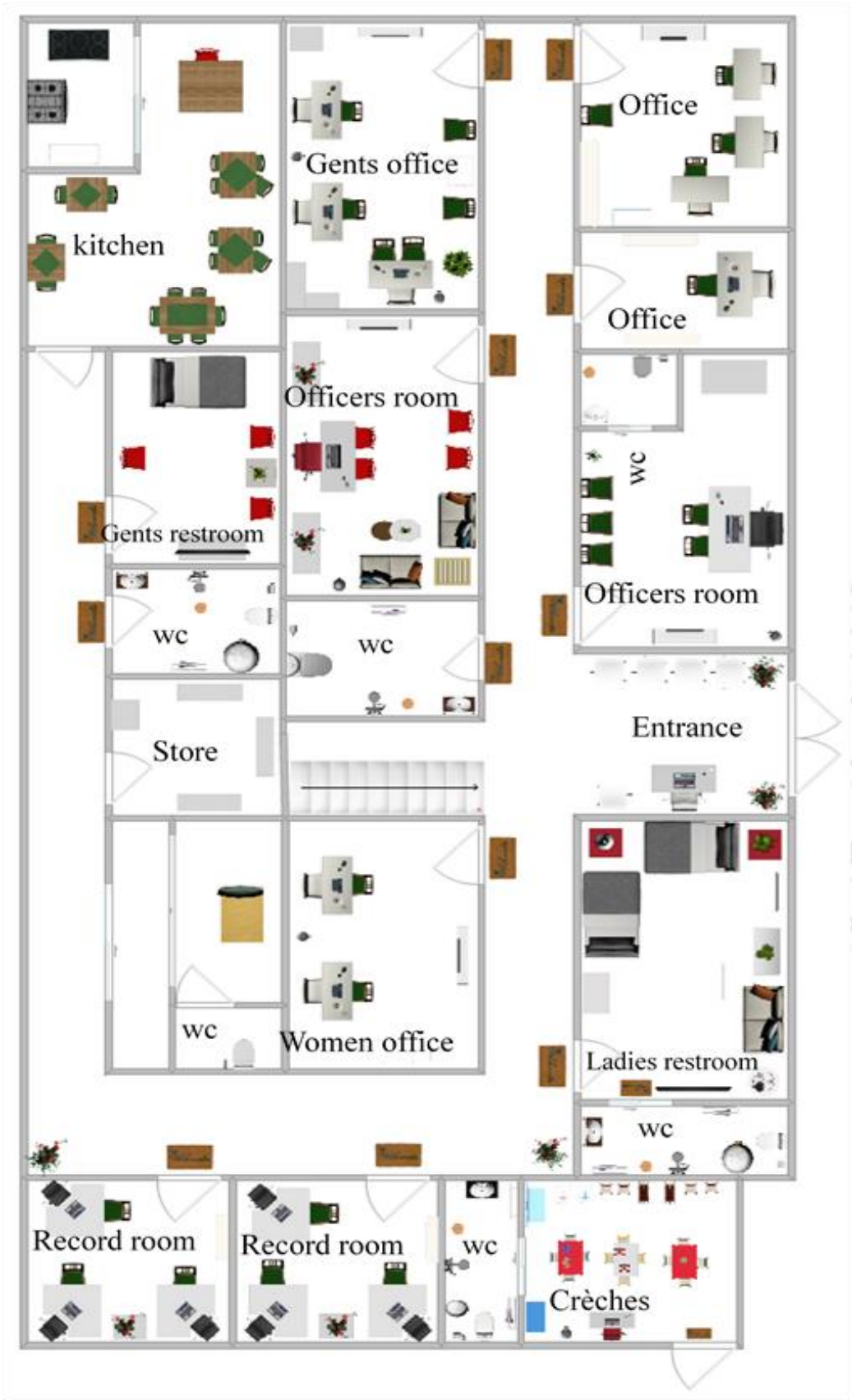

Figure.47. Overview of a schematic final Detailed layout (2Dimensional) of a Common Pan Bazar police station along with arrangement of furniture, fittings and fixtures for increasing their working capacity, safety and privacy in their workplace

3.2.4. All PS (Police Station) Combined for District Tinsukia (TSK)

During field visits to Tinsukia Police stations, visual observation was carried out to analyse changes in infrastructure before and after interventions. It was found that police stations at Magherita and Tinsukia were recently modernised. However, based on personal visit followed by physical exploration and discussion with policewomen, it was found that the layout of the police station was very conventional. The barracks were of age old and conventional design. There were no separate washrooms and restrooms for women. Residential accommodation was also very poor with no proper drinking water, washrooms and also no security for policewomen. This suggested that, even in recent time, there might be some renovation taking place, but that still follows the conventional layout without considering hygiene, privacy and safety which is necessary for women. There was no consideration for issues of womanness (for example, child care) in design of the police station.

As noted from above, problems related to womanness issues were the most common type of stress experienced by Tinsukia policewomen. The study revealed that womanness issues and the lack of basic amenity facilities in even the renovated police station have been the most common grind factors, and giving it the uppermost precedence for improvement. Hence, in this study, ergonomic design principles were explored to provide a pilot layout of the police station with consideration of womanness issues. In proposed layout, findings from surveys of all police stations were considered.

Table 28. Comparative observations on exposure to occupational and environmental stress and perceived well-being of policewomen for All PS combined for District Tinsukia (TSK) before and after intervention

Q	Before Intervention					After Intervention				
Sl No	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Q1	22					22				
Q2	5	13	4			11	10	1		
Q3	22					22				
Q4	12	10				10	12			
Q5	20	2				10	8	4		
Q6	14	8				10	12			
Q7	10	9	3			6	14	2		
Q8	8	14				16	6			
Q9	2	20				4	18			
Q10	15	7				15	7			
Q11	8	14				10	12			

Q12	22					22				
Q13	8	2		9	3	8	2		9	3
Q14				12	12				10	10
Q15		9	10	3			12	9	6	
Q16	9	13		5		7	10			
Q17	22					22				
Q18	11	8	3			10	10	2		
Q19					22		22			
Q20	12	10	2			12	10			
Q21	22					22				
Q22	22					22				
Q23	22									22
Q24	22									22
Q25	22									22
Q26	22									22
Q27	22									22

(1) represents Strongly Agree, **(2)** Agree, **(3)** Neutral, **(4)** Disagree and **(5)** Strongly Disagree

Tabulated representation of the questionnaire-based survey on exposure to occupational and environmental stress and perceived well-being. Q 1–27 represents the questions (Table 20) from the questionnaire (Part 1A, explained in the methodology section)

Table 28 summarized the survey responses on occupational well-being and environmental stress before and after intervention among policewomen in PS Tinsukia. Similar to that in CPS Guwahati, it was seen that, with the proposed design, there was noteworthy change in perception for queries related to requirement of basic amenities, lack of residential accommodation, requirement of separate utility and also child care centre. The views changed enthusiastically across the questions. The proposed design intervention appeared to minimize their occupational stress expressively. However, it should be noted that despite this change, the stress due to unfair work environment and shortage of staff existed. This spelt of the need to reform the policies of staffing and their duties in TSK to minimize occupational stress further.

Table 29 showed the responses pertaining to job burnout before and after intervention among policewomen in PS Tinsukia (Figure.41, 42, 43, 44, 45, 46, 47, 52, 53, 54, 55 and 56 were displayed to them). It was realized that, based on the proposed design, more policewomen at CPS inclined towards less frustration. However, many of them still felt exhaustive, though different from that in CPS Guwahati, where many policemen tended to feel less exhaustive after intervention. This denoted that proposed design interventions had some impact on reducing on-job burnout, but could not fully minimize the burnout stress.

Table 29. Comparative observations on on-job burnout of policewomen for All PS combined for District Tinsukia before and after intervention

Q Sl No	BEFORE INTERVENTION					AFTER INTERVENTION				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Q1		11	11			14	6	**2**		
Q2	16	6				22				
Q3	12	10				2	4		16	
Q4	9	13				22				
Q5	11	8	1	1	1	8	14			
Q6	22					22				

(1) *represents Strongly Agree,* ***(2)*** *Agree,* ***(3)*** *Neutral,* ***(4)*** *Disagree and* ***(5)*** *Strongly Disagree Tabulated representation of the questionnaire-based survey on job burnout. Q 1–6 represents the statements (Table 21) from the questionnaire (Part 1B, explained in the methodology section).*

Table 30 revealed the results of on-job satisfaction survey before and after intervention among policewomen in PS Tinsukia. Based on the proposed design, there were variable lines of opinion regarding the questions asked during the survey, though no marked improvement of the scenario was noted. This pointed of little or no effect of the proposed design on job satisfaction with reference to the aspects concerned.

Table 30. Comparative observations on-job satisfaction of policewomen for All PS combined for District Tinsukia before and after intervention

Q Sl No	BEFORE INTERVENTION					AFTER INTERVENTION				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Q1	3	13		6			7		13	2
Q2					22		22			
Q3		2		10	10	10	10		2	
Q4	22									22
Q5		4	4	11	3	4	11	4		
Q6				22			17	5		

(1) *represents Strongly Agree,* ***(2)*** *Agree,* ***(3)*** *Neutral,* ***(4)*** *Disagree and* ***(5)*** *Strongly Disagree Tabulated representation of the questionnaire-based survey on job satisfaction. Q 1–6 represents the statements (Table 22) from the questionnaire (Part 1C, explained in the methodology section).*

The results of the survey on satisfaction index (Table 31) before and after intervention among policewomen in PS Tinsukia, similar to CPS Guwahati, projected that, the proposed design induced significant changes in perception of policewomen towards views on lack of utilities, government residential accommodation, modular van with separate amenities therein and

public perception towards police. Moreover, policewomen at PS Tinsukia also had optimistic perceptions with no further requirement of utilities after the physical execution of the design. They also opined that, even the public perception would change considerably with more policewomen on job and better environment for interaction. Thus the proposed design intervention had further positive effect on satisfaction index (Figure.41, 42, 43, 44, 45, 46, 47, 52, 53, 54, 55 and 56 were shown to them). The effect was comparatively higher than in cases of job satisfaction and burnout.

Table 31. Comparative observations on exposure to satisfaction index of policewomen for All PS combined for District Tinsukia before (BI) and after intervention (AI)

Q Sl No	YES		NO	
	BI	AI	BI	AI
Q1	5	17	-	22
Q2		22	22	
Q3		22	22	
Q4		22	22	
Q5		22	22	
Q6		22	22	
Q7		22	22	
Q8		22	22	

Tabulated representation of the questionnaire-based survey on satisfaction index. Q No 1–8 represents the questions (Table 23) from the questionnaire (Part 2, explained in the methodology section).

3.3. Statistical Interpretation of Improvements due to Ergonomic Design Interventions

The responses of policewomen to satisfaction index (through Part 2 of the questionnaire**)** across the various police stations were subjected to statistical analyses using Spearman's ranked correlation to explore the reliance (if any) of physical implementation of the ergonomic design intervention on the corresponding subjective perception, vs that of 2D sketches of intervention epitomized theoretically. Table 32 represented the correlational observations (r) along with their significance (P) for different locations and conditions.

In case of AWPS, there was a significant direct correlation after intervention (AWPS/AI, $r = 0.12$, $P < 0.05$) with r^2 being 0.0146; while before interventions (AWPS/BI), r showed to be 0.01 (NS), registering no correlation at all. CPS showed no significant correlation after intervention (CPS/AI, $r=0.02$, $P > 0.05$); while before interventions (CPS/BI), r showed to be 0.01 ($P > 0.05$; NS), registering no correlation. Similarly, for TSK, there was merely any

correlation after intervention (TSK/AI, r=0.08, P > 0.05); while before interventions (TSK/BI), r showed to be 0.04 (NS), registering no correlation again. The correlation with the changes after intervention for AWPS only was significant, perhaps because of the physical implementation of ergonomics design interventions in AWPS, which, for the rest of the cases (CPS and TSK), were on paper only (physical implementation yet to come up).

Table 32. Representation of correlation properties (r) for AWPS, CPS, TSK showing the significance of satisfaction index of policewomen across the various police stations through the Questionnaire. (Part 2)

Condition	r	P	Significance	$CI_{95(L)}$	$CI_{95(U)}$
AWPS / BI	0.01	0.915	NS	-0.110	0.123
AWPS / AI	0.12	0.04	*	0.004	0.234
CPS / BI	0.01	0.81	NS	-0.103	0.130
CPS / AI	0.02	0.75	NS	-0.098	0.135
TSK / BI	0.04	0.61	NS	-0.122	0.203
TSK / AI	0.08	0.30	NS	-0.081	0.243

AWPS: All Women Police Station, CPS: Common Police Station, TSK: Tinsukia District common Police station, BI: Before Intervention, AI: after intervention; r: Spearman rank correlation; $CI_{95(L)}$ *and* $CI_{95(U)}$*: Lower and Upper limits of 95 % Confidence Interval respectively;* NS: Not Significant, * = P < 0.05.

3.4. Motivation Behind Modular Utility Van

Reminisce those days when women would rouse up early morning and along with others in tow would go out to do the early morning business in grounds basically in rural area. But now-a-days in the different part of India mostly the urban area, there has a facility of having toilets install in the public places, however, they the women still feel the same dread and revulsion while using public toilets. Mostly women wouldn't want to use a unisex washroom that is unclean, unhygienic and unsafe.

In this context Anand (2017) reported that to combat the issue, Pune Municipal Corporation (PMC), under Swachh Bharat Abhiyan has started mobile toilets which are designed especially for women as shown in Figure.48. The Pune Mahanaar Parivahan Mahamandal LTD (PMPML) buses were in an awful state and were about to get scrapped. Therefore, PMC decided to refurbish and build them into moving toilets. The Municipal Commissioner (Anand, 2017) wanted these type of toilets to be built particularly for women so that they don't face trouble using toilets when in public. It is a big bus with a nice interior and will be comfortable to use stated by City Transformation Unit (Anand, 2017).

Figure.48. Overview of Women's Mobile Toilets Launched in Pune. A bus was designed for only the women which could be moved easily from one place to another in the public place.
(source:http://swachhindia.ndtv.com/womens-mobile-toilets-launched-pune-8698/)

Figure.49. Overview of a portable toilet at Ahmedabad, normally these are used in large gathering like fair or any public events which can be moved and can used by all civics

Figure.50. Overview of a mobile toilet at IIT Guwahati campus, a fixed installation on rode side for common use. These type of toilet units are available in the public places that may serve as a ready reference.

Portable toilets are available now a day as shown in the Figure. 49 and Figure. 50 in a public place across the country. Considering these existing solutions for moving toilets, mobile utility van can be proposed for the police organization to increase the occupational wellbeing of the women police personnel at the workplace. Mobile utility van is necessary for policewomen as compared to portable toilets available publically because women police personnel faces many problems specifically during patrolling duty. Police organization doesn't seem to be interested to use this facility which is public. They want their personnel mobile utility van which is attached in the police van. The existing portable toilets facility will be used by all the people. The police job is a confidential job, therefore they prefer separate facility which will be too personnel and can only be used by the police force in terms of their need.

3.5. Concept of Mini Truck Mounted Mobile Toilet Unit

At present condition of crowded world, finding an empty space is virtually impossible. As such if need arises thinking of a building or constructing a public toilet is a far dream which is where the need of designing a compact, movable, efficient and cheap mobile toilet unit arises which has the potential to shows all the above problems efficiently. Mobile toilets unit (MTU) have several significant benefits mostly related to their mobility as they are self-contained they can be placed almost anywhere.

The toilet design has been conceived by keeping the busy area of Guwahati in mind where for e.g. the unit can be made operational anywhere as required. Details of the design are as follows:

1.These Mobile Toilets made to meet the temporary arrangements of toilets in camps, rally's, party, functions, meeting, etc. 2. These is design with attention to safety, hygiene, comfort and privacy. 3. The toilets have smart arrangement of water supply and waste disposal. 4.These is designed using high-grade raw material. 5. Easy to use, owing to their remarkable features such as lightweight, sturdy construction and systematic drainage system. 6. Easy to bring from one place to another. 7. Superb finishing and construction. 8. Easy to carry. 9. Comfortable to use. 10. Affordable prices. 11. European style of ceramic / stainless steel, urinals with stylish soap dispensers, wash basins, tissue holders and many other types of equipment. 12. An Easy to bring from one place to another. 13. Superb finishing and construction. 14. Easy to carry. 15. Comfortable to use. 16. Affordable prices. 17. European style of ceramic / stainless steel, urinals with stylish soap dispensers, wash basins, tissue holders and many other types of equipment. 18. All panels are made of FRP (fiber reinforced plastic) to avoid rusting. 19. No smell, due to air gas pipe. 20. Water storage fiber tank of 1000 liters is mounted on top of the cabin. 21. There is a ramp with handrails. 22. Utility area. 24. Light fittings. 25. Specific Jetting Operation: This multi-purpose machine can be used for cleaning toilet blocks, foot paths, cleaning/servicing of vehicles and also to extinguish small fires. 26. Jets vacuum sanitary systems provide a modern, compact and water-saving solution to this challenge, built into portable facilities for temporary toilet installation.27. The toilets will have an ozone sterilizer, a hand sanitizer and there will be periodical use of pesticides in the mobile toilet.

Other specifications such as shell materials should be from tested quality steel duly welded, PVC vinyl flooring shall be fixed on the panel, sliding doors, proper plumbing and electrical systems. The schematic 2D conceptual diagram is shown in Figure. 51. The maintenance of the mobile toilets would be done by the civic body. The civic body would place the mobile toilets at locations where the need for such facilities is higher.

The proposed MTU concept becomes an answer which is easily movable, low cost, easy maintenance and equally hygienic both structurally and environmentally providing quality services for aforesaid reasons. The quantitative experiment to verify this concept was not done, instead this idea was extended towards the modular utility van for policewomen in the next section, where it was verified from the survey of responses. Design assignment may be taken into consideration, using Indian anthropometry dimensions for design purpose.

(Chakrabarti,1997). Through these assignments containing measurements of policewomen, design of work station and necessary infrastructure can be explored

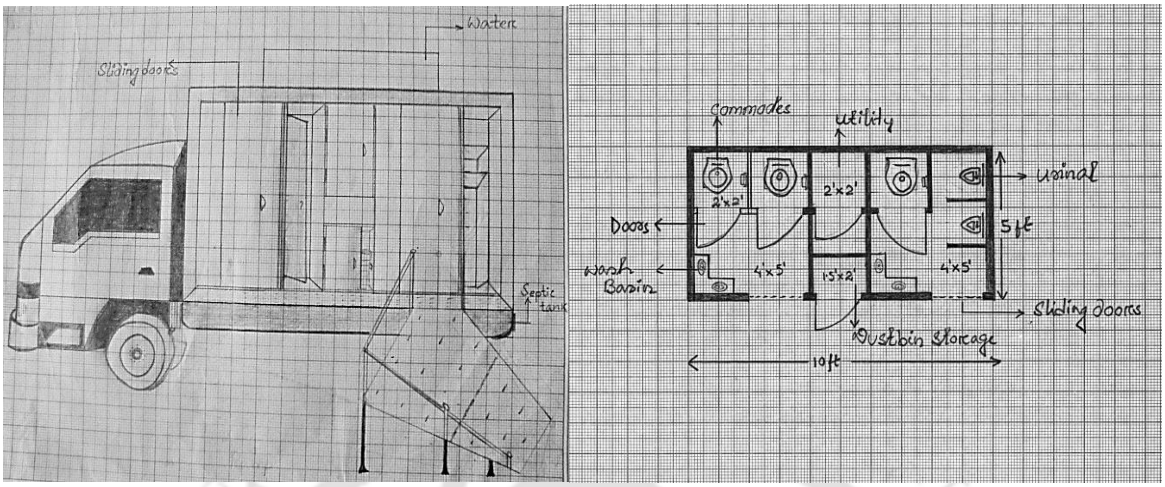

Figure.51. The schematic 2D conceptual diagram of mini truck mounted MTU. This unit can be dismountable with two separate units for ladies and gents. Here in this figure it has also been shown that the accessories were fix accordingly in this mini truck for the necessary purpose.

3.6. Survey of Responses with Proposed Modular Utility Van

The researcher, considering lack of adequate facilities in the vicinity, perceived the requirement of a mobile utility van for women police force during patrolling duty. The so-called modular police station (multi-utility vans) with washroom, pantry and rest room would allow cops to freshen up or rest for a bit, who eventually stand for hours together. The cops' job demand to keep always fit and standing for prolonged hours results in difficulties, like, they feel exhausted and forced to abstain from basic physiological necessities for a long leading to various medical problems, including kidney stones and pregnancy related problems (Bhula et al, 2015). In the north-eastern part of India, Assam is reportedly lagging behind in this regard. Reports revealed the need of some measure for the well-being of policewomen on out-of-station duty. A schematic concept of a dismountable modular mobile utility van for policewomen was conceptualized along with its interior arrangement plan, with the intention of reducing their occupation hazards, increased job satisfaction thereby reduced work burnout while on duty. A schematic concept for interior of the combined utility van was prepared on special recommendation from the higher authorities of Assam Police, to ensure better working condition of both policemen and women and to improve overall workplace flexibility – thus productivity. The mobile utility van for women police personnel during patrolling duty was imperative consequent to existing lack of adequate facilities in the vicinity. In addition to the

workspace, the researcher developed a 2D schematic model of a dismountable modular mobile utility van for policewomen, with an interior plan aiming to reduce occupation hazards, increase job satisfaction and reduce work burnout while on duty (Figure.52 to Figure.56).

Design intervention possibilities considering womanness-specific areas like, separate toilet facility, rest room and day care centre was chalked out worked out through a 2D plan. The policemen also encouraged such design interventions considering the specific issues mentioned above as an important concern and urged for a healthy, better and stress-free workplace for the police personnel (both men and women – leading to the concept of a S-Sensitive and Strict; M-Modern with mobility; A- Alert and Accountable; R- Reliable and Responsive; T-Trained and Techno-savvy (SMART) police station (Ministry of Home Affairs, 2014; Agarwal, 2014; Press Trust of India, 2017) for both the genders compatible work condition.

Both the design layouts (Figure. 52 to Figure. 56) were shown to the respondents and they anticipated that, the job satisfaction would rise with enhanced working capacity, if the recommended design were implemented in the respective workplaces. The responses before and after intervention at AWPS / CPS / TSK were shown in Table 20 – Table 32, where the assessment of responses were done in Section 4.2 – Section 4.3. These were the mutual needs in the work places to be addressed unswervingly, where ergonomic design interventions were anticipated to comprehend a more hygienic, user-friendly and amiable workplace, most importantly to enhance motivation for, pleasure from, and devotion to the job responsibilities.

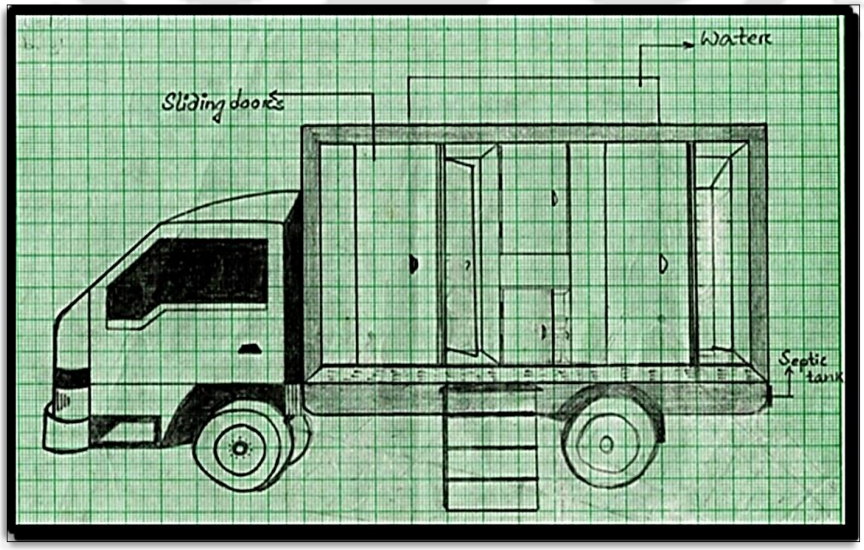

Figure.52. Proposed schematic concept of a dismountable / modular mobile utility van for police force considering police personnel. This type of unit can be developed or designed for police organisation considering all the basic facilities inside the unit

Figure.ure.53. (a)

Figure.ure.53. (b)

Figure.53. a, b, proposed Schematic Diagram (2D plan concept) of Mobile Utility Van for Policewomen with an interior plan. This Figure. are shown to the police women where little changes were made according to their request and finally came up with Figure. 54

Figure.54. Overview of a final proposed Schematic Diagram with interior planning (2D concept) of Mobile Utility Van for Policewomen (Diagrammatic representation, aspect ratio not locked and not to scale)

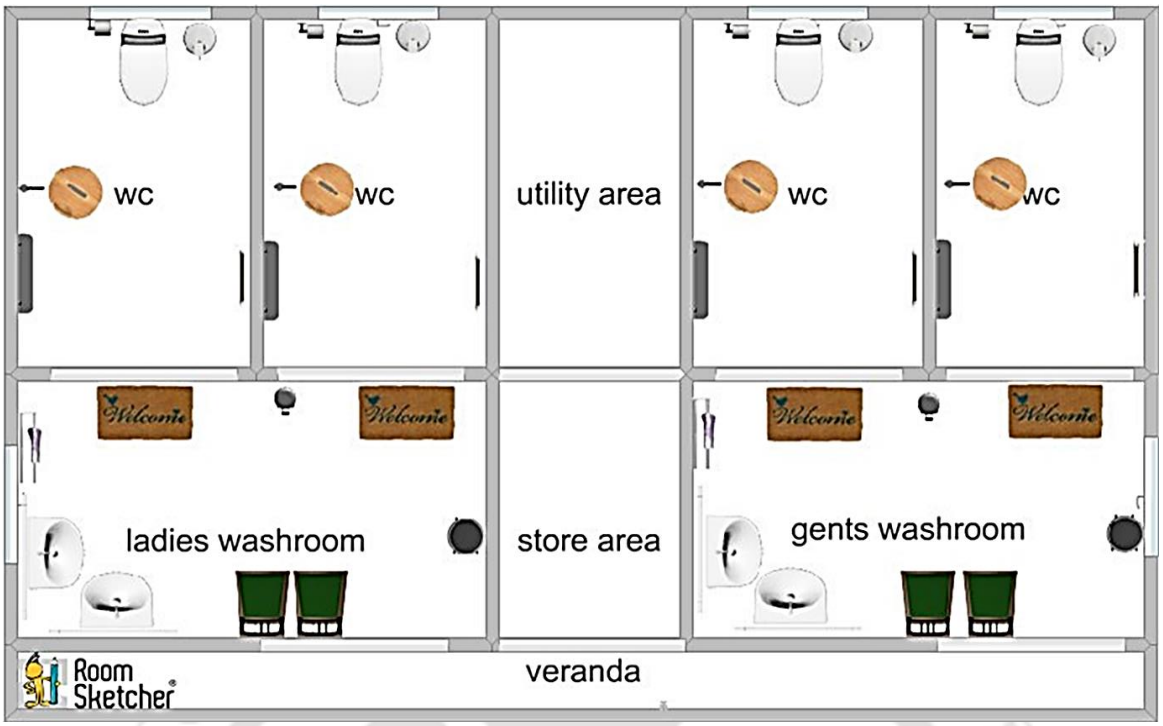

Figure.ure.55. (a)

Figure.ure.55. (b)

Figure.55. a, b, proposed Schematic Diagram (2D concept) of Mobile Utility Van considering both men and women police personnel with an interior plan. This Figure are shown to the police women and men where little changes were made according to their request and finally came up with Figure. 56

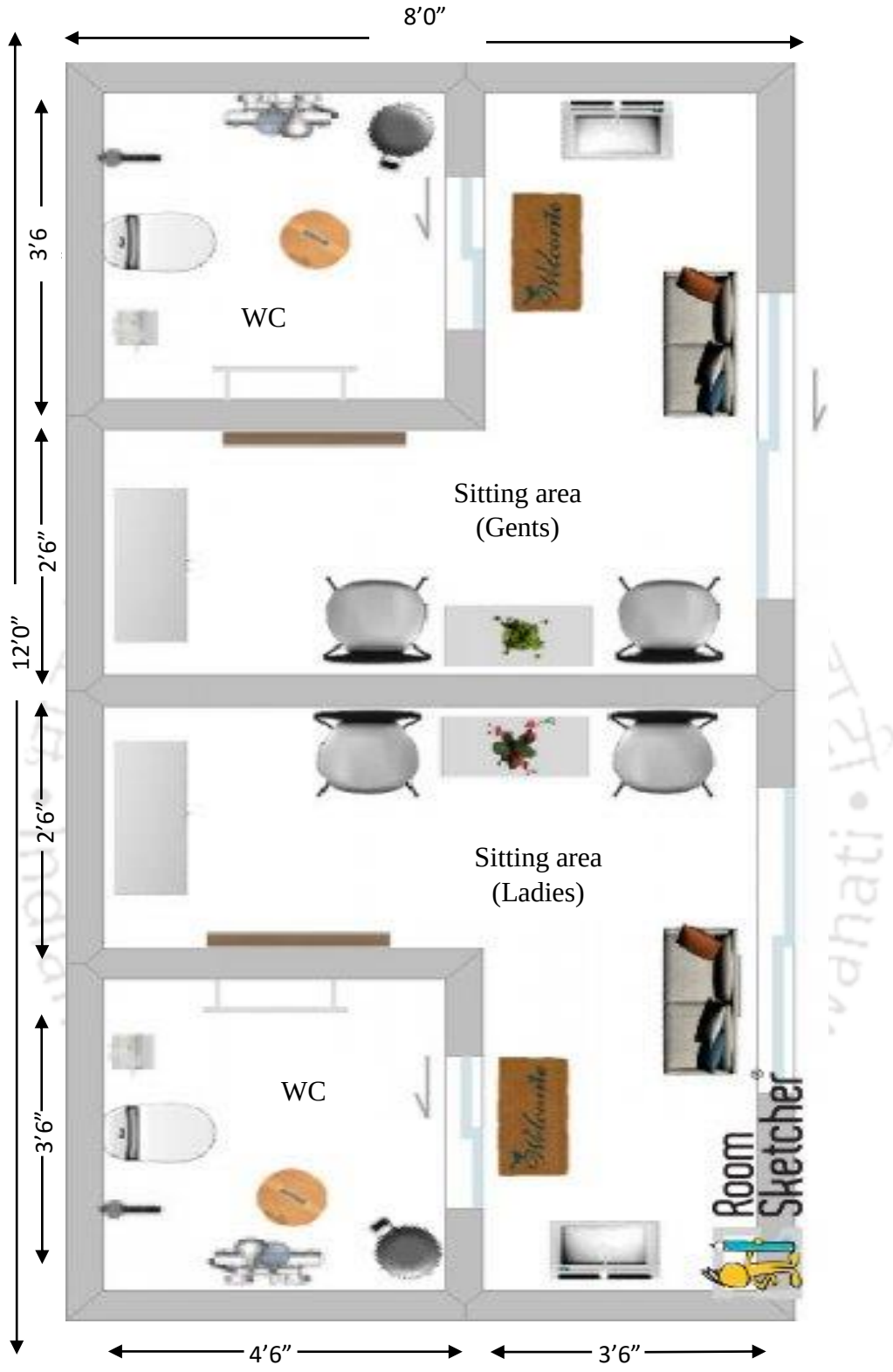

Figure.56. Overview of a final proposed Schematic Diagram (2D concept) of Mobile Utility Van considering both men and women police personnel with an interior plan. (Diagrammatic representation, aspect ratio not locked and not to scale)

3.7. Comparison of Policewomen at AWPS Pan Bazar, Guwahati (after intervention) and WPS Hangzhou (China)

With the intention of a comparative assessment of occupational well-being perspectives of policewomen in India (like, in Assam) with some other the BRIC country (deemed to be at a similar stage of newly advanced economic development), China was selected to serve the purpose. For this, Hangzhou, PRC was selected for collecting data, depending on availability of policewomen, scope of administering the questionnaire and conducting the personal interviews. In terms of occupational stress, resources and night shift policy, the response was more or less neutral. This was contradictory to that found in PSs in India. In addition, similar to that of CPS, policewomen also think that presence of child / day care centre would not increase their satisfaction level. This spoke of that, issues related to work environment might be more important, as they already had sufficient infrastructure in place.

The economic growth of China (five times the Gross Domestic Product of India) could also be the reason for greater recruitment and better job benefits of women in police services, including pay and welfares, along with other occupations. Greater number of women at workplace (in China, as compared to that in India) might be the likely factor for fair work distribution among the workforce, leading to reduction in overall work stress. Respondents were neutral when enquired about on-job stress. The uniqueness of policewomen in China was moderately less disparity among the responses, as compared to India. However, despite higher staff and availability of equipment's, there were agreement on lack of specific washrooms, childcare units as well as modular van for policewomen in China. There was also agreement on unfair work environment. Though, during interview, they introduced the modular van [Figure. 42(a)] allotted which was self-sufficient in inside.

As observed from comparison of occupational stress between WPS Hangzhou, China and AWPS Guwahati, India (after intervention, see Table 33), there was relatively much less insufficiency of resources, staff and modern equipment with policewomen in China. The interviews revealed that, there were around 400 policewomen in AWPS for metropolitan areas of China, much higher compared to 60 in AWPS Guwahati. However, after intervention in AWPS Guwahati, the assertiveness of the responses improved, though with some degree of dissatisfaction with respect to lack of resources. Views regarding discriminating / uncomfortable work environment at AWPS Guwahati improved after intervention with

somewhat better perception of the overall occupational well-being than that of AWPS earlier. It indicated that this ergonomics based design intervention was perceived to be satisfactory by the policewomen in India. Respondents were, however, neutral when enquired about the job stress.

Table 33. Comparative observations on exposure to occupational and environmental stress and perceived well-being of policewomen across the AWPS Pan Bazar Guwahati after intervention (AI) and WPS Hangzhou (China)

Q	AWPS Guwahati (AI)					WPS Hangzhou (China)				
Sl No	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Q1	43					27	4			
Q2	43								27	4
Q3	43								28	3
Q4		**25**		**18**				29	2	
Q5	43							30	1	
Q6	18		16		9			27	4	
Q7	26	17					2	29		
Q8	21	14		8				31		
Q9		16		11	16			31		
Q10	20	23						31		
Q11	43					2	29			
Q12	43								30	1
Q13	8	12	18	5				31		
Q14				43				31		
Q15		24		19		1	30			
Q16		**6**		**37**			29	2		
Q17	43								31	
Q18	27	10		6			28	3		
Q19					43		28	3		
Q20	43						28	3		
Q21	43						30	1		
Q22	43						25	6		
Q23					43		31			
Q24					43		31			
Q25					43		31			
Q26					43		31			
Q27					43				29	2

(1) represents Strongly Agree, **(2)** Agree, **(3)** Neutral, **(4)** Disagree and **(5)** Strongly Disagree

Tabulated representation of the questionnaire-based survey on exposure to occupational and environmental stress and perceived well-being. Q 1–27 represents the questions (Table 20) from the questionnaire (Part 1A, explained in the methodology section).

Table 33 showed that, for most of questions for job burn out, responses of AWPS Guwahati after intervention were quite similar to those of WPS Hangzhou. Policewomen in China apparently disagreed with aspects like burn-out due to work. This could likely be because of greater number of policewomen in WPS Hangzhou than AWPS Guwahati. Further, with regard to feeling exhausted of routine work, the policewomen in China had somewhat scattered response (more disagreed than agreed) as compared to strong agreement with that by policewomen of AWPS Guwahati.

Table 34. Comparative observations on on-job burnout of policewomen across AWPS Pan Bazar Guwahati after intervention and WPS Hangzhou (China)

Q Sl No	AWPS Guwahati (AI)					WPS Hangzhou (China)				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Q1		3	40					31		
Q2				26	17	7	24			
Q3				26	17				28	3
Q4	20	23				4	26	1		
Q5	20	9	4	5	5	3	25	3		
Q6	43						29	1	1	

(1) represents Strongly Agree, **(2)** Agree, **(3)** Neutral, **(4)** Disagree and **(5)** Strongly Disagree

Tabulated representation of the questionnaire-based survey on job burnout. Q 1–6 represents the statements (Table 21) from the questionnaire (Part 1B, explained in the methodology section).

Table 34 reflected that, for questions related to job promotion as well as rules and procedures, the responses were grossly similar for WPS Hangzhou and AWPS Guwahati (after intervention). Policewomen in China appeared to agree strongly with regards to be paid fairly and service benefits as compared to other organizations. This was likely because of higher economic growth in China and also higher income of women in general as compared to that in India. Supplementary to that, in response to the question related to supervisor's competency, the policewomen in Hangzhou was neutral as compared to mixed responses of policewomen in AWPS Guwahati.

Comparison of the outcomes of the survey (Table 35) for satisfaction index conducted on policewomen in AWPS Guwahati (after intervention) and WPS Hangzhou represented comprehensive improvement in response to aspects related to public attitude towards women, lack of separate utilities, separate modular van and better work environment among policewomen in AWPS Guwahati. With these enrichments after intervention, the policewomen from Guwahati appeared to have some more positive perceptions than those from Hangzhou.

However, for queries related to accommodation and child care centre, the response was more or less similar for personnel of both locations. Design interventions at AWPS Guwahati indeed augmented the satisfaction index among policewomen. This indicated that further design interventions could be even more useful in uplifting work environment and thereby productivity of policewomen in India at large.

Table 35. Comparative observations on job satisfaction of policewomen across AWPS Pan Bazar Guwahati after intervention (AI) and WPS Hangzhou (China)

Q Sl No	AWPS Guwahati (AI)					WPS Hangzhou (China)				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Q1	2		3	15	23	1	26	3	1	
Q2	4	17	12	10				31		
Q3		37	1	5				31		
Q4		10		11	22	3	28			
Q5		8	5	13	11			4	27	
Q6				36	7				29	2

(1) represents Strongly Agree, **(2)** Agree, **(3)** Neutral, **(4)** Disagree and **(5)** Strongly Disagree

Tabulated representation of the questionnaire-based survey on job satisfaction. Q 1–6 represents the statements (Table 22) from the questionnaire (Part 1C, explained in the methodology section).

Table 36. Comparative observations on exposure to satisfaction index of policewomen across AWPS Pan Bazar Guwahati after intervention (AI) and WPS Hangzhou (China)

Q Sl No	AWPS Guwahati (AI)				WPS Hangzhou (China)			
	Yes		No		Yes		No	
	BI	AI	BI	AI	BI	AI	BI	AI
Q1	33	10	7	36	31			
Q2	43			43	31			
Q3	9	34	34	9	31			
Q4			43	43	31			
Q5			43	43	31			
Q6	43			43	31			
Q7	43			43	31			
Q8	43			43	31			

Tabulated representation of the questionnaire-based survey on satisfaction index. Q No 1–8 represents the questions (Table 23) from the questionnaire (Part 2, explained in the methodology section).

(a)

(b)

Figure.57. Identity of police vehicles (a) Mobile police station of China (b) Police Car in Assam, India.

(a) *(b)*

Figure.58. Picture representing women police in (a) Hangzhou, China, and Assam, India (b)

(a) *(b)*

Figure.59. Women Police with their two wheelers in Hangzhou Women Police with their two wheelers in China (a) (b) Motor bike and Scooty in India ***(source:****http://indiagirlsonbike.blogspot.com/2016/11/india-lady-police-bike-ride.html#**) Scooty (Image courtesy: BCCL; obtained from article (dated April, 2013). Weblink:http://www.idiva.com/news-work-life/maharashtra-has-most-female-cops/20797)*

The mobile police station seen in Hangzhou (PRC) was advantageous for maintaining law and order in heavily populated areas in the city. The vehicle was comprehensively equipped with cameras at the top and windows having bullet proof glass (as identified from discussion with the police). The van was greatly useful for patrolling even during night. However, this van did not have provisions for separate washrooms/restrooms for women, but the common washroom was clean and hygienic enough, and anodyne for use of women also. As compared to that in Hangzhou [Figure.ure.57 (a)], police car in Assam [Figure.ure.57 (b)] was relatively simpler, containing mainly red / blue beckon, siren and wireless communication system. Unlike, mobile utility van in Hangzhou, police car in India lacks sophisticated instrumentation (cameras, LED displays, etc.). Policewomen in Hangzhou [Figure.ure.58 (a)] appeared to be equipped with better uniforms than those policewomen in India [Figure.ure.58 (b)], where design of uniform for policemen and policewomen were almost the same. Policewomen in Hangzhou had all basic equipment required for patrolling at different places. On the other hand, policewomen in India lacked of basic equipment required for patrolling. Similarly, vehicle for patrolling was also found to be more sophisticated in China with presence of red beacon, shelf to hold necessary equipment and siren [Figure.59 (a)]. For policewomen in India [Figure.59 (b)], the vehicles were not usually provided. Even if they were provided, they were relatively simple without any special provision for holding equipment.

3.8. Conclusion

This chapter summarizes two things i.e., 1) Evaluation of certain design interventions in all women and common police stations and 2) Proposing preliminary design (2-D) for work station as well as transport convenience (Modular Van). The study was carried out before and after intervention at AWPS/CPS/TSK. It has been found from first part that there is drastic increase in satisfaction level and optimism even with fewer design interventions (improvement of furniture). The satisfactions level increase is higher for women working in common police station than in All Women Police Station. Among the proposed designs, a children day care centre, attached toilet, ladies' restrooms and canteen were the major additions. A sitting area, reception and toilet is also proposed for visitors. A separate women office is proposed to ensure privacy and comfortness for handling cases related to women. In case of modular van, toilet, WC, restrooms and an office space are proposed to provide convenience during outdoor duties including safe instant planning for operations.

Comparison of Policewomen at AWPS Pan Bazar, Guwahati (after intervention) and WPS Hangzhou (China) was also done and it was found that the satisfaction level is higher in China compare to AWPS, Guwahati because of the higher economic growth. However, China also lacks modular van facilities for women.

Chapter 4 - DISCUSSION: KEY ISSUES FOR BETTERMENT OF WORK SITUATION

This chapter discuss insights from various findings with respect to existing literature and also from other countries. The first section presents the current scenario of Women police in India, where they discuss issues related to women employment including law and enforcement perspective in a relatively male dominated organization. Further, the findings of key issues related to well-being of women in police stations such as AWPS, CPS and TSK were analysed collectively and differences were discussed. A new framework for police work station is then proposed based on the identified key issues.

CHAPTER 4

DISCUSSION: KEY ISSUES FOR BETTERMENT OF WORK SITUATION

4.1. Status of well-being of women police: An Indian perspective

Today's women are essentially participating for men's equivalence outside the family premises – including their contribution to the nation also by the virtue of their entrance into once male-dominating professions such as police forces, which is still to a great extent considered to be one of the most masculinised occupation and therefore being recognized with potential and strength as shown in Figure. 60. The job of Police personnel is indeed a challenging one, which encompasses uncertainty in many terms including longer hours of duty, sudden unexpected deployments and exposure to unavoidable risky circumstances, to name a few. In the prevailing socio-cultural set-up, policewomen are often overstrained and thus, find it difficult to maintain equal between their job and home making responsibilities. This advocates some situational concerns about the women in police service like universal gender bias within the police force; the contexts / situations that policewomen are compelled to bear within course of satisfying their job responsibilities etc.

Figure. 60. Figure showing the male dominance in the police department.

As per women report (CHRI, 2015), just an average of 9% of the police is women, with rates falling as low as 2% in some parts of the world. Stereotypically, women seldom comprise more than 13% of the gross police force globally, though the contributions of women in law

enforcement have progressed during the last three decades. However, in most of the developed countries, women normally comprise up to 25% of the total force. Police job have traditionally been dominated by males. However, with more and more females entering the workforce and more prominence being placed on equal opportunity hiring, there has been a radical increase in the number of women joining police service (Jamil & Mohyuddin, 2015). Through their paid work, women around the world continues to make remarkable contribution to the economy in variety of occupations both with intellectual as well as exercising capabilities such as teachers, secretaries, doctors, machine operators, child care worker, agricultural farm women, policewomen and many more as reported by Commonwealth Human Rights Initiatives (CHRI, 2015). Engagement of women in law enforcement started merely in the early twentieth century in a very lesser records (CHRI, 2015). Progressive induction of women in law and enforcement is gradual in a phased manner (in terms of government rules and policies). Women have diverse capabilities and authenticities than men (CHRI, 2015). Policewoman could bring superfluous services and potentials, and upsurge the image of, and communal self-assurance in the police.

Over the preceding years, workplace has become an abundantly diverse environment. Organizations of all the domains across the globe are gradually envisaging their workplace approaches with due concern for women working within. Inadequate workplace space and uncompromising work requirements contribute to reduced job satisfaction due to greater work pressure for any establishment. Flexible workspace strategies are crucial in order to accommodate the progressive upsurge of modular workstations with involvement of women. Today's generation of employees deserve malleable office environments with employee-friendly job circumstances and policies. The workstation currently trends on speedy organizational changes into progressive and flexible work culture. Occupational well-being observes the need to retain pace with the rapid deviations in office-based work. Working at office (workstation) with awkward postures or for long periods can cause pain, discomfort and injury.

In India, women comprise 24.4 % of the overall workforce, where safety has become essential to their physical, professional, intellectual and emotional well-being in their workplace (Federation of Indian Chambers of Commerce and industry, FICCI). Several areas in policing are coming up which deems essential to accommodate the policewomen in those domes, along with their male counterparts. The timeworn inclinations should be set distinctly for equal opportunities through greater absorption of women in police service and identify their

potentials of accomplishment. The impression of women in law enforcement is attaining position throughout the world, and numerous nations are tapping passionate determinations to mainstream women in policing. Subsequently, the outcome of police station as workspace on the employee efficiency has been efficaciously reflected as a critical contributor to their satisfaction leading to occupational well-being and effective motivation. In light of these, the design of office workplace (police station) could be enriched with reference to occupational well-being aspects / factors of the women police personnel through implementation of ergonomic design interventions.

Stress is considered as the invisible element which affects all people at all levels; therefore, should no way be ignored. Stress denotes the dynamic state caused by the physical, psychological, and social over-demands, which are assumed to be threatening to an individual and leads to exceed his / her coping resources. Occupation of police is highly stressful, as they always have to face challenges to their life by taking risk in their daily work. A study by Nikam and Shaikh (2014) concluded that policing was one of the six professions where the higher stress led to comprise in impact in terms of poor health and low job satisfaction. Although law enforcement is, at present, still a male-dominated profession, greater number of women are joining Police Service and their contributions are being recognized. As law enforcement was instituted as (and remains, to a considerable extent) a male dominated profession, its norms for performance and behaviour is "unintentionally designed around the prototypic male officer". This adds practical obstacle in achieving equality for women. Female in law enforcement also struggle with inadequate facilities and equipment, including proper uniforms, patrol car seats, and moderately-sized handguns. During Pregnancy and the physical changes that necessarily accompany it may interfere with a woman's ability to perform required tasks. A pregnant woman could be physically or psychologically unable to execute some functions essential for law enforcement, as significant physical changes occur during pregnancy, especially with respect to a woman's ability to do physical work (Kruger, 2007). Stressors in the workplace which may affect the pregnant woman should be circumvented by outlining ergonomic practical measures (preferably through advices of the safety practitioner) to minimize all difficulties like, standing for long durations, repetitive lifting and working long hours etc. (Tapp, 2000).

Occupational stress is the key sponsor of increased workloads, overtime, unfavourable work environment and working capacity to name just a few of the many workplace hazards. The

occupational stress of policewomen has serious implications on the police organization (Vidya & Katian, 2016). The womanness related issues require extra attention with respect to the vulnerabilities, either created or exacerbated, by unfriendly work environment, poor working condition and the discrepant attitude to policewomen. Appropriate facilities could prevent injuries, enhance the employee's comfort, and help her handle the stress of work better, combined with the specific issues relevant to womanness. In view of womanness, some of the workplace complications was identified, which included lack of user-friendly facilities, perceived lack of comfort, job satisfaction and occupational wellness, workplace harassment, and deprived working condition in the workplace. In such circumstances with a chance of intimidation of life, reliance on genuine noble provision upsurges (Goswami & Burman, 2015). Hence in such circumstances, the endorsement and endless support of a peer group appears vital. Occupational stresses occur due to lack of amenities and resources available in the police station. One of the foremost apprehensions stated by the policewomen is the necessity to improve privacy in the workplace (Bora et al, 2016; The Economic Times, 2016; Police and Nation, 2016). The survey and interviews conducted by the interviewer found that, almost all the women police suffered from occupational health hazards like back pain, neck pain, joint pain due unavailability of resources in the workstation.

4.2. Identifying key issues related to well-being of women police in India

Womanness issues at workplace with specific reference to basic amenities are one of the major problems during their duty. The major objective of this research was to explore office work environment of police station with reference to womanness specific issues. The improved atmosphere of workplace would upsurge the probabilities of innovativeness, accomplishment and enhance the eminence of work productivity of policewomen. This research also indicates that despite better amenities and infrastructure in police station in China, there is some lack of support, when it comes to issues related to womanness. On the contrary, Indian policewomen were found to lack even basic facilities and an amiable workplace – giving rise to their on-job stress and affected occupational well-being.

Policewomen in the AWPS, CPS and TSK expressed as feeling tormented from inconveniences and discomforts due to the age old design of their workstations. It was also perceived that higher authority was somewhat unwitting for workplace comfort in the police stations (as

revealed by respondents from AWPS, CPS and TSK). Mostly the respondents reported of suffering from musculoskeletal disorders (mostly work-related) in the shoulders, arms and neck due to the work pattern at workplace, reckoning the consideration of the physical risk factors in the workplace. Greater body force, repetition, long term static postures, prolonged sitting and standing, exposure to heat and fatigue were among the frequently identified physical risk factors in the police job. Workplace of AWPS, CPS and TSK suffered from poor maintenance, which likely increased the negative consequences, thereby reducing the job satisfaction. Subsidence of these risk factors was the major goal to render utmost preventive approaches in the work environment. Several respondents stated that policing is not an easy occupation for females because of insufficient of resources, separate arrangement and amenities and communal gravities (Haider, 2015).

Police station (as seen in India) is a workplace with limited amenities and facilities. The workplace remains grossly identical for both all women and common police stations, which often leads to occupational health menaces, as communicated by the respondents interviewed. The interactions also conveyed the insufficiency of resources provided to the police stations. It was observed in AWPS Pan bazar Guwahati that, the existing furniture was not in a condition of reuse and beyond the scope of economic repair. It was at the end of its economic life and was functionally obsolete to refurbish, necessitating upgradation with new furniture for better working conditions (Office accommodation workspace and fit out standard, 2012). Use of the modular furniture in the workspace was suggested consequently, so as to reduce grounds on which they feel exhausted in their workplace. Portable furniture was recommended to allow modest workplace rearrangement which are usually efficient and cost-effective. There was lack of even basic amenities for women working in police station, e.g. toilets, crèches, privacy, proper sitting area etc., apart from organisational, motivational and infrastructural prerequisites like mobility including the night shifts, lack of resources, promotions and leaves. These concerns for distress of proficiency, performance, productivity affecting their personal lives imply to all those who join the police force and face these additional challenges. This could perhaps be handled with induction more women into the police service in addition to providing their requirement systematically in order to establish a user-friendly, sociable, comfortable and citizen centric workplace.

Workplace risk factors such as combination of physical, psychological, and psychophysiological were identified within the respondents. Known risk factors for the

development of low back pain include trunk postures (moderately flexed, laterally bent or twisted), high forces on the hands, single high / accumulated forces on the spine and vibration (Norman and Wells, 1998). Work and workplace stress is known guarantors to musculoskeletal ailments in lower back. The work stress is directly related to perceived level of musculoskeletal symptoms – the higher the work stress, the more prone the person is to develop musculoskeletal symptoms (Prasuna & Neeraja, 2016). Akhtar *et al*. (2014) proposed temperature of workplace and office furniture as two most prominent stressors on the output of employees. Furthermore, ergonomic interventions intend to enhance work at the levels of both individuals and organization. Thus ergonomic interventions are recommended to improve the office design for better performance. An intense series of personal interviews with policewomen and the questionnaires they responded to, explored a grossly varied tendency of sentiments concerning the current scenario in terms of exposure to occupational and environmental stress and perceived well-being, and job satisfaction.

Figure. 61. Overview of a three women police sitting with child on ground where it shows their no provision of facilities in the work place (Courtesy: Deccan Chronicle; web link accessed on 2016

(source: http://www.deccanchronicle.com/nation/current-affairs/080216/telangana-women-cops-face-bias.html)

According to CHRI (2015) report, physical conditions matter ominously, specifically for the women. Physical work atmosphere is imperative and it has a notable effect on mental processes of women police personnel. However, a better provision could be arranged to ensure the

compliant workflow of the policewomen. Necessary design interventions in the police station could certainly buoy up the working condition of the women police personnel, thus increasing their erudite progress and overall well-being (Shewta and Iqbal, 2016).

Design of office was not resistant to noise, temperature, lighting and also growing visitors. It was found from previous study (Akhtar et al, 2014) that, diverse rudiments of intangible framework have impact on productivity but furniture, temperature and light have greater impact on employee's performance. Two cardinal factors that distress the output of employees the most are temperature and office furniture of workplace. The prime feature which conceited the efficiency of policewomen was the furniture of the workspace. Similar to AWPS, there was no provision for specifically designed modular utility van for transport. a news article published by Deccan Chronicle, reported that policewomen lack facilities including child care as shown in Figure. 61.

The police job deems to levy a higher degree of stress, as well array of stressful circumstances, which can affect their physical, mental and interpersonal relations of a police personnel (Sekar et. al., 2013). The essential characteristic of office accommodation in the police station is conceivable with the provision of a more flexible workplace (Office accommodation workspace and fit out standard, 2012). Hence, it was recommended that the workspace i.e., the police station would be a place of inspiration and ideas rather than a centre for monotonous dispensation activities; and in addition to this, the workstation must reproduce organisational reconfiguration and be malleable to new conducts of working environments.

Very recently some states such as Tamil Nadu, Uttar Pradesh, Bihar and Rajasthan have enthusiastically implemented the setting up of AWPS, which are established alongside regular police stations. But in case of Assam, it is still in its initial stage. There is only one AWPS in Guwahati City with shortage of staff even therein. Encountered will lots of problems of being posted at AWPSs, it has become prominent that they should be provided with all the basic facilities to reduce their occupational hazards and increase the job satisfaction. One of the most unwavering imperfections revealed in the research was the paucity of toilet and restroom facilities for women. The toilets that are in the police stations were common for both male and female and this accessible facility is often badly maintained and unhygienic; whereas in AWPS Pan Bazar, the women personnel uses the toilet those are attached with the lock room. Reassuringly, the concern of refining conveniences for women police is being given due policy precedence in the law enforcement. Even under the Modernization of State Police Force

Scheme, the Government of India has issued guidelines in February 2013 for State Governments on matters to be addressed under the scheme (CHRI 2015), so that productivity of the women police increases. Also induction of more and more women in the police force was emphasized. Therefore, some measures adopted, for improving the workplace of AWPSs as well as patrolling duty together with the CPS, included crèches and day care centres, separate accommodation for women personnel with basic amenities including toilets, mobile toilets for women personnel during movement from one place to another and during picketing duties etc. Subsequently, an effective and competent workplace for policewomen along with safety and suitable convenience facility in such police stations (previously suited the male predominant job) has become imperial for their occupational well-being.

4.3. Framework of police work station: Inclusion of key elements related to womanness

Participatory approach was used for design intervention, enchanting the opinions of the women police personnel, recognizing the hazardous working condition and occupational stress they feel to be efficient in the existing police station. Thus an ergonomic interventions proposed for workplace improvements of AWPS, Pan bazar, Guwahati and some of their implementations towards facilitating the workplace environment and basic amenities. Secondly a schematic 2D plan was developed and recommended in the pan bazar CPS. Thirdly while the policewomen are in an outdoor duty they had to stand for a prolong hour and also these personnel have to go thirsty for long hours while on duty due to lack of facilities for them therefore a modular or a mobile utility van was schematic conceptual design was planned and recommended for improving the work environment. This design was conceptualized and developed ensuing ergonomics principles, beholding frontward to lessen the work related problems prevailing in the present workplace. Recommendation and suggestions were carried out by the relevant techniques, to evaluate efficacy of the newly developed design and thus comfort level and occupational wellness of the respondents.

A 2D schematic layout of a model police station considering workplace well-being for women was designed, recommending most of the facilities that a police station necessitates for police personnel in their relevant workplaces. Womanness explicit efficacies were considered in the police station for increasing their occupational well-being and working ability. The entire AWPS was remodelled and all the convenience facilities were implemented in line with the proposed layout as per the ergonomics design interventions for AWPS Pan Bazar.

Similar to work station plan, a utility van (Figure. 43, Fig 44, Fig 47, Fig 52 - 56) considering specific issues related to womanness was also proposed. It consisted of bathrooms, water closets, changing room, store room and a sitting area. The number of bathrooms, water closets and other rooms were not fixed and depends on the need of that particular police station. The numbers shown here are just a typical set up. Bathrooms and water closets would help police personal to maintain their hygiene and also remain fresh while on duty outside station. It might be very useful especially for carrying operations at longer distances away from police station. Even during cases of emergency especially as discussed in disturbed regions (Tinsukia), this facility would be self-sufficient for police personnel to protect themselves by staying inside the van for long hours. Even while transferring criminal, these amenities will be useful to avoid any stoppage and hence security. Likewise, a concept of utility van for both the genders has been planned with two separate convenience facilities accordingly.

The implementation of a suggested design intervention and viewpoints of ergonomics design intervention (even though partially), helped to motivate policewomen in workplace by means of enhance feeling of well-being. This study explored the comfort and convenience during on duty so as to comprehend the improvement of working condition along with workplace. Presently, there is very low involvement of women in police force and even it is not a representative count of the population (such as one women police at one police station). In regards to this they feel uncomfortable at their workplace and the police station cannot be modernising in such condition as said by higher authorities.

As a reflection of the cultural, social, economic and political contexts and institutions of lives the gender-specific health risks for women occur and vary throughout the life cycle. There are differences in anatomy, physiology, genetics, age, social status, income, activities, and environment. According to Lewis *et al*, (2005) the development of a comprehensive understanding of the differential health risks for women and men and girls and boys in various parts of the world - an understanding which goes beyond measurement of mortality and morbidity outcomes, and includes the daily physical, mental, social and economic costs for the individual and society. The pressing need for a comprehensive understanding of the differential health risks facing women is one of the main reasons why we need a conceptual and operational definition of Womanness.

As in other countries, policing in India were in crucial need of overall improvement. Nevertheless, there is an imperative requirement to dedicate precise courtesy to the dilemma

of women in the police. The insight that establishes in departmental policies and performs must be documented and addressed immediately. The lack of facilities those are vital to ensure an admirable and flexible workplace for women: from basic amenities, to shift system, lack of proper equipment and maintenance, malleable office environments, employee-friendly etc. which enable them to more easily balance work and family responsibilities.

Chapter 5 – SUMMARY AND CONCLUSION

The last chapter allied together with numerous research verdicts of the study and highlights the impact of the present findings to the frame of acquaintance. Salient research findings were discussed and deliberated about the limitation and interrogation which were elevated for future research work.

CHAPTER 5

SUMMARY AND CONCLUSION

5.1. Summary

The stress due to workplace and work environment was by and large found to be higher among policewomen across virtually all police stations available under study. This impression was perhaps largely due to lack of adequate facilities especially separate resting rooms, toilets and other womanness specific amenities like baby / child care. The policewomen also pinpointed lack of job benefits and stresses pertinent to womanness compared to other organizations. Interestingly, Occupational stress due to workplace and work environment appeared to be ignored even during special circumstances for women (periods, pregnancy etc.). There was dissatisfaction due to shortage of staff and hence some degree of fear while on night duty. One major contrast found between AWPS and CPS was trust on supervisor competency – interestingly stronger in latter than in former. This was likely because role of policewomen in CPS is relatively limited (mainly supportive). There was strong accordance for modular van / mobile police stations with separate utilities across all stations. There is substantial lack of accommodation for policewomen and also basic facilities. Despite intervention in one police station in Tinsukia mainly in terms of basic furniture, there is still occupational well-being constraints due to environmental stress at the workplace among policewomen.

Comparison of national scenario (AWPS Guwahati, India) with international (AWPS Hangzhou, China) was done in terms of workplace stress and occupational well-being with respect to policewomen. It was beheld that due to greater strength of policewomen (400), the amount of work stress was lower than that of India. interactive discussions revealed that their LED lit office is equipped with sufficient furniture including computers. However, there was demand for enhancing facilities for women in outposts. Responses related to supervisor competency and even for policies of government was more or less neutral. This could be due to stronger level of hierarchy in China than India. Similar to India, there was strong bid to improve job benefits and also allotment of specific washrooms/restrooms.

The reasons for occupational stress were quantified in this piece of work. It was observed that apart from job benefits, there was shortage of adequate workplace amenities. It could be

concluded that for CPSs, there was lack of basic amenities (furniture, washrooms) for policewomen. Policewomen have to utilize washrooms / rest rooms of nearby AWPS. Also, for visitors, there is no sitting area; or even if it is there, the quality and number of furniture is insufficient. In AWPS in Guwahati, though there is furniture, however, those are not conducive for prolonged sitting and also during special cases (pregnancy or menstruation period). General hygiene was one of the most important concerns among basic amenities in CPS, privacy (lack of separate toilet system and rest rooms) was one major aspect leading to occupational stress among policewomen in CPS. Lack of appropriate mobile utility van for patrolling and outdoor duties at night for women was another issue perceived necessary to draw attention of the competent authority. Some of interventions (improvement in basic furniture, washrooms) took place in AWPS Guwahati leading to markedly augmented positivity. There was still dissatisfaction regarding lack of facilities like modular van and baby / child care.

The evaluation of ergonomic design interventions in AWPS (after physical implementation) and CPS (after showcasing design interventions recommended through 2-D sketches) manifested radical intensification in on-job satisfaction index and optimism. However, there was still discontent with regard to job benefits. The satisfaction level was higher for policewomen working in CPS than in AWPS, perhaps because of the supporting role of policewomen in CPS with comparatively lesser load of work. The transformation in fundamental workplace amenities was more in AWPS than CPS, as a consequence of physical implementation of ergonomic design interventions. There is normally only one policewoman in every CPS, which might contribute to the feeling of isolation for policewoman in CPS.

Based on few interventions and also loopholes, preliminary design (2-D) for work station as well as movable convenience facility (mobile utility van) was proposed. Among the proposed designs, a children day care centre, attached toilet and ladies' restrooms were added. A sitting area, reception and toilet were also added for visitors at CPS. A separate women office was included to ensure privacy and comfort for handling cases related to women. In case of modular van, toilet, rest rooms and an office space were added to provide convenience during outdoor duties including safe instant planning for operations.

5.2. Conclusion

Ergonomics based design interventions were explored for improving occupational well-being for women police. Two police stations i.e., all women type and common police stations located in Guwahati were selected for investigation. Police stations in Tinsukia district were also selected as some of them has undergone interventions. In order to access the occupational well-being of policewomen before and after interventions, survey study was also conducted for police stations in Tinsukia district. Before proposing design, comprehensive survey programme was executed to identify work related stress and also work space amenities in above mentioned police stations. These were also compared with International practice (i.e., China in this case). Post design intervention assessment was also conducted to identify further issues. Based on these identified issues and also comparison, preliminary (schematic diagram) 2-D plans of work station and mobile utility Van were proposed.

Looking into the women-specific issues related to Assam Police, the present work attempted to scrutinize the status of policewomen in Assam specific to the inconveniences they face in their workplace police station, outposts or patrolling duties, being women, followed by approaching with some ergonomic interventions to minimize the discomfort and related stress. Based on the study following salient features can be drawn as concluding remark:

1. In today's job scenario, more women were inducted in the police organization and Government of India has taken step to give special reservation for women, and Assam police has around 0.93% of women representation in police.
2. Policewomen's stress level is more than the male counterpart as both have to work simultaneously in same environmental condition.
3. Unlike, male counterpart, policewomen faces several womanness issues during task that requires special attention.
4. In police stations, all women require basic amenities like day - care centre, privacy, sitting room, separate restroom, separate washroom, canteen etc. which need to be developed.
5. During patrolling duty, certain demands have to be full-filled for policewomen such as mobile utility van has to be designed.

6. Basic amenities like sitting area, office furniture, privacy, counselling room and restroom were implemented at AWPS to improve the working capacity and occupational well-being of the police women; in addition, women visitors comfort has to be look into.
7. A 2D schematic / conceptual diagram was recommended to the police women at CPS and TSK which could improve the productivity and occupational wellness of the policewomen.
8. The issues being faced in Assam policewomen as well as in China are similar in some cases such as stress level were due to absence of mobile utility van, day care centre and restroom. Hence the requirement is genuine wherever policewomen were engaged being stationary at police station or in combat in field.
9. Specific design attempts for various purpose in tune to job context and personnel need would lead to a positive work output.
10. All the developmental approaches should be participatory with the feedback from the policewomen; and thus a positive attitude to joining police force would be motivating for the women.

5.3. Contribution of the Research Work: Novelty of the Thesis

This type of study is today's need-of-the-hour to empower women and facilitate their inner talent to come up in service of the nation. Lack of shortage of staff is one of the major problem where considering the recommended implementation would motivate the women to join the law enforcement. A change in the mind-set and workplace environment is crucial if the women have to perform judiciously within the police environment. It can be overcome only through the recommended plans which would escalate the output and well ness of the policewomen personnel. The office workspace design also finds critical importance for perhaps every occupation, where office workstation needs further improvement. Also the study recommended that government should boast additional consideration to make an amiable workplace environment for the law enforcement to raise productivity and whole organizational performance. The real-time scenario and the need of corrective ergonomic design interventions, which when implemented, might reduce the workplace stress, thus making Indian police organisations more women-friendly. A comparison of the present scenario with some other developing countries (China, in this study) would be supportive to encourage researchers to think in this line for a better India, at large.

During the study, implementation of few suggestions in the AWPS at Guwahati made by police authority confirms the finding and suggestions made herein are appropriate towards occupational wellbeing for policewomen.

5.4. Recommendation

Based on the study, following preliminary recommendations were suggested:

1. Design of police work station and transport convenience must include facilities that are associated with womanness issues. Basic infrastructure such as separate washrooms, restrooms and child care center for woman police should be included.
2. There is also need to increase woman staff in common police station along with their corresponding basic infrastructure. This will certainly reduce work load, increase their importance and enhance well-being of women police.
3. Anthropometric data would be collected for women police. Data for different posture, work load, work environment etc. are to be considered for better design possibilities in the police station (Chakrabarti, 1997).

5.5. Limitations

This study focussed on analysing occupational well-being and environmental stress for policewomen working in both all women and common police stations. Further, it also investigated stress before and after ergonomics interventions in selected police stations. From all these analysis, a preliminary 2-D plan was proposed for office and modular for police station. However, some limitations of this research work, which could not be side-stepped, include the following:

1. The respondents were mainly from AWPS Guwahati, metropolitan region; while such AWPS could not be attempted for an urban, semi-urban or rural area. There is a need for similar research processes in urban, semi-urban and rural regions.
2. The heterogeneity in social and economic conditions along with womanness issues would vary from that observed in the present piece of work, depending on regions.
3. Need for long term monitoring of occupational well-being and environmental stress was felt, which could bring out more detailed insights on impacts of the interventions implemented.

5.6. Future scope

1. Further studies could be extended specially to analyse occupational well-being and environmental stress in police stations located in urban, semi-urban and rural areas.
2. Supplementary to it, long term studies are needed with surveys at frequent times during a year to analyse effects of any change in job policy and other factors such as number of staff, social relations and also crime rate. These will help to explore or identify new factors that are causing occupational well-being and environmental stress among women police.
3. Post design intervention studies can be conducted to analyse effectiveness of proposed design.

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भारतीय प्रौद्योगिकी संस्थान गुवाहाटी
Indian Institute of Technology Guwahati

APPENDICES……

APPENDIX A: A questionnaire used for the survey

Participant Information System

1. Control No/ID No:
2. Name:
3. DOB: Age:
4. Height (cm): Weight (kg):
5. BMI (kg/m2): WHO Category:
6. Education (Basic): Technical:
7. Job Details:
    a. Years of Joining:
    b. No's of year completed:
    c. Nature of duty:
    d. Rank:
    e. ID No:
8. Any other job experience:
9. Family details:
    a. Family Location:
    b. Home Town:
    c. Family members:
    d. Family type: joint/nuclear/extended
    e. Spouse if any:
    f. Children if any:
    g. Womanhood status:

☐ Unmarried

Menstruation ☐

Menopause ☐

☐ Married

1. Menstruation ☐ 2. Pregnancy ☐ 3. Expecting mother ☐

4. Lactating Mother ☐ 5. Experienced Mothe ☐ 6. Menopause ☐

Control no:

Name:

Police Station:

Date:

Place:

Sex:

Survey on peace, comfort, efficiency, requirements, convenience and on the job satisfaction for Women Police under Ministry of Home Affairs, Government of Assam

GUIDELINES

PLEASE MARK AN "X" ON THE SCORE WHICH BEST REPRESENTS YOUR OPINION.

Strongly agree	Agree	Neither agrees nor disagrees	Disagree	Strongly disagree
1	2	3	4	5

THERE ARE "YES" AND "NO" QUESTIONS TOO WHERE YOU HAVE TO TICK THE APPROPIATE TICK MARK ($\surd$) ACCORDING TO YOUR OPINION

Many things help us determine our individual opinion. We are interested in your experience. Take the time you need to think about how you felt at the police station and helped you to fill in the form.

Table 1. Participant response questionnaire for subjective assessment of workplace and on-job amenities

Part 1A: Exposure to occupational and environmental stress and perceived well-being	
Please use the following response scale to indicate the extent to which you agree with each statement regarding your job satisfaction. Please choose the scale that is most closely applicable for each statement: (1) Strongly agree; (2) Agree; (3) Neither Agree nor Disagree; (4) Disagree and (5) Strongly disagree	
1	Law enforcement is generally regarded as a masculine profile, therefore we who are inducted in this job, felt that convenience is equally important for us
2	Administrative over shifting is common
3	Staff shortages cause stress
4	Lack of resources cause stress
5	In equal sharing of work responsibilities cause stress
6	Shift work causes stress for special cases Like pregnancy, expecting mother, lactating mother, menstruation period
7	Traumatic events affects psychophysical health
8	Social life outside the job is impacted by duty regimen
9	Occupation-related health issues in special cases like pregnancy, expecting mother, lactating mother, menstruation period
10	Not finding time to stay in good physical condition
11	Feelings like you are always on the job and other responsibilities are compromised
12	Working beyond working hours brings boredom
13	Noisy work area
14	Frequent interruptions brings disturbance in the work place
15	Inadequate or poor quality equipment/maintenance
16	Unfair work environment in this job
17	Lack of a modern system/apparatus on duty
18	Occupational health issues (e.g. back pain, neck pain, joint pain)
19	A good infrastructure brings satisfactions while doing work
20	Lack of resources in professional/promotional
21	Working alone at night is risky and I don't feel good
22	Prolong standing affects physical health
23	Lack of separate modular convenience/prompt service utilities in every police station
24	Basic amenities like isolated /separate restrooms and child care units are still a major requirement for women police personnel
25	Lack of residential accommodation which is seen as one of the major impediments faced by women in joining police force

26	While I am involved in outdoor activities such as patrolling, security duty on several occasions, touring in and outside the district where mobile convenience facility is a compulsory requirement.
27	Crèches/day care center in the police station for working mother will help them to take care of their children

Part 1B: On-job Burn-Out

Please use the following response scale to indicate the extent to which you agree with each statement regarding your job satisfaction. Please choose the scale that is most closely applicable for each statement:
(1) Strongly agree; (2) Agree; (3) Neither Agree nor Disagree; (4) Disagree and (5) Strongly disagree

1	My work is emotionally exhaustive
2	I feel burnt out because of my work.
3	My work frustrates me.
4	I feel burn out at the end of the working day.
5	I feel exhausted in the morning only by the thought of another similar day at work.
6	I feel quite energetic while passing time with family, friends and relations

Part 1C: On-job satisfaction

Please use the following response scale to indicate the extent to which you agree with each statement regarding your job satisfaction. Please choose the scale that is most closely applicable for each statement:
(1) Strongly agree; (2) Agree; (3) Neither Agree nor Disagree; (4) Disagree and (5) Strongly disagree

1	I feel I am being paid a fair amount for the work I do.
2	My supervisor is quite competent in doing his/her job.
3	When I do a good job, I receive the recognition for it that I should receive.
4	The benefits we receive are as good as most other organizations offer.
5	Many of our rules and procedures make doing a good job simple.
6	Those who do well on the job stand a fair chance of being promoted.

Part B: Job satisfaction

Please response to the following statements to indicate the extent to which you agree with each statement regarding your job satisfaction. Please choose 'Yes' or 'No' for each statement.

1	Public attitude towards women police is awkward
2	Lack of separate utility facilities in police stations.
3	Problems related to training.
4	Govt accommodation for womanhood related issues
5	Difficulties faced in upbringing of children – day care center is essential
6	Need to have a better working environment in terms of infrastructure
7	Provision of separate toilet facility at all offices / outpost
8	A modular mobile convenience facility while outdoor duty an immediate need

APPENDIX B (Chinese version of questionnaire was used during survey in Hangzhou, China whereas English version of questionnaire is given in Appendix A)

参与者信息系统

1. 控制号/身份证号码：
2. 名称：徐亦琦
3. 出生日期: 年龄：
4. 高度（厘米）：160 重量（公斤）：
5. 身体质量指（公斤/平方米）： 谁的范畴：
6. 教育（基础）：本科 技术：思想政治
7. 工作细节：
    a. 加入数年：
    b. 完成年份数：
    c. 责任性质：
    d. 秩：
    e. 身份证号：
8. 其他工作经验：无
9. 家庭的细节：
    a. 家庭位置：杭州城区
    b. 家乡：浙江衢州
    c. 家庭成员：父母,老公,女儿,妹妹
    d. 家庭类型：关节/核/扩展
    e. 配偶: 有

f. 儿童：女儿

10. 妇女的地位：高

11. 未婚

a.月经√

b. 更年期

12. 结婚

a. 月经

b. 怀孕

c. 期待的母亲

d. 哺乳期的母亲

e. 有经验的妈妈√

f. 更年期

控制号码：

名称：

警察局：浙江省女子监狱

戴特：

广场:

性别：女

在和平、舒适、效率、需求调查、便利性和对工作的满意度为女性警察内政部之下，中国政府

指南

请在分数上标明最能代表你意见的“X”。

强烈同意	**同意**	既不同意也不反对	不同意	非常不同意
1	2	3	4	5

有“是”和“不是”的问题，你必须选择适当的刻度标记根据你的意见

许多事情帮助我们决定我们的个人意见。我们对你们的经验很感兴趣。花点时间想想你在警察局的感受，帮你填好表格

表 1 参与者对工作场所和在职设施进行主观评估的回答问卷

职业与环境压力暴露与主观幸福感调查结果

请使用以下回答量表来表明您同意每个关于工作满意度的陈述的程度。请选择最适合每种说法的比例：（1）非常同意；（2）同意；（3）既不同意也不反对；（4）不同意和（5）非常不同意

1	执法通常被认为是一个男性的形象，因此，我们谁在这项工作中，认为，方便同样重 的是我们
2	行政过度转移是常见的
3	人员短缺导致压力
4	资源缺乏导致压力
5	平等分担工作责任造成压力
6	轮班工作对妊娠、母亲、哺乳期母亲、月经期等特殊情况会产生压力
7	创伤性事件影响心理健康
8	工作以外的社会生活受责任制的影响
9	妊娠、期待母亲、哺乳期母亲、月经期等职业相关健康问题
10	没有时间呆在良好的身体状况
11	感觉像你总是在工作和其他责任妥协
12	工作时间之外的工作带来无聊
13	嘈杂的工作区
14	频繁的打扰带来工作场所的干扰
15	设备质量不合格或维修
16	工作环境不公平
17	缺乏现代化的系统/设备值班
18	职业健康问题（如背部疼痛，颈部疼痛，关节疼痛）
19	好的基础设施带来工作的满足感
20	专业/促销缺乏资源
21	晚上独自工作很危险，我感觉不好
22	延长站立影响身体健康
23	每个警察局缺乏单独的模块化便利/及时服务设施
24	分离/独立卫生 间等基础设施和儿童保健单位仍为女性警务人员的主要要求
25	缺乏住宅住宿被视为妇女参与警队的主要障碍之一
26	本人多次参与巡逻、保安等户外活动，在区内及外地进行移动便利设施的强制性规定。
27	铬 èCHES /日托中心在派出所工作的母亲会帮他们照顾他们的孩子

第 1B 部分：在职倦怠

请使用以下回答量表来表明您同意每个关于工作满意度的陈述的程度。请选择最适合每种说法的比例：（1）非常同意;（2）同意;（3）既不同意也不反对;（4）不同意和（5）非常不同意

1 我的工作情绪十分详尽
2 因为我的工作，我感到疲惫不堪。
3 我的工作让我感到挫折
4 我在工作日结束时感到疲倦。
5 只有在工作的另一天，我才感到筋疲力尽。
6 在与家人，朋友和关系相处的时候，我感到精力充沛

第 1C 部分：在职满意度

请使用以下回答量表来表明您同意每个关于工作满意度的陈述的程度。请选择最适合每种说法的比例：（1）非常同意;（2）同意;（3）既不同意也不反对;（4）不同意和（5）非常不同意

1 我觉得我为我所做的工作获得了相当的报酬。
2 我的主管很有能力做自己的工作。
3 当我做得好的时候，我得到了应得的认可
4 我们收到的好处与大多数其他组织一样好。
5 我们的许多规则和程序使得简单的工作变得简单。
6 在工作上表现出色的人有很好的晋升机会

B 部分：工作满意度

请回应以下陈述，以表明您在多大程度上同意每个关于工作满意度的陈述。请为每个陈述选择“是”或“否”。

1 公众对女警察的态度很尴尬。
2 在派出所缺乏独立的公用设施。
3 与培训有关的问题
4 政府住宿与女性有关的问题
5 儿童培养面临的困难 - 日托中心至关重要
6 需要在基础设施方面有更好的工作环境
7 在所有办事处/哨所提供独立卫生间设施
8 一个模块化的移动便利设施，同时需要户外值班

APPENDIX C- Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA

1.1 Before Intervention of AWPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

Table 8 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1A of the questionnaire by AWPS respondents before physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q9, Q1 vs. Q13, Q1 vs. Q14, Q1 vs. Q15, Q1 vs. Q19, Q1 vs. Q20, Q1 vs. Q23, Q1 vs. Q24, Q1 vs. Q25,Q1 vs. Q26,Q1 vs. Q27, Q2 vs. Q9, Q2 vs. Q13, Q2 vs. Q14,Q2 vs. Q15, Q2 vs. Q19, Q2 vs. Q20, Q2 vs. Q23, Q2 vs. Q24, Q2 vs. Q25,Q2 vs. Q26, Q2 vs. Q27, Q3 vs. Q9, Q3 vs. Q13,Q3 vs. Q14,Q3 vs. Q15, Q3 vs. Q19,Q3 vs. Q20, Q3 vs. Q23, Q3 vs. Q24, Q3 vs. Q25,Q3 vs. Q26,Q3 vs. Q27, Q4 vs. Q9, Q4 vs. Q13, Q4 vs. Q14, Q4 vs. Q15, Q4 vs. Q19, Q4 vs. Q20, Q4 vs. Q23, Q4 vs. Q24, Q4 vs. Q25, Q4 vs. Q26, Q4 vs. Q27, Q5 vs. Q9, Q5 vs. Q13,Q5 vs. Q14, Q5 vs. Q15, Q5 vs. Q19, Q5 vs. Q20, Q5 vs. Q23, Q5 vs. Q24, Q5 vs. Q25,Q5 vs. Q26, Q5 vs. Q27, Q6 vs. Q19, Q6 vs. Q20, Q6 vs. Q23, Q6 vs. Q24,Q7 vs. Q9, Q7 vs. Q14, Q7 vs. Q19,Q7 vs. Q20, Q7 vs. Q23, Q7 vs. Q24, Q7 vs. Q25, Q7 vs. Q26, Q7 vs. Q27, Q8 vs. Q9, Q8 vs. Q19, Q8 vs. Q20, Q8 vs. Q23, Q8 vs. Q24, Q8 vs. Q25, Q8 vs. Q26, Q8 vs. Q27, Q9 vs. Q10, Q9 vs. Q11, Q9 vs. Q12, Q9 vs. Q16, Q9 vs. Q17, Q9 vs. Q18, Q9 vs. Q21, Q9 vs. Q22, Q10 vs. Q14, Q10 vs. Q19, Q10 vs. Q20,Q10 vs. Q23, Q10 vs. Q24, Q10 vs. Q25, Q10 vs. Q26, Q10 vs. Q27, Q11 vs. Q13, Q11 vs. Q14, Q11 vs. Q15,Q11 vs. Q19, Q11 vs. Q20, Q11 vs. Q23, Q11 vs. Q24, Q11 vs. Q25, Q11 vs. Q26, Q11 vs. Q27, Q12 vs. Q13, Q12 vs. Q14, Q12 vs. Q15, Q12 vs. Q19, Q12 vs. Q20, Q12 vs. Q23, Q12 vs. Q24, Q12 vs. Q25, Q12 vs. Q26, Q12 vs. Q27, Q13 vs. Q16, Q13 vs. Q17, Q13 vs. Q19, Q13 vs. Q20, Q13 vs. Q21, Q13 vs. Q22, Q13 vs. Q23, Q13 vs. Q24, Q14 vs. Q16, Q14 vs. Q17, Q14 vs. Q21, Q14 vs. Q22, Q15 vs. Q16, Q15 vs. Q17, Q15 vs. Q21, Q15 vs. Q22, Q16 vs. Q19, Q16 vs. Q20, Q16 vs. Q23, Q16 vs. Q24, Q16 vs. Q25, Q16 vs. Q26, Q16 vs. Q27, Q17 vs. Q19, Q17 vs. Q20, Q17 vs. Q23, Q17 vs. Q24, Q17 vs. Q25, Q17 vs. Q26, Q17 vs. Q27, Q18 vs. Q19, Q18 vs. Q20, Q18 vs. Q23, Q18 vs. Q24, Q18 vs. Q25, Q18 vs. Q26, Q18 vs. Q27, Q19 vs. Q21, Q19 vs. Q22, Q20 vs. Q21, Q20 vs. Q22, Q21 vs. Q21, Q21 vs. Q22, Q21 vs. Q23, Q21 vs. Q24, Q21 vs. Q25, Q21 vs. Q26, Q21 vs. Q27,Q22 vs. Q23, Q22 vs. Q24, Q22 vs. Q25, Q22 vs. Q26 and Q22 vs. Q27. It was also noted that, before intervention for AWPS responses, there was significant

difference at $p < 0.01$ between pairs of questions viz.Q1 vs. Q6, Q2 vs. Q6, Q3 vs. Q6, Q4 vs. Q6, Q5 vs. Q6, Q6 vs. Q11, Q6 vs. Q12, Q6 vs. Q16, Q6 vs. Q17, Q6 vs. Q21, Q6 vs. Q22, Q6 vs. Q25, Q6 vs. Q26, Q7 vs. Q15, Q8 vs. Q14, Q13 vs. Q26, and Q14 vs. Q18; whereas for the pairs of questions viz. Q6 vs. Q27, Q8 vs. 15, Q10 vs. Q15, Q13 vs. Q25, Q13 vs. Q27, and Q15 vs. Q19 the difference was significant at $p < 0.05$. For all other questions such as Q1 vs. Q2, Q1 vs. Q3, Q1 vs. Q4, Q1 vs. Q5, Q1 vs. Q7, Q1 vs. Q8, Q1 vs. Q10, Q1 vs. Q11, Q1 vs. Q12, Q1 vs. Q16, Q1 vs. Q17, Q1 vs. Q18, Q1 vs. Q21, Q1 vs. Q22, Q2 vs. Q3, Q2 vs. Q4, Q2 vs. Q5, Q2 vs. Q7, Q2 vs. Q8, Q2 vs. Q10, Q2 vs. Q11, Q2 vs. Q12, Q2 vs. Q16, Q2 vs. Q17, Q2 vs. Q18, Q2 vs. Q21, Q2 vs. Q22, Q3 vs. Q4, Q3 vs. Q5, Q3 vs. Q7, Q3 vs. Q8, Q3 vs. Q10, Q3 vs. Q11, Q3 vs. Q12, Q3 vs. Q16, Q3 vs. Q17, Q3 vs. Q18, Q3 vs. Q21, Q3 vs. Q22, Q4 vs. Q5, Q4 vs. Q7, Q4 vs. Q8, Q4 vs. Q10, Q4 vs. Q11, Q4 vs. Q12, Q4 vs. Q16, Q4 vs. Q17, Q4 vs. Q18, Q4 vs. Q21, Q4 vs. Q22, Q5 vs. Q7, Q5 vs. Q8, Q5 vs. Q10, Q5 vs. Q11, Q5 vs. Q12, Q5 vs. Q16, Q5 vs. Q17, Q5 vs. Q18, Q5 vs. Q21, Q5 vs. Q22, Q6 vs. Q7, Q6 vs. Q8, Q6 vs. Q9, Q6 vs. Q10, Q6 vs. Q13, Q6 vs. Q14, Q6 vs. Q15, Q6 vs. Q18, Q7 vs. Q8, Q7 vs. Q10, Q7 vs. Q11, Q7 vs. Q12, Q7 vs. Q13, Q7 vs. Q16, Q7 vs. Q17, Q7 vs. Q18, Q7 vs. Q21, Q7 vs. Q22, Q8 vs. Q10, Q8 vs. Q11, Q8 vs. Q12, Q8 vs. Q13, Q8 vs. Q16, Q8 vs. Q17, Q8 vs. Q18, Q8 vs. Q21, Q8 vs. Q22, Q9 vs. Q13, Q9 vs. Q14, Q9 vs. Q15, Q9 vs. Q19, Q9 vs. Q20, Q9 vs. Q21, Q9 vs. Q22, Q9 vs. Q23, Q9 vs. Q24, Q9 vs. Q25, Q9 vs. Q26, Q9 vs. Q27, Q10 vs. Q11, Q10 vs. Q12, Q10 vs. Q13, Q10 vs. Q16, Q10 vs. Q17, Q10 vs. Q18, Q10 vs. Q21, Q10 vs. Q22, Q11 vs. Q12, Q11 vs. Q16, Q11 vs. Q17, Q11 vs. Q18, Q11 vs. Q21, Q11 vs. Q22, Q12 vs. Q16, Q12 vs. Q17, Q12 vs. Q18, Q12 vs. Q21, Q12 vs. Q22, Q13 vs. Q14, Q13 vs. Q15, Q13 vs. Q18, Q14 vs. Q15, Q14 vs. Q19, Q14 vs. Q20, Q14 vs. Q23, Q14 vs. Q24, Q14 vs. Q25, Q14 vs. Q26, Q14 vs. Q27, Q15 vs. Q19, Q15 vs. Q20, Q15 vs. Q23, Q15 vs. Q24, Q15 vs. Q25, Q15 vs. Q26, Q15 vs. Q27, Q16 vs. Q17, Q16 vs. Q18, Q16 vs. Q21, Q16 vs. Q22,Q17 vs. Q18, Q17 vs. Q21, Q17 vs. Q22, Q18 vs. Q21, Q18 vs. Q22, Q19 vs. Q20, Q19 vs. Q23, Q19 vs. Q24, Q19 vs. Q25, Q19 vs. Q26, Q19 vs. Q27, Q20 vs. Q23, Q20 vs. Q24, Q20 vs. Q25, Q20 vs. Q26, Q20 vs. Q27,Q21 vs. Q22, Q23 vs. Q24, Q23 vs. Q25, Q23 vs. Q26, Q23 vs. Q27, Q24 vs. Q25, Q24 vs. Q26, Q24 vs. Q27, Q25 vs. Q26, Q25 vs. Q27 andQ26 vs. Q27, no significant difference ($p > 0.05$) was found before physical implementation of the design intervention.

1.2. After Intervention of AWPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

Table 9 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1A of the questionnaire by AWPS respondents after physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q4, Q1 vs. Q6, Q1 vs. Q9, Q1 vs. 13, Q1 vs. 14, Q1 vs. 15, Q1 vs. Q16, Q1 vs. Q20, Q2 vs. Q4, Q2 vs. Q6, Q2 vs. Q9, Q2 vs. Q13, Q2 vs. Q14, Q2 vs. Q15, Q2 vs. Q16, Q2 vs. Q20, Q3 vs. Q4, Q3 vs. Q6, Q3 vs. Q9, Q3 vs. Q13, Q3 vs. Q14, Q3 vs. Q15, Q3 vs. Q16, Q3 vs. Q20, Q4 vs. Q5, Q4 vs. Q7, Q4 vs. Q11, Q4 vs. Q12, Q4 vs. Q17, Q4 vs. Q18, Q4 vs. Q19,Q4 vs. Q21, Q4 vs. Q22, Q4 vs. Q23, Q4 vs. Q24, Q4 vs. Q25, Q4 vs. Q26, Q4 vs. Q27, Q5 vs. Q6, Q5 vs. Q9, Q5 vs. Q13, Q5 vs. Q14, Q5 vs. Q15, Q5 vs. Q16, Q5 vs. Q20, Q6 vs. Q11,Q6 vs. Q12, Q6 vs. Q17, Q6 vs. Q19, Q6 vs. Q20, Q6 vs. Q21, Q6 vs. Q22, Q6 vs. Q23, Q6 vs. Q24, Q6 vs. Q25, Q6 vs. Q26, Q6 vs. Q27, Q7 vs. Q9, Q7 vs. Q14, Q7 vs. Q15, Q7 vs. Q16,Q7 vs. Q20, Q8 vs. Q9,Q8 vs. Q14, Q8 vs. Q15, Q8 vs. Q16, Q8 vs. Q20, Q9 vs. Q10, Q9 vs. Q11, Q9 vs. Q12, Q9 vs. Q17, Q9 vs. Q8, Q9 vs. Q19, Q9 vs. Q21, Q9 vs. Q22, Q9 vs. Q23, Q9 vs. Q24, Q9 vs. Q25, Q9 vs. Q26, Q9 vs. Q27,Q10 vs. Q14, Q10 vs. Q16, Q10 vs. Q20, Q11 vs. Q13, Q11 vs. Q14, Q11 vs. Q15, Q11 vs. Q16, Q11 vs. Q20, Q12 vs. Q13, Q12 vs. Q14, Q12 vs. Q15, Q12 vs. Q16,Q12 vs. Q20, Q13 vs. Q17, Q13 vs. Q19, Q13 vs. Q21, Q13 vs. Q22, Q13 vs. Q23, Q13 vs. Q24, Q13 vs. Q25, Q13 vs. Q26, Q13 vs. Q27, Q14 vs. Q17, Q14 vs. Q18, Q14 vs. Q19, Q14 vs. Q21, Q14 vs. Q22, Q14 vs. Q23, Q14 vs. Q24, Q14 vs. Q25, Q14 vs. Q26, Q14 vs. Q27, Q15 vs. Q17, Q15 vs. Q18, Q15 vs. Q19, Q15 vs. Q21, Q15 vs. Q22, Q15 vs. Q23, Q15 vs. Q24, Q15 vs. Q25, Q15 vs. Q26, Q15 vs. Q27, Q16 vs. Q17, Q16 vs. Q18, Q16 vs. Q19, Q16 vs. Q21, Q16 vs. Q22, Q16 vs. Q23, Q16 vs. Q24, Q16 vs. Q25, Q16 vs. Q26, Q16 vs. Q27, Q17 vs. Q20, Q18 vs. Q20, Q19 vs. Q20, Q20 vs. Q21,Q20 vs. Q22, Q20 vs. Q23, Q20 vs. Q24, Q20 vs. Q25, Q20 vs. Q26, and Q20 vs. Q27. It was also noted that, after intervention for AWPS responses, there was significant difference at $p < 0.01$ between pairs of questions viz. Q4 vs. Q8, Q4 vs. Q10, Q8 vs. Q15, Q10 vs. Q15, Q13 vs. Q20 whereas there was no significant difference at $p < 0.05$. For all other questions such as Q1 vs. Q2, Q1 vs. Q3, Q1 vs. Q5, Q1 vs. Q7, Q1 vs. Q8, Q1 vs. Q10, Q1 vs. Q11, Q1 vs. Q12, Q1 vs. Q17, Q1 vs. Q18, Q1 vs. Q19, Q1 vs. Q21, Q1 vs. Q22, Q1 vs. Q23, Q1 vs. Q24, Q1 vs. Q25, Q1 vs. Q26, Q1 vs. Q27, Q2 vs. Q3, Q2 vs. Q5, Q2 vs. Q7, Q2 vs. Q8, Q2 vs. Q10, Q2 vs. Q11, Q2 vs. Q12, Q2 vs. Q17, Q2

vs. Q18, Q2 vs. Q19, Q2 vs. Q21, Q2 vs. Q22, Q2 vs. Q23, Q2 vs. Q24, Q2 vs. Q25, Q2 vs. Q26, Q2 vs. Q27, Q3 vs. Q5, Q3 vs. Q7, Q3 vs. Q8, Q3 vs. Q10, Q3 vs. Q11, Q3 vs. Q12, Q3 vs. Q17, Q3 vs. Q18, Q3 vs. Q19, Q3 vs. Q21, Q3 vs. Q22, Q3 vs. Q23, Q3 vs. Q24, Q3 vs. Q25, Q3 vs. Q26, Q3 vs. Q27, Q4 vs. Q6, Q4 vs. Q9, Q4 vs. Q13, Q4 vs. Q14, Q4 vs. Q15, Q4 vs. Q16, Q4 vs. Q20, Q5 vs. Q7,Q5 vs. Q8, Q5 vs. Q10, Q5 vs. Q11, Q5 vs. Q12, Q5 vs. Q17, Q5 vs. Q18, Q5 vs. Q19, Q5 vs. Q21, Q5 vs. Q22, Q5 vs. Q23, Q5 vs. Q24, Q5 vs. Q25, Q5 vs. Q26, Q5 vs. Q27, Q6 vs. Q7, Q6 vs. Q8, Q6 vs. Q9, Q6 vs. Q10, Q6 vs. Q13, Q6 vs. Q14, Q6 vs. Q15, Q6 vs. Q16, Q6 vs. Q18, Q7 vs. Q8, Q7 vs. Q10, Q7 vs. Q12, Q7 vs. Q13, Q7 vs. Q14, Q7 vs. Q21, Q7 vs. Q22, Q7 vs. Q23, Q7 vs. Q24, Q7 vs. Q25, Q7 vs. Q26, Q7 vs. Q27, Q8 vs. Q10, Q8 vs. Q11, Q8 vs. Q12, Q8 vs. Q13, Q8 vs. Q17, Q8 vs. Q18, Q8 vs. Q19, Q8 vs. Q21, Q8 vs. Q22, Q8 vs. Q23, Q8 vs. Q24, Q8 vs. Q25, Q8 vs. Q26, Q8 vs. Q27,Q9 vs. Q13, Q9 vs. Q14, Q9 vs. Q15, Q9 vs. Q16, Q9 vs. Q20, Q10 vs. Q11, Q10 vs. Q12, Q10 vs. Q13, Q10 vs. Q17, Q10 vs. Q18, Q10 vs. Q19, Q10 vs. Q21, Q10 vs. Q22, Q10 vs. Q23, Q10 vs. Q24, Q10 vs. Q25, Q10 vs. Q26, Q10 vs. Q27, Q11 vs. Q12, Q11 vs. Q17, Q11 vs. Q18, Q11 vs. Q19,Q11 vs. Q21, Q11 vs. Q22, Q11 vs. Q23, Q11 vs. Q24, Q11 vs. Q25, Q11 vs. Q26, Q11 vs. Q27, Q12 vs. Q17, Q12 vs. Q18, Q12 vs. Q19, Q12 vs. Q21, Q12 vs. Q22, Q12 vs. Q23, Q12 vs. Q24, Q12 vs. Q25, Q12 vs. Q26, Q12 vs. Q27, Q13 vs. Q14, Q13 vs. Q15, Q13 vs. Q16, Q13 vs. Q18, Q14 vs. Q15, Q14 vs. Q16, Q14 vs. Q20, Q15 vs. Q16, Q15 vs. Q20, Q16 vs. Q20, Q17 vs. Q18,Q17 vs. Q19,Q17 vs. Q21, Q17 vs. Q22, Q17 vs. Q23, Q17 vs. Q24, Q17 vs. Q25, Q17 vs. Q26, Q17 vs. Q27, Q18 vs. Q19, Q18 vs. Q21, Q18 vs. Q22, Q18 vs. Q23, Q18 vs. Q24, Q18 vs. Q25, Q18 vs. Q26, Q18 vs. Q27, Q19 vs. Q21, Q19 vs. Q22, Q19 vs. Q23, Q19 vs. Q24, Q19 vs. Q25, Q19 vs. Q26, Q19 vs. Q27, Q21 vs. Q22, Q21 vs. Q23, Q21 vs. Q24, Q21 vs. Q25, Q21 vs. Q26, Q21 vs. Q27, Q22 vs. Q23, Q22 vs. Q24, Q22 vs. Q25, Q22 vs. Q26, Q22 vs. Q27, Q23 vs. Q24, Q23 vs. Q25, Q23 vs. Q26, Q23 vs. Q27, Q24 vs. Q25,Q24 vs. Q26, Q24 vs. Q27, Q25 vs. Q26,Q25 vs. Q27, and Q26 vs. Q27 there was no significant difference ($p > 0.05$) was found after physical implementation of the design intervention.

1.3. Before Intervention of CPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

Table 12 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1A of the questionnaire by CPS respondents before physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q2, Q1 vs. Q7, Q1 vs. Q13, Q1 vs. Q14, Q1 vs. Q16, Q1 vs. Q19, Q1 vs. Q23, Q1 vs. Q24, Q1 vs. Q25, Q1 vs. Q26, Q1 vs. Q27, Q2 vs. Q3, Q2 vs. Q4, Q2 vs. Q5, Q2 vs. Q6, Q2 vs. Q9, vs. Q10, Q2 vs. Q12, Q2 vs. Q15, Q2 vs. Q18, Q2 vs. Q21, Q2 vs. Q22, Q3 vs. Q7, Q3 vs. Q13, Q3 vs. Q14, Q3 vs. Q16, Q3 vs. Q19, Q3 vs. Q23, Q3 vs. Q24, Q3 vs. Q25, Q3 vs. Q26, Q3 vs. Q27, Q4 vs. Q13, Q4 vs. Q14, Q4 vs. Q19, Q4 vs. Q23, Q4 vs. Q24, Q4 vs. Q25, Q4 vs. Q26, Q4 vs. Q27, Q5 vs. Q7, Q5 vs. Q13, Q5 vs. Q14, Q5 vs. Q19, Q5 vs. Q23, Q5 vs. Q24, Q5 vs. Q25, Q5 vs. Q26, Q5 vs. Q27,Q6 vs. Q7, Q13 vs. Q14, Q6 vs. Q16, Q6 vs. Q19, Q6 vs. Q23, Q6 vs. Q24, Q6 vs. Q25, Q6 vs. Q26, Q6 vs. Q27, Q7 vs. Q9, Q7 vs. Q10, Q7 vs. Q12, Q7 vs. Q15, Q7 vs. Q18, Q7 vs. Q21, Q7 vs. Q22, Q8 vs. Q14, Q8 vs. Q19, Q8 vs. Q23, Q8 vs. Q24, Q8 vs. Q25, Q8 vs. Q26, Q8 vs. Q27, Q9 vs. Q13, Q9 vs. Q14, Q9 vs. Q16, Q9 vs. Q19, Q9 vs. Q23, Q9 vs. Q24, Q9 vs. Q25, Q10 vs. Q13, Q10 vs. Q14, Q10 vs. Q16, Q10 vs. Q19,Q10 vs. Q23, Q10 vs. Q24, Q10 vs. Q25, Q10 vs. Q26, Q10 vs. Q27, Q11 vs. Q14, Q11 vs. Q19, Q11 vs. Q23, Q11 vs. Q24, Q11 vs. Q25, Q11 vs. Q26, Q11 vs. Q27,Q12 vs. Q13, Q12 vs. Q14, Q12 vs. Q16, Q12 vs. Q19, Q12 vs. Q23, Q12 vs. Q24, Q12 vs. Q25, Q12 vs. Q26, Q12 vs. Q27, Q13 vs. Q15, Q13 vs. Q18, Q13 vs. Q21, Q13 vs. Q22, Q14 vs. Q15, Q14 vs. Q17, Q14 vs. Q18, Q14 vs. Q20, Q14 vs. Q21, Q14 vs. Q22, Q15 vs. Q16, Q15 vs. Q19, Q15 vs. Q23, Q15 vs. Q24, Q15 vs. Q25, Q15 vs. Q26, Q15 vs. Q27, Q16 vs. Q18, Q16 vs. Q21, Q16 vs. Q22, Q17 vs. Q19, Q17 vs. Q23, Q17 vs. Q24, Q17 vs. Q25, Q17 vs. Q26, Q17 vs. Q27, Q18 vs. Q19, Q18 vs. Q23, Q18 vs. Q24, Q18 vs. Q25, Q18 vs. Q26, Q18 vs. Q27, Q19 vs. Q20, Q19 vs. Q21, Q19 vs. Q22, Q20 vs. Q23, Q20 vs. Q24, Q20 vs. Q25, Q20 vs. Q26, Q20 vs. Q27,Q21 vs. Q23, Q21 vs. Q24, Q21 vs. Q25, Q21 vs. Q26, Q21 vs. Q27, Q22 vs. Q23, Q22 vs. Q24, Q22 vs. Q25, Q22 vs. Q26, and Q22 vs. Q27. It was also noted that, before intervention for CPS responses, there was significant difference at $p < 0.01$ between pairs of questions viz.Q1 vs. Q11, Q4 vs. Q7, Q4 vs. Q16, Q5 vs. Q16, Q11 vs. Q12, Q11 vs. Q15, Q11 vs. Q18, Q11 vs. Q21, and Q11 vs. Q22;whereas for the pair of questions viz.Q1 vs. Q17, Q2 vs. Q8, Q2 vs. Q19, Q2 vs. Q23, Q2 vs. Q24, Q2 vs. Q25, Q2 vs. Q26, Q2 vs. Q27, Q7 vs. Q8, Q7 vs. Q19,

Q7 vs. Q23, Q7 vs. Q24, Q7 vs. Q25, Q7 vs. Q26, Q7 vs. Q27, Q8 vs. Q13, Q9 vs. Q11, Q9 vs. Q17, Q12 vs. Q17, Q14 vs. Q16, Q15 vs. Q17, Q16 vs. Q19, Q16 vs. Q23, Q16 vs. Q24, Q16 vs. Q25, Q16 vs. Q26, Q16 vs. Q27,Q17 vs. Q18,Q17 vs. Q21, and Q17 vs. Q22, the difference was significant at $p < 0.05$. For all other questions such as Q1 vs. Q3,Q1 vs. Q4, Q1 vs. Q5, Q1 vs. Q6,Q1 vs. Q8, Q1 vs. Q9, Q1 vs. Q10, Q1 vs. Q12, Q1 vs. Q15, Q1 vs. Q18, Q1 vs. Q20, Q1 vs. Q21, Q1 vs. Q22, Q2 vs. Q7, Q2 vs. Q11, Q2 vs. Q13, Q2 vs. Q14, Q2 vs. Q16, Q2 vs. Q17, Q2 vs. Q20, Q3 vs. Q4, Q3 vs. Q5, Q3 vs. Q6,Q3 vs. Q8, Q3 vs. Q9, Q3 vs. Q10, Q3 vs. Q11, Q3 vs. Q12, Q3 vs. Q15, Q3 vs. Q17, Q3 vs. Q18, Q3 vs. Q20, Q3 vs. Q21, Q3 vs. Q22, Q4 vs. Q5, Q4 vs. Q6, Q4 vs. Q8, Q4 vs. Q9, Q4 vs. Q10, Q4 vs. Q11, Q4 vs. Q12,Q4 vs. Q15, Q4 vs. Q17, Q4 vs. Q18,Q4 vs. Q20, Q4 vs. Q21, Q4 vs. Q22, Q5 vs. Q6, Q5 vs. Q8, Q5 vs. Q9, Q5 vs. Q10, Q5 vs. Q11, Q5 vs. Q12, Q5 vs. Q15, Q5 vs. Q17, Q5 vs. Q18, Q5 vs. Q20, Q5 vs. Q21, Q5 vs. Q22, Q6 vs. Q8, Q6 vs. Q9, Q6 vs. Q10, Q6 vs. Q11, Q6 vs. Q12, Q6 vs. Q15, Q6 vs. Q17, Q6 vs. Q18, Q6 vs. Q20, Q6 vs. Q21, Q6 vs. Q22, Q7 vs. Q11, Q7 vs. Q13,Q7 vs. Q14, Q7 vs. Q16, Q7 vs. Q17,Q7 vs. Q20, Q8 vs. Q9, Q8 vs. Q10, Q8 vs. Q11, Q8 vs. Q12, Q8 vs. Q15, Q8 vs. Q16, Q8 vs. Q17, Q8 vs. Q18, Q8 vs. Q20, Q8 vs. Q21, Q8 vs. Q22, Q9 vs. Q10, Q9 vs. Q12, Q9 vs. Q15, Q9 vs. Q18, Q9 vs. Q20, Q9 vs. Q21, Q9 vs. Q22, Q11 vs. Q13, Q11 vs. Q16, Q11 vs. Q17, Q11 vs. Q20, Q12 vs. Q15, Q12 vs. Q18, Q12 vs. Q20, Q12 vs. Q21, Q12 vs. Q22, Q 13 vs. Q14, Q13 vs. Q16, Q13 vs. Q17, Q13 vs. Q19, Q13 vs. Q20, Q13 vs. Q23, Q13 vs. Q24, Q13 vs. Q25, Q13 vs. Q26, Q13 vs. Q7, Q14 vs. Q19, Q14 vs. Q23, Q14 vs. Q24, Q14 vs. Q25, Q14 vs. Q26, Q14 vs. Q27, Q15 vs. Q18, Q15 vs. Q20, Q15 vs. Q21, Q15 vs. Q22, Q16 vs. Q17, Q16 vs. Q20, Q17 vs. Q20, Q18 vs. Q20, Q18 vs. Q21, Q18 vs. Q22, Q19 vs. Q23, Q19 vs. Q24, Q19 vs. Q25, Q19 vs. Q26, Q19 vs. Q27, Q20 vs. Q21, Q20 vs. Q22,Q21 vs. Q22, Q23 vs. Q24, Q23 vs. Q25, Q23 vs. Q26, Q23 vs. Q27, Q24 vs. Q25, Q24 vs. Q26, Q24 vs. Q27, Q25 vs. Q26, Q25 vs. Q26, and Q26 vs. Q27 no significant differences ($p > 0.05$) was found before physical implementation of the design intervention.

1.4. After Intervention of CPS (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

Table 13 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1A of the questionnaire by CPS respondents after physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q2, Q1 vs. Q7, Q1 vs. Q11, Q1 vs. Q13, Q1 vs. Q14, Q1 vs. Q16, Q1 vs. Q17, Q1 vs. Q20, Q2 vs. Q3,Q2 vs. Q4, Q2 vs. Q5, Q2 vs. Q6, Q2 vs. Q8, Q2 vs. Q9, Q2 vs. Q10, Q2 vs. Q12, Q2 vs. Q15, Q2 vs. Q18, Q2 vs. Q19, Q2 vs. Q21, Q2 vs. Q22, Q2 vs. Q23, Q2 vs. Q24, Q2 vs. Q25, Q2 vs. Q26, Q2 vs. Q27, Q3 vs. Q7, Q3 vs. Q13, Q3 vs. Q14, Q3 vs. Q16, Q4 vs. Q7, Q4 vs. Q13, Q4 vs. Q14, Q4 vs. Q16, Q5 vs. Q7, Q5 vs. Q13, Q5 vs. Q14, Q5 vs. Q16, Q6 vs. Q7, Q6 vs. Q13, Q6 vs. Q14, Q6 vs. Q16, Q7 vs. Q8, Q7 vs. Q9, Q7 vs. Q10, Q7 vs. Q12, Q7 vs. Q15, Q7 vs. Q18, Q7 vs. Q19, Q7 vs. Q21, Q7 vs. Q22, Q7 vs. Q23, Q7 vs. Q24, Q7 vs. Q25, Q7 vs. Q26, Q7 vs. Q27,Q8 vs. Q13, Q8 vs. Q14, Q9 vs. Q11, Q9 vs. Q13, Q9 vs. Q14, Q9 vs. Q16, Q9 vs. Q17, Q10 vs. Q13, Q10 vs. Q14, Q10 vs. Q16, Q11 vs. Q12, Q11 vs. Q15, Q11 vs. Q18, Q11 vs. Q19, Q11 vs. Q21, Q11 vs. Q22, Q11 vs. Q23, Q11 vs. Q24, Q11 vs. Q25, Q11 vs. Q26, Q11 vs. Q27, Q12 vs. Q13, Q12 vs. Q14, Q12 vs. Q16, Q12 vs. Q17, Q12 vs. Q20, Q13 vs. Q15, Q13 vs. Q18, Q13 vs. Q19, Q13 vs. Q21, Q13 vs. Q22, Q13 vs. Q23, Q13 vs. Q24, Q13 vs. Q25, Q13 vs. Q26, Q13 vs. Q27, Q14 vs. Q15, Q14 vs. Q18, Q14 vs. Q19, Q14 vs. Q20, Q14 vs. Q21, Q14 vs. Q22, Q14 vs. Q23, Q14 vs. Q24, Q14 vs. Q25, Q14 vs. Q26, Q14 vs. Q27, Q15 vs. Q16, Q15 vs. Q17, Q15 vs. Q20, Q16 vs. Q18, Q16 vs. Q19,Q16 vs. Q21, Q16 vs. Q22, Q16 vs. Q23, Q16 vs. Q24, Q16 vs. Q25, Q16 vs. Q26, Q16 vs. Q27, Q17 vs. Q18,Q17 vs. Q19, Q17 vs. Q21, Q17 vs. Q22, Q17 vs. Q23, Q17 vs. Q24, Q17 vs. Q25, Q17 vs. Q26, Q17 vs. Q27, Q18 vs. Q20, Q19 vs. Q20, Q20 vs. Q21, Q20 vs. Q22, Q20 vs. Q23, Q20 vs. Q24, Q20 vs. Q25, Q20 vs. Q26, Q20 vs. Q27, Q21 vs. Q22,Q21 vs. Q23, Q21 vs. Q24, Q21 vs. Q25, Q21 vs. Q26, and Q21 vs. Q27. It was also noted that, after intervention for AWPS responses, there was significant difference at $p < 0.01$ between pairs of questions viz. Q3 vs. Q11, Q3 vs. Q17, Q6 vs. Q11, Q6 vs. Q17, Q8 vs. Q16, Q9 vs. Q20, Q11 vs. Q14, and Q14 vs. Q17; whereas for the pair of questions viz. Q5 vs. Q11, Q6 vs. Q20, Q10 vs. Q11, and Q10 vs. Q17 the difference was significant at $p < 0.05$. For all other questions such as Q1 vs. Q3, Q1 vs. Q4, Q1 vs. Q5, Q1 vs. Q6, Q1 vs. Q8, Q1 vs. Q9, Q1 vs. Q10, Q1 vs. 12, Q1 vs. Q15, Q1 vs Q18, Q1 vs Q19, Q1 vs Q21, Q1 vs Q22, Q1 vs Q23, Q1 vs Q24, Q1 vs Q25, Q1 vs Q26, Q1 vs Q27, Q2 vs Q7,

Q2 vs. Q11, Q2 vs. Q13, Q2 vs. Q14, Q2 vs. Q16, Q2 vs. Q17, Q2 vs. Q20, Q3 vs. Q4, Q3 vs. Q5, Q3 vs. Q6, Q3 vs. Q8, Q3 vs. Q9, Q3 vs. Q10, Q3 vs. Q12, Q3 vs. Q15, Q3 vs. Q18, Q3 vs. Q19, Q3 vs. Q20, Q3 vs. Q21, Q3 vs. Q22, Q3 vs. Q23, Q3 vs. Q24, Q3 vs. Q25, Q3 vs. Q26, Q3 vs. Q27, Q4 vs. Q5,Q4 vs. Q6, Q4 vs. Q8, Q4 vs. Q9, Q4 vs. Q10, Q4 vs. Q11, Q4 vs. Q12, Q4 vs. Q15, Q4 vs. Q17, Q4 vs. Q18, Q4 vs. Q19, Q4 vs. Q20, Q4 vs. Q21, Q4 vs. Q22, Q4 vs. Q23, Q4 vs. Q24, Q4 vs. Q25, Q4 vs. Q26, Q4 vs. Q27, Q5 vs. Q6, Q5 vs. Q8, Q5 vs. Q9, Q5 vs. Q10, Q5 vs. Q12, Q5 vs. Q15, Q5 vs. Q17, Q5 vs. Q18, Q5 vs. Q19, Q5 vs. Q20, Q5 vs. Q21, Q5 vs. Q22, Q5 vs. Q23, Q5 vs. Q24, Q5 vs. Q25, Q5 vs. Q26, Q5 vs. Q26, Q6 vs. Q8, Q6 vs. Q9, Q6 vs. Q10, Q6 vs Q12, Q6 vs. Q15, Q6 vs. Q18, Q6 vs. Q19, Q6 vs. Q21, Q6 vs. Q22, Q6 vs. Q23, Q6 vs. Q24, Q6 vs. Q25, Q6 vs. Q26, Q6 vs. Q27, Q7 vs. Q11, Q7 vs. Q13, Q7 vs. Q14, Q7 vs. Q16,Q7 vs. Q17, Q7 vs. Q20, Q8 vs. Q9, Q8 vs. Q10, Q8 vs. Q11, Q8 vs. Q12, Q8 vs. Q15, Q8 vs. Q17, Q8 vs. Q18, Q8 vs. Q19, Q8 vs. Q20, Q8 vs. Q21, Q8 vs. Q22, Q8 vs. Q23, Q8 vs. Q24, Q8 vs. Q25, Q8 vs. Q26, Q8 vs. Q27,Q9 vs. Q10, Q9 vs. Q12, Q9 vs. Q15, Q9 vs. Q18, Q9 vs. Q19, Q9 vs. Q21, Q9 vs. Q22, Q9 vs. Q23, Q9 vs. Q24, Q9 vs. Q25, Q9 vs. Q26, Q9 vs. Q27, Q10 vs. Q12, Q10 vs. Q15, Q10 vs. Q18, Q10 vs. Q19, Q10 vs. Q20, Q10 vs. Q21, Q10 vs. Q22, Q10 vs. Q23, Q10 vs. Q24, Q10 vs. Q25, Q10 vs. Q26, Q10 vs. Q27,Q11 vs. Q13, Q11 vs. Q16, Q11 vs. Q17, Q11 vs. Q20, Q12 vs. Q15, Q12 vs. Q18, Q12 vs. Q19, Q12 vs. Q21, Q12 vs. Q22, Q12 vs. Q23, Q12 vs. Q24, Q12 vs. Q25, Q12 vs. Q26, Q12 vs. Q27, Q13 vs. Q14, Q13 vs. Q16,Q13 vs. Q17, Q13 vs. Q20, Q14 vs. Q16, Q15 vs. Q18,Q15 vs. Q19, Q15 vs. Q21, Q15 vs. Q22, Q15 vs. Q23, Q15 vs. Q24, Q15 vs. Q25, Q15 vs. Q26, Q15 vs. Q27, Q16 vs. Q17, Q16 vs. Q20, Q17 vs. Q20, Q18 vs. Q19, Q18 vs. Q21, Q18 vs. Q22, Q18 vs. Q23, Q18 vs. Q24, Q18 vs. Q25, Q18 vs. Q26, Q18 vs. Q27, Q19 vs. Q21, Q19 vs. Q22, Q19 vs. Q23, Q19 vs. Q24, Q19 vs. Q25, Q19 vs. Q26, Q19 vs. Q27, Q22 vs. Q23, Q22 vs. Q24, Q22 vs. Q25, Q22 vs. Q26, Q22 vs. Q27, Q23 vs. Q24, Q23 vs. Q25, Q23 vs. Q26, Q23 vs. Q27, Q24 vs. Q25, Q24 vs. Q26, Q24 vs. Q27, Q25 vs. Q26, Q25 vs. Q27,and Q26 vs. Q27 no significant difference ($p > 0.05$) was found after physical implementation of the design intervention.

1.5. Before Intervention of TSK (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

Table 16 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1A of the questionnaire by TSK respondents before physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q14, Q1 vs. Q19, Q1 vs. Q20, Q1 vs. Q23, Q1 vs. Q24, Q1 vs. Q25, Q1 vs. Q26, Q1 vs. Q27, Q3 vs. Q14, Q3 vs. Q19,Q3 vs. Q20, Q3 vs. Q23, Q3 vs. Q24, Q3 vs. Q25, Q3 vs. Q26, Q3 vs. Q27, Q4 vs. Q14, Q4 vs. Q19,Q4 vs. Q20, Q4 vs. Q23, Q4 vs. Q24, Q4 vs. Q25, Q4 vs. Q26, Q4 vs. Q27, Q5 vs. Q14, Q5 vs. Q19,Q5 vs. Q20, Q5 vs. Q23, Q5 vs. Q24, Q5 vs. Q25, Q5 vs. Q26, Q5 vs. Q27, Q6 vs. Q14, Q6 vs. Q19, Q6 vs. Q20, Q6 vs. Q23, Q6 vs. Q24, Q6 vs. Q25, Q6 vs. Q26, Q6 vs. Q27, Q9 vs. Q14, Q9 vs. Q19, Q9 vs. Q20, Q9 vs. Q23, Q9 vs. Q24, Q9 vs. Q25, Q9 vs. Q26, Q9 vs. Q27, Q11 vs. Q14, Q11 vs. Q19, Q11 vs. Q20, Q11 vs. Q23, Q11 vs. Q24, Q11 vs. Q25, Q11 vs. Q26, Q11 vs. Q27, Q12 vs. Q14, Q12 vs. Q19,Q12 vs. Q20, Q12 vs. Q23, Q12 vs. Q24, Q12 vs. Q25, Q12 vs. Q26, Q12 vs. Q27, Q14 vs. Q15, Q14 vs. Q18, Q14 vs. Q21, Q14 vs. Q22, Q15 vs. Q19,Q15 vs. Q20, Q15 vs. Q23, Q15 vs. Q24, Q15 vs. Q25, Q15 vs. Q26, Q15 vs. Q27, Q18 vs. Q19, Q18 vs. Q22, Q18 vs. Q23, Q18 vs. Q24, Q18 vs. Q25, Q18 vs. Q26, Q18 vs. Q27, Q19 vs. Q21, Q19 vs. Q22, Q20 vs. Q21, Q20 vs. Q22, Q21 vs. Q23, Q21 vs. Q24, Q21 vs. Q25, Q21 vs. Q26, Q21 vs. Q27,Q22 vs. Q23, Q22 vs. Q24, Q22 vs. Q25, Q22 vs. Q26, and Q22 vs. Q27. It was also noted that, before intervention for TSK responses, there was significant difference at $p < 0.01$ between pairs of questions viz. Q8 vs. Q14, Q8 vs. Q19, Q8 vs. Q20, and Q8 vs. Q23, Q8 vs. Q24, Q8 vs. Q25, Q8 vs. Q26, Q8 vs. Q27, whereas for the pair of questions Q1 vs. Q2, Q1 vs. Q17, Q2 vs. Q3, Q2 vs. Q4, Q2 vs. Q6, Q2 vs. Q9, Q2 vs. Q12, Q2 vs. Q18, Q2 vs. Q21, Q2 vs. Q22, Q3 vs. Q17, Q4 vs. Q17, Q6 vs. Q17, Q7 vs. Q14, Q7 vs. Q19, Q7 vs. Q20,Q7 vs. Q23, Q7 vs. Q24, Q7 vs. Q25, Q7 vs. Q26, Q7 vs. Q27, Q9 vs. Q17, Q10 vs. 14, Q10 vs. 19, Q10 vs. 20, Q10 vs. Q23, Q10 vs. Q24, Q10 vs. Q25, Q10 vs. Q26, Q10 vs. Q27, Q12 vs. Q17, Q17 vs. Q18, Q17 vs. Q21, and Q17 vs. Q22 the difference was significant at $p < 0.05$. For all other questions such as Q1 vs. Q3, Q1 vs. Q4, Q1 vs. Q5, Q1 vs. Q6, Q1 vs. Q7, Q1 vs. Q8, Q1 vs. Q9, Q1 vs. Q10, Q1 vs. Q11, Q1 vs. Q12, Q1 vs. Q13, Q1 vs Q15, Q1 vs Q16, Q1 vs. Q18, Q1 vs. Q21, Q1 vs. Q22, Q2 vs. Q5, Q2 vs. Q7,Q2 vs. Q8, Q2 vs. Q10, Q2 vs. Q11, Q2 vs. Q13, Q2 vs. Q14, Q2 vs. Q15, Q2 vs. Q16, Q2 vs. Q17, Q2 vs. Q19, Q2 vs. Q20, Q2 vs. Q23, Q2 vs. Q24, Q2 vs. Q25, Q2 vs. Q26, Q2 vs.

Q27, Q3 vs. Q4, Q3 vs. Q5, Q3 vs. Q6, Q3 vs. Q7, Q3 vs. Q8, Q3 vs. Q9, Q3 vs. Q10, Q3 vs. Q11, Q3 vs. Q12, Q3 vs. Q13, Q3 vs. Q15, Q3 vs. Q16, Q3 vs. Q18, Q3 vs. Q21, Q3 vs. Q22, Q4 vs. Q5, Q4 vs. Q6, Q4 vs. Q7, Q4 vs. Q8, Q4 vs. Q9, Q4 vs. Q10, Q4 vs. Q11, Q4 vs. Q12, Q4 vs. Q13, Q4 vs. Q15,Q4 vs. Q16, Q4 vs. Q18, Q4 vs. Q21, Q4 vs. Q22, Q5 vs. Q6, Q5 vs. Q7, Q5 vs. Q8, Q5 vs. Q9, Q5 vs. Q10, Q5 vs. Q11, Q5 vs. Q12, Q5 vs. Q13, Q5 vs. Q15, Q5 vs. Q16, Q5 vs. Q17, Q5 vs. Q18, Q5 vs. Q21, Q5 vs. Q22, Q6 vs. Q7, Q6 vs. Q8, Q6 vs. Q9, Q6 vs. Q10, Q6 vs. Q11, Q6 vs. Q12, Q6 vs. Q13, Q6 vs. Q15, Q6 vs. Q16, Q6 vs. Q18, Q6 vs. Q21, Q6 vs. Q22, Q7 vs. Q8, Q7 vs. Q9, Q7 vs. Q10, Q7 vs. Q11, Q7 vs. Q12, Q7 vs. Q13, Q7 vs. Q15, Q7 vs. Q16, Q7 vs. Q17, Q7 vs. Q18, Q7 vs. Q21, Q7 vs. Q22, Q8 vs. Q9, Q8 vs. Q10, Q8 vs. Q11, Q8 vs. Q12, Q8 vs. Q13, Q8 vs. Q15, Q8 vs. Q16, Q8 vs. Q17, Q8 vs. Q18, Q8 vs. Q21,Q8 vs. Q22, Q9 vs. Q10, Q9 vs. Q11, Q9 vs. Q12, Q9 vs. Q13, Q9 vs. Q15, Q9 vs. Q16, Q9 vs. Q18, Q9 vs. Q21,Q9 vs. Q22, Q10 vs. Q11, Q10 vs. Q12, Q10 vs. Q13, Q10 vs. Q15, Q10 vs. Q16,Q10 vs. Q17, Q10 vs. Q18, Q10 vs. Q21,Q10 vs. Q22, Q11 vs. Q12, Q11 vs. Q13, Q11 vs. Q15, Q11 vs. Q16, Q11 vs. Q17, Q11 vs. Q18,Q11 vs. Q21,Q11 vs. Q22, Q12 vs. Q13, Q12 vs. Q15, Q12 vs. Q16, Q12 vs. Q18, Q12 vs. Q21,Q12 vs. Q22, Q13 vs. Q14, Q13 vs. Q15, Q13 vs. Q16, Q13 vs. Q17, Q13 vs. Q18, Q13 vs. Q19, Q13 vs. Q20, Q13 vs. Q21, Q13 vs. Q22, Q13 vs. Q23, Q13 vs. Q24, Q13 vs. Q25, Q13 vs. Q26, Q13 vs. Q27, Q14 vs. Q16,Q14 vs. Q17, Q14 vs. Q19, Q14 vs. Q20, Q14 vs. Q23, Q14 vs. Q24, Q14 vs. Q25, Q14 vs. Q26, Q14 vs. Q27, Q15 vs. Q16,Q15 vs. Q17, Q15 vs. Q18, Q15 vs. Q21, Q15 vs. Q22,Q16 vs. Q17, Q16 vs. Q18, Q16 vs. Q19, Q16 vs. Q20, Q16 vs. Q21, Q16 vs. Q22, Q16 vs. Q23, Q16 vs. Q24, Q16 vs. Q25, Q16 vs. Q26, Q16 vs. Q27, Q17 vs. Q19, Q17 vs. Q20, Q17 vs. Q23, Q17 vs. Q24, Q17 vs. Q25, Q17 vs. Q26, Q17 vs. Q27, Q18 vs. Q20, Q18 vs. Q21, Q19 vs. Q20, Q19 vs. Q23, Q19 vs. Q24, Q19 vs. Q25, Q19 vs. Q26, Q19 vs. Q27, Q20 vs. Q23, Q20 vs. Q24, Q20 vs. Q25, Q20 vs. Q26, Q20 vs. Q27, Q21 vs. Q22, Q23 vs. Q24, Q23 vs. Q25, Q23 vs. Q26, Q23 vs. Q27, Q24 vs. Q25, Q24 vs. Q26, Q24 vs. Q27, Q25 vs. Q26, Q25 vs. Q27, andQ26 vs. Q27 no significant ($p > 0.05$) differences were found before physical implementation of the design intervention.

1.6. After Intervention of TSK (Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA) for questionnaire Part 1A

Table 17 showed the findings of Friedman's Chi-Squared Nonparametric Repeated Measures ANOVA of the subjective ratings against the questions in Part 1A of the questionnaire by TSK respondents after physical implementation of ergonomics design intervention. It was observed that, there was significant difference at $p < 0.001$ between the mentioned pairs of questions, when subjected to between-group analyses – Q1 vs. Q14, Q1 vs. Q16, Q1 vs. Q17, Q1 vs. Q20, Q3 vs. Q14, Q3 vs. Q16,Q3 vs. Q17, Q3 vs. Q20, Q4 vs. Q14, Q4 vs. Q16,Q4 vs. Q17, Q4 vs. Q20, Q5 vs. Q14, Q5 vs. Q20, Q6 vs. Q14, Q6 vs. Q16,Q6 vs. Q17, Q6 vs. Q20, Q9 vs. Q14, Q9 vs. Q16, Q9 vs. Q17, Q9 vs. Q20, Q11 vs. Q14, Q11 vs. Q20, Q12 vs. Q14, Q12 vs. Q16, Q12 vs. Q17, Q12 vs. Q20, Q14 vs. Q15, Q14 vs. Q18,Q14 vs. Q19, Q14 vs. Q21, Q14 vs. Q22, Q14 vs. Q23, Q14 vs. Q24, Q14 vs. Q25, Q14 vs. Q26, Q14 vs. Q27, Q15 vs. Q20, Q16 vs. Q18,Q16 vs. Q19, Q16 vs. Q21, Q16 vs. Q22, Q16 vs. Q23, Q16 vs. Q24, Q16 vs. Q25, Q16 vs. Q26, Q16 vs. Q27, Q17 vs. Q18, Q17 vs. Q19,Q17 vs. Q21, Q17 vs. Q22, Q17 vs. Q23, Q17 vs. Q24, Q17 vs. Q25, Q17 vs. Q26, Q17 vs. Q27, Q18 vs. Q20, Q19 vs. Q20, Q20 vs. Q21 Q20 vs. Q22, Q20 vs. Q23, Q20 vs. Q24, Q20 vs. Q25, Q20 vs. Q26, and Q20 vs. Q27. It was also noted that, before intervention for TSK responses, there was significant difference at $p < 0.01$ between pairs of questions viz.Q1 vs. Q13, Q3 vs. Q13, Q4 vs. Q13, Q6 vs. Q13, Q9 vs. Q13, Q11 vs. Q17, Q12 vs. Q13, Q13 vs. Q18, Q13 vs. Q19, Q13 vs. Q21, Q13 vs. Q22, Q13 vs. Q23, Q13 vs. Q24, Q13 vs. Q25, Q13 vs. Q26, and Q13 vs. Q27 whereas for the pair of questions viz. for Q1 vs. Q7, Q1 vs. Q10, Q3 vs. Q7, Q3 vs. Q10, Q4 vs. Q7, Q4 vs. Q10, Q5 vs. Q17, Q6 vs. Q7, Q6 vs. Q10, Q7 vs. Q9, Q7 vs. Q12, Q7 vs. Q18,Q7 vs. Q19, Q7 vs. Q21, Q7 vs. Q22, Q7 vs. Q23, Q7 vs. Q24, Q7 vs. Q25, Q7 vs. Q26, Q7 vs. Q27, Q9 vs. Q10, Q10 vs. Q12, Q10 vs. Q18, Q10 vs. Q19, Q10 vs. Q21, Q10 vs. Q22, Q10 vs. Q23, Q10 vs. Q24, Q10 vs. Q25, Q10 vs. Q26, Q10 vs. Q27, and Q11 vs. Q16 the difference was significant at $p < 0.05$. For all other questions such as Q1 vs. Q2, Q1 vs. Q3, Q1 vs. Q4, Q1 vs. Q5, Q1 vs. Q6, Q1 vs. Q8, Q1 vs. Q9, Q1 vs. Q11, Q1 vs. Q12, Q1 vs. Q15, Q1 vs. Q18, Q1 vs. Q19, Q1 vs. Q21, Q1 vs. Q22, Q1 vs. Q23, Q1 vs. Q24, Q1 vs. Q25, Q1 vs. Q26, Q1 vs. Q27, Q2 vs. Q3, Q2 vs. Q4, Q2 vs. Q5, Q2 vs. Q6, Q2 vs. Q7, Q2 vs. Q8, Q2 vs. Q9, Q2 vs. Q10, Q2 vs. Q11, Q2 vs. Q12, Q2 vs. Q13, Q2 vs. Q14, Q2 vs. Q15, Q2 vs. Q16, Q2 vs. Q17, Q2 vs. Q18, Q2 vs. Q19, Q2 vs. Q20, Q2 vs. Q21, Q2 vs. Q22, Q2 vs. Q23, Q2 vs. Q24, Q2 vs. Q25, Q2 vs. Q26, Q2 vs. Q27,Q3 vs. Q4, Q3 vs. Q5, Q3 vs. Q6, Q3 vs. Q8, Q3 vs. Q9, Q3 vs. Q11, Q3 vs. Q12, Q3 vs. Q15, Q3 vs. Q18,Q3 vs. Q19, Q3 vs. Q21, Q3 vs. Q22, Q3 vs.

Q23, Q3 vs. Q24, Q3 vs. Q25, Q3 vs. Q26, Q3 vs. Q27, Q4 vs. Q5,Q4 vs. Q6, Q4 vs. Q8,Q4 vs. Q9, Q4 vs. Q11, Q4 vs. Q12, Q4 vs. Q15, Q4 vs. Q18,Q4 vs. Q19, Q4 vs. Q21, Q4 vs. Q22, Q4 vs. Q23, Q4 vs. Q24, Q4 vs. Q25, Q4 vs. Q26, Q4 vs. Q27, Q5 vs. Q6, Q5 vs. Q7, Q5 vs. Q8, Q5 vs. Q9, Q5 vs. Q10, Q5 vs. Q11, Q5 vs. Q12, Q5 vs. Q13, Q5 vs. Q15,Q5 vs. Q16, Q5 vs. Q18, Q5 vs. Q19, Q5 vs. Q21, Q5 vs. Q22, Q5 vs. Q23, Q5 vs. Q24, Q5 vs. Q25, Q5 vs. Q26, Q5 vs. Q27, Q6 vs. Q8,Q6 vs. Q9, Q6 vs. Q11, Q6 vs. Q12, Q6 vs. Q15, Q6 vs. Q18, Q6 vs. Q19, Q6 vs. Q21, Q6 vs. Q22, Q6 vs. Q23, Q6 vs. Q24, Q6 vs. Q25, Q6 vs. Q26, Q6 vs. Q27,Q7 vs. Q8, Q7 vs. Q10, Q7 vs. Q11, Q7 vs. Q13, Q7 vs. Q14, Q7 vs. Q15, Q7 vs. Q16, Q7 vs. Q17, Q7 vs. Q20, Q8 vs. Q9, Q8 vs. Q10, Q8 vs. Q11, Q8 vs. Q12, Q8 vs. Q13, Q8 vs. Q14, Q8 vs. Q15, Q8 vs. Q16, Q8 vs. Q17, Q8 vs. Q18, Q8 vs. Q19, Q8 vs. Q20, Q8 vs. Q21, Q8 vs. Q22, Q8 vs. Q23, Q8 vs. Q24, Q8 vs. Q25, Q8 vs. Q26, Q8 vs. Q27, Q9 vs. Q11, Q9 vs. Q12, Q9 vs. Q15, Q9 vs. Q18,Q9 vs. Q19, Q9 vs. Q21, Q9 vs. Q22, Q9 vs. Q23, Q9 vs. Q24, Q9 vs. Q25, Q9 vs. Q26, Q9 vs. Q27,Q10 vs. Q11, Q10 vs. Q13 , Q10 vs. Q14, Q10 vs. Q15, Q10 vs. Q16, Q10 vs. Q17, Q10 vs. Q20, Q11 vs. Q12,Q11 vs. Q13, Q11 vs. Q15, Q11 vs. Q18, Q11 vs. Q19, Q11 vs. Q21, Q11 vs. Q22, Q11 vs. Q23, Q11 vs. Q24, Q11 vs. Q25, Q11 vs. Q26, Q11 vs. Q27, Q12 vs. Q15, Q12 vs. Q18,Q12 vs. Q19, Q12 vs. Q21, Q12 vs. Q22, Q12 vs. Q23, Q12 vs. Q24, Q12 vs. Q25, Q12 vs. Q26, Q12 vs. Q27, Q13 vs. Q14, Q13 vs. Q15, Q13 vs. Q16, Q13 vs. Q17, Q13 vs. Q20, Q14 vs. Q16, Q14 vs. Q17, Q14 vs. Q20, Q15 vs. Q16, Q15 vs. Q17, Q15 vs. Q18, Q15 vs. Q19, Q15 vs. Q20, Q15 vs. Q21, Q15 vs. Q22, Q15 vs. Q23, Q15 vs. Q24, Q15 vs. Q25, Q15 vs. Q26, Q15 vs. Q27, Q16 vs. Q17, Q16 vs. Q20, Q17 vs. Q20, Q18 vs. Q19, Q18 vs. Q21, Q18 vs. Q22, Q18 vs. Q23, Q18 vs. Q24, Q18 vs. Q25, Q18 vs. Q26, Q18 vs. Q27, Q19 vs. Q21, Q19 vs. Q22, Q19 vs. Q23, Q19 vs. Q24, Q19 vs. Q25, Q19 vs. Q26, Q19 vs. Q27,Q21 vs. Q22, Q21 vs. Q23, Q21 vs. Q24, Q21 vs. Q25, Q21 vs. Q26, Q21 vs. Q27,Q22 vs. Q23, Q22 vs. Q24, Q22 vs. Q25, Q22 vs. Q26, Q22 vs. Q27,Q23 vs. Q24, Q23 vs. Q25, Q23 vs. Q26, Q23 vs. Q27,Q24 vs. Q25, Q24 vs. Q26, Q24 vs. Q27, Q25 vs. Q26, Q25 vs. Q27, and Q26 vs. Q27 no significant differences ($p > 0.05$) was found after intervention.

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DEPARTMENT OF DESIGN

To
Ms. Rinkumoni Kalita
O/C, Women Police Station
Panbazar
Guwahati, Assam

Date: 20.5.2015

Sub: Seeking permission to interact with Police stations of Assam regarding PhD work.

Dear Madam,

Shilpi Bora, the bearer of this letter, is pursuing her PhD under my supervision at IIT Guwahati. She has chosen to work in the field of Design Ergonomics interventions in women police in Assam with specific issues of womanhood and occupational stress. In this context she requires to interact with some police (men and women) visiting some police stations (under your jurisdiction) to see the existing facilities available there in and do relevant interviews. All the observations made and information collected thus would be used for academic references and PhD thesis documentation.

Sir, Shilpi is a young researcher and has plans and dreams to do something that may be helpful to make better work situation for women police; and I strongly believe that your guidance would lead her to get success in her endeavor.

Look forward for your guidance and approval on above request; I would like to have such academic collaboration with you.

With warm regards,

Debkumar Chakrabarti
20.5.2015

Debkumar Chakrabarti, PhD
Professor
Department of Design
IIT Guwahati

APPENDIX E

Publications out of the thesis work

1. **Shilpi Bora**; Debkumar Chakrabarti; Akhil Garg. 2017. Ergonomics based Design of Work Station and Modular Van for Improving Occupational well-being for Policewomen; *Journal of Ergonomics*, Manuscript ID TERG-2017-0229 (under review)
2. **Shilpi Bora**; Debkumar Chakrabarti; Akhil Garg; (2017) A Comparative study on measurement of job stress and workspace amenities for Policewomen in disturbed and undisturbed region; *Measurement journa*l; Manuscript Number: MEAS-D-17-01127 (under review)
3. **Shilpi Bora**, Abhirup Chatterjee, Pallavi Rani, Debkumar Chakrabarti. On-the-Job Stress: Interventions to Improve the Occupational Well-being of Policewomen in Assam, India. Journal of International Women's Studies (JIWS), 2016. Vol. 18 (1), 260-272.
4. Rani, Pallavi; Udaya Kumar, D.; Tudu, Saheb Ram; and **Bora, Shilpi** (2016). Rural Women Artists: A Visual Analysis of the Mural Art Forms of Santhal Pargana, Jharkhand, India. Journal of International Women's Studies, 18(1), 73-86.
5. **Shilpi Bora;** Debkumar Chakrabarti; Zhang Yi; Xiongbin Peng; Akhil Garg; (2017). Computing RULA and REBA of Industry Vehicle Operators using Automated Neural Search Approach; International Journal of Industrial Ergonomics; Manuscript number ERGON_2017_201 (under review)
6. **Shilpi Bora,** Abhirup Chatterjee, Debkumar Chakrabarti. Perceived Occupational Wellbeing of Policewomen After Ergonomic Design Intervention. International Ergonomics Conference HWWE 2016.
7. **Shilpi Bora,** Debkumar Chakrabarti. Occupational Wellbeing Issues in Police with Specific Reference to Womanhood. In: Chakrabarti D et al (Eds): 'User Cantered Design and Occupational Wellbeing – Proceedings of International Ergonomics Conference HWWE 2014', McGraw Hill Education (Professional), New Delhi, India; 2014.
8. **Shilpi Bora,** Abhirup Chatterjee, Debkumar Chakrabarti. Ergonomic Enrichment of the Working Condition of Assamese Policewomen. International Ergonomics Conference HWWE 2015 Ergonomics in Caring for People; Springer Singapore

9. **Shilpi Bora,** Abhirup Chatterjee, Debkumar Chakrabarti. 2017. An Ergonomic Interventional Approach to Improve Office Workspace for Policewomen in Assam, India. 8th International Conference on Applied Human Factors and Ergonomics, International Conference on Applied Human Factors and Ergonomics AHFE 2017: Advances in Social & Occupational Ergonomics pp 318-325; Springer Verlag
10. **Shilpi Bora,** Abhirup Chatterjee, Saugata Kamakar, Debkumar Chakrabarti. Implementation of Ergonomic Design Interventions to Improve Workplace Amenities for Assam Policewomen. 6th International Conference On Research into Design (Icord), 2017. Research into Design for Communities, Volume 1. Icord 2017. Smart Innovation, Systems and Technologies, vol 65, Pages 219-229, Springer Science and Business Media Deutschland GmbH
11. Pallavi Rani, **Shilpi Bora,** Dr. D. Udaya Kumar. A Study On Enrichment of the Rural Mural Painting of Jharkhand, India, The International Conference On Art and Humanities, Colombo, Sri Lanka, 2015
12. Wanrisa Bok Kharkongor, Arunita Paul, **Shilpi Bora**, Debkumar Chakrabarti. Meghalaya Tourism: Inculcating Cultural Image in developing en-route mini halts. Research into Design for Communities, Volume 2. Icord 2017. Smart Innovation, Systems and Technologies, vol 66, Pages 255-265, Springer Science and Business Media Deutschland GmbH
13. **Shilpi Bora,** Abhirup Chatterjee, Debkumar Chakrabarti. Office Workspace Design for Policewomen in Assam, India: Applications for Developing Countries. 19th International Conference on Engineering Psychology and Cognitive Ergonomics Tokyo, Japan, ICEPCE, International Science Index, Humanities and Social Sciences Vol:4, No:5, 2017 waset.org/abstracts/59678 (abstract)
14. **Bora S.,** Chatterjee A. and Chakrabarti D. Workspace Amenities for Assam Policewomen: Ergonomic Interventions. XXVIIth Annual Conference of the Physiological Society of India (PSI) VIth Congress of the Federation of Indian Physiological Societies (FIPS), 2015. (abstract)
15. P. Rani, S. Bora, G. Kumar and D. Udaya Kumar, "A Comparative study of the mural painting from Jharkhand and West Bengal," Journal of Higher Education and Research Society, vol. 3, no. 2, pp. 508-518, 2015.http://herso.org/vol-3-issue-2-oct-2015-index-2/

16. **Shilpi Bora**, Abhirup Chatterjee, Debkumar Chakrabarti. A scrutiny of on-job stress and occupational well-being of Indian policewomen compared to Chinese policewomen; Humanizing Work and Work Environment (HWWE, 2017) (Full paper submitted)
17. **Shilpi Bora**, Abhirup Chatterjee, Debkumar Chakrabarti. Analysis of stress at workplace of policewomen in Guwahati and Tinsukia and scope of ergonomic interventions; Intelligent Human Systems Integration: Integrating People and Intelligent Systems (AHFE 2018) (abstract accepted)
18. **Shilpi Bora**, Abhirup Chatterjee, Debkumar Chakrabarti. A study on Occupational well-being of Assam policewomen and scope of ergonomic design interventions. IEA 2018 – 20th Congress International Ergonomics Association. (abstract submitted)

Note: Copy of the first page of the publication are presented herein for ready reference.

Occupational wellbeing issues in police with specific reference to womanhood

Shilpi Bora and Debkumar Chakrabarti

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Abstract

Occupational stress of police officers has specific impact on the organizational performance in terms of womanhood issues and that is most hazardous obsession for police organization when gradually more and more inclusion for female police officers began to emerge. Based on a pilot study carried out in Assam, it has been observed that occupational stress of pregnant police women and their possible risk factors, including hazards have adverse effect on their performance. General well-being as well as levels of satisfaction and commitment to the organization has each been identified as a result of the employee experiencing occupational stress. The responses obtained from women police personnel at Guwahati, Assam have confirmed that a better accommodation and work place support will reduce the stresses and other issues of the pregnant officers; there is a need for in-depth study on ergonomic design intervention to address the issues.

Keywords: women Police, occupational stress, Pregnancy and duty.

1. INTRODUCTION

Women have always worked being inside the home; still the responsibilities remain same along with increased facilities outside jobs with male folks. Over the last century, however, women participation in the labour force has increased steadily and dramatically. Today more than 45% of the women participated equally in the job as those of the male counterpart worldwide. Through their paid work, women around the world continue to make tremendous contribution to the economy in variety of occupations both with intellectual as well as exercising physical capabilities such as teachers, secretaries, doctors, machine operators, child care worker, agricultural farm women, police women and many more.

Stress is considered as “the invisible” sickness which affects all people; therefore, we cannot afford or ignore it. Stress refers to the dynamic state caused by the physical, psychological, and social demands which are assumed to be threatening to an individual and leads to exceed in his or her coping resources. Occupation of police is highly stressful as they always have to face challenges to their life by taking risk in their daily work……..

Ergonomic Enrichment of the Working Condition of Assam Policewomen

Shilpi Bora[1], Abhirup Chatterjee[2], Wanrisa Bok Kharkongor[3], Arunita Paul[4], Pallavi Rani[5], Debkumar Chakrabarti[6]

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Law enforcement is generally considered as a stressful occupation, where policewomen perform a major role. Recent decades have witnessed a greater induction of women in the Police force, consequent with the views in line of the state and national level of recommendations. The on-job stress is inescapable and concomitant with the duty regiment of the police forces, and women may be at the increasing risk of its deleterious effects. In this connection, it was envisioned as important to address their preliminary requirements of on-job well-being, by providing them a harmonious and amiable place of work to perform their duty efficiently, securely and with dignity.

With reference to the daily on-job rosters of the policewomen across India, the same being equally applicable for women of Assam Police forces, are commonly witnessed to go through quite a few adversities for example, lesser acceptance of their on-job role to their family, conflicts in balancing job and family components, on-job stress, lack of job satisfaction, workplace discomfort on personal front; and with inadequate welfare measures, unsatisfactory facilities, less flexible leaves and benefits etc. on the organizational front. To look into these women specific issues related to the police forces of Assam, the present work attempts to scrutinize the status of policewomen in Assam specific to the inconveniences they face in their workplace (police station, outposts and patrolling duties), being women.

IIT Guwahati reviews perceived that, the basic amenities specific to womanhood like personal privacy and convenience facilities that include, privacy preserved changing spaces, day care center etc, have already been proposed. These are the societal needs-of-the-hour to be addressed urgently, where ergonomic design interventions have been projected to constitute a more hygienic, user friendly and amiable workplace, leading to boosted motivation for, satisfaction from, and dedication to the job responsibilities. The study addresses some interventional design recommendations for women police workstation and the occupational issues for policewomen in Guwahati city of Assam. The interning result showed that there was a crucial requirement for policewomen friendly infrastructures both in police station such as such restroom, crèche facilities as well as on-job convenience privacy; upon which the ergonomic design intervention is in progress as a PhD work.

Key words: Policewomen; Jobsite amenities; Workplace comfort; Conveniences

TH-1918_136105008

Workspace Amenities for Assam Policewomen: Ergonomic Interventions

Bora S., Chatterjee A. and Chakrabarti D.

Ergonomics Lab, Department of design, IIT Guwahati, Guwahati – 781039, Assam, India.

Abstract: The present research explores the womanhood issues at workplace with specific reference to the basic amenities in the police station; and we aimed to evaluate the occupational wellbeing of policewomen. For this, forty-three (n = 43) women police personnel of mixed age and ethnicity, deployed at the women police station of Pan bazar, Guwahati, responded to a bipartite questionnaire, which envisioned their present workplace scenario and issues therein. Descriptive analysis was undertaken to understand the problems tackled by women personnel in the police station. Review of the situation and observations obtained through questionnaires revealed the basic inconveniences of policewomen in terms of lack-ing basic amenities like conveniences and passable privacy at workplace. Ergo-nomic interventions were proposed after thorough scrutiny of the situations and possibilities to recover from them, and were thus intended to aid policewomen to lessen their problems hindering their well-being.

Key words: *Policewomen; Jobsite amenities; Workplace comfort; Conveniences*

1 Introduction

Today's women are essentially participating for men's equivalence outside the family premises– including their contribution to the nation also by the virtue of their entrance into once male-dominating professions such as police forces, which is still to a great extent considered to be one of the most masculinized occupation and therefore being recognized with potential and strength. The job of Police personnel is indeed a challenging one, which encompasses uncertainty in many terms including longer hours of duty, sudden unexpected deployments and exposure to unavoidable risky circumstances, to name a few. In the prevailing socio-cultural set-up, policewomen are often overstrained and thus, find it difficult to maintain equilibrium between their job and homemaking responsibilities. This advocates some situational concerns about the women in police service like universal gender bias within the police force; the contexts / situations that police women are compelled to bear with in course of satisfying their job responsibilities etc……..

A COMPARATIVE STUDY OF THEMURAL PAINTINGFROM JHARKHAND AND WEST BENGAL, INDIA

Pallavi Rani Shilpi Bora Research Scholars, Gautam Kumar Visual Designer, Dr. D. Udaya Kumar Assistant Professor Department of Design, IIT Guwahati, Assam, India.

Abstract: The present paper deals with the livelihood mural traditions in rural Jharkhand and west Bengal. The rural area of "Chota Daona" village Saraikela Kharsawan district of Jharkhand and "Ghosaldanga" village of Birbhum district of West Bengal comprise scheduled cast and scheduled tribes. These rural communities take great pride in their mural and artwork, which are part of decoration of their mud houses. In 'Chota Daona' rural people are more aware of their traditional wall decoration. They color their wall in a particular style with border on the both side, before applying a mural on their walls. The people of this area compose flowers and geometrical forms to paint their walls. Whereas in 'Ghosal Danga' color is applied on relief mud instead of direct painting on the walls. The architectural units of those houses are the main decorative part of their murals. The population of Chota Daona and Ghosaldanga area composes animal and flowers as the part of their decoration. The architectural structure, art style and techniques are different in both the regions. This paper composes and analyzes the various styles and techniques of mural paintings with respect to tribal and folk cultural. The study attempts to create awareness of mural art to understand the cultural and tradition of these rural communities.

Key words- Rural mural, design elements, culture

INTRODUCTION

India is rich in visual art and performing art. Visual art is a term of art which creating aesthetic sense in viewer's eye. Its definition varies with different medium and form in different province of India. "Mural" is a branch of visual artist grows out of the wall and shows the correlation with the architecture an environment. The term Mural generally includes art and design on ceilings, pillars and other architectural unites (J. Appa swamy, 1985: 82). In rural India different mural style and technique corresponds to ritualistic1art. The purpose of the art of tribes and folk communities to equally pacify the malevolent deities and to pay homage and express gratitude to benevolent once (Gupta, 2008: 18). They are never indulged purely for pleasure among the different tribal and folk communities……

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A STUDY ON THE RURAL MURAL PAINTING OF JHARKHAND, INDIA

Rani, P., Bora, S., and Kumar, D.U

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Abstract: India has a rich tradition of wall paintings from prehistory period to present. The style of painting culturally varies in every province. There is a livelihood tradition in the rural Jharkhand which enlighten their social structure with cultural individuality. The rural community of Jharkhand depend on agricultural and participate in regular cultural activities. The communities of Scheduled Casts and Scheduled Tribes take great pride in their art and design, namely decorations of their mud houses. Now-a- day's mud plaster has been replaced by cement and the need for annual repairing of the houses is gradually diminishing, therefore the paintings have reduced dramatically. At present the interest of the population concerning the murals are lacking due to change in socio economic lifestyle and globalization. This paper explores and analyses the various forms of tribal mural art. The study examines the different mural art of the rural communities along with its visual elements.

Keywords: Rural murals, art and culture, visual element

INTRODUCTION

Jharkhand is a newly formed state in eastern India that lies on the Chhotanagpur Plateau. The word Jharkhand connotes 'area of land covered with forests'. The state shares its border with the Bihar, Uttar Pradesh, Chhattisgarh and Odisha. It has 24 districts and 5 divisions namely Palamu, North Chotanagpur, South Chotanagpur, Kolhan and Santhal Pargna. From these divisions two culturally rich districts "Hazaribagh" which lies in North Chotanagpur division and "Saraikela-Kharsawan" in Kolhan division were selected for the study (See Fig.1). According to 2011census in Hazaribagh, 15.87% live in urban regions and 84.13% population live in rural areas. Similarly, in Saraikela-Kharsawan, 24.29 % live in urban regions while 75.71% live in rural areas……..

Perceived Occupational Wellbeing of Policewomen after Ergonomic Design Intervention

Shilpi Bora 1, Abhirup Chatterjee 2, Debkumar Chakrabarti 3

Ergonomics Laboratory, Department of design, IIT Guwahati, Guwahati - 781039, Assam, India.

Abstract: This paper scrutinises the qualitative scenario of the workplace for policewomen and their well-being issues like the basic amenities and conveniences etc. The analysis has been done on the basis of in-depth personal interviews and audio recording with those who are female police. One of the most important arena that deems consideration for Indian Police Administration is to facilitate women-friendly environments in all aspects like other organizations and thus making the workplace environment expedient and amiable for women, leading to reduced stress of policewomen at workplace. In this regard, considering the working condition of women police personnel at the Police Station and All Women Police Station Pan bazar, Guwahati, an ergonomic design intervention was proposed and partially implemented later. Accordingly, our present study attempted to assess the perceived well-being of policewomen at their workplace in response to the ergonomics and design intervention for a stress-free environment in the workplace. The implementation of a recommended design intervention and perspectives of ergonomics (even though partially), helped to inspire policewomen in workplace by means of enhance feeling of wellbeing. This in due course could be probable to inspire more women to join police forces; since it could no more be a platter of stress and anxiety**.**

Keywords: Police women, womanhood, comfort, job Satisfaction, Ergonomic intervention

1 Introduction

In India today, women hold senior officials comprising the politics, services and various other occupations amongst which the duty of policing is one of the most taxing and demanding one (Savitha, 2016). However, the trend of inducting women in the police force sees escalation in India. The necessity for women police has been recognized all over the world both in the developed and developing countries through assessment of special needs and requirements of women. In recent years, police departments have become progressively anxious with the effects of occupational stress on policewomen……

Rural Women Artists: A Visual Analysis of the Mural Art Forms of Santhal Pargana, Jharkhand, India

By Pallavi Rani1, D. Udaya Kumar, Saheb Ram Tudu and Shilpi Bora

Abstract

Women are the pioneers of traditional mural art practices in rural India. Warli art, Gond art, and Madhubani paintings are examples of their artworks. The women belonging to the Santhal region in eastern India, are highly skilled in rich rural vernacular art. Murals are generally created by them during local festivals and marriage ceremonies. The women of six districts that comprise the Santhal Pargana2 (Dumka, Godda, Deoghar, Jamtara, Pakur and Sahibganj), decorate their mud houses during these occasions with visual borders and motifs. A pilot study was carried out with the women artists to research these murals. The framework for the visual analysis is based on distinct symmetry operations such as translation, rotation, reflection, and glide reflection. This paper examines the various artistic expressions of the rural women of Santhal Pargana. *Keywords:* Mural art, rural women artists, motifs, Walari art, Gond art, Madhubani paintings

Introduction

The relationship among women, art, and society is a valuable framework for examining the changing social circumstances of Indian women artists. The cultural legacy of women artists and their visual art practices are now being accepted as an intellectual contribution in the world of art. Exposure on global platforms are motivating rural women to lead women artists from similar socio-economic backgrounds in the field of art practices. Indian art history has documented the artistic skills of rural women as house decorators. The tradition of house decoration is still prevalent in rural India in the form of painted walls, floors, and other handicrafts. Each decorated house reveals the cultural aspects of its own community, place and technique. Gond, Warli, Saura and Pithora mural paintings are known for their community art practices and Madhubani, Sanjhi, Mandana and Lippan mural arts are known for their place and technique. The cultural diversity of rural Jharkhand makes an interesting study in the fields of Cultural Studies and Women's Studies. The six districts of Jharkhand Deoghar, Dumka, Godda, Pakur, Jamtara, and Shahibganj, comprise the administrative division of Santhal Pargana. The mixed population of this area works on a single mural layout and technique annually. Generally, the local festivals, marriage ceremonies, and other occasions are celebrated in the villages with annual house repairing processes and the decorations. Nature is the main inspiration behind mural art. Rituals…….

On-the-Job Stress: Interventions to Improve the Occupational Well-being of Policewomen in Assam, India

Shilpi Bora1, Abhirup Chatterjee, Pallavi Rani, Debkumar Chakrabarti

Abstract

This article discusses the results of a study with an all-women police station and other police stations in Guwahati, Assam, India, considering their occupational stress and hazards related to womanhood issues. In this descriptive study, a sample of 30 women police was selected by purposive sampling and analyses were performed using responses to a questionnaire method and individual/group meetings. Well-being as well as levels of satisfaction leading to the commitment of the policewomen to their organization have been identified. A majority opined about experiencing occupational stress/hazards related to issues specific to womanhood. Ergonomic, on the- job criteria, and appropriate design interventions, may address their stress and related concerns. Women's hygiene specific issues in the workplace was a major concern. A few remedial design attempts have been proposed and some such improvements have been implemented by authorities to upgrade the women's police station. In addition to the physical and mental well-being of existing policewomen enabling them to perform their duties effectively and efficiently, such sympathetic developments have created a positive niche to motivate more young women to enter the police force.

Keywords: Indian policewomen, occupational stress and discomfort, womanhood issues

Introduction

Today in India, many women are striving for equality with men outside of the home, including making contributions to the nation by entering into once male-dominated professions such as the police force. Considered as one of the more masculine occupations, the job of police personnel is indeed a challenging one, which encompasses uncertainty in many areas, including long hours of duty, sudden, unexpected deployments and exposure to unavoidable risky circumstances, to name a few. In the prevailing socio-cultural arrangement, policewomen are often overstrained and thus, find it difficult to maintain equilibrium between their job and homemaking responsibilities. This raises some situational concerns about the women in police service, including universal gender bias within the police force; the contexts/situations that police women are compelled to bear while satisfying their job responsibilities…….

Computing RULA and REBA of Industry Vehicle Operators using Automated Neural Search Approach

Shilpi Bora[1,2], DebKumar Chakrabarti[1,3], Zhang Yi[4], Xiongbin Peng*[2], Akhil Garg[2]

Department of Design, Indian Institute of Technology, Guwahati, India

Department of Mechatronics Engineering, Shantou University, China

Department of Civil and Earth Resources Engineering, Graduate School of Engineering, Kyoto University, Japan

Abstract A comfortable design of cabin for industrial vehicles is important for maintaining musculoskeletal order of drivers. For safety design, it is important to understand the optimum posture parameters such as the elbow-ground distance, the popliteal height and the reach angle. RULA and REBA, which are most commonly adopted to evaluate the risk associated with posture exhibit higher dependence on the mentioned parameters. Many studies in the past were conducted to optimize the parameters related to posture, but the applications were found in agricultural farmer and workers in various industries. However, none of the applications are found for industrial drivers. The relative significance of these parameters is not known for drivers in industrial vehicle. The main objective of this study is to develop a model using an automated neural network search (ANS) approach for the prediction of RULA and REBA based on the coupled interactions of posture parameters. In the context of model development, field study that contains measurement of these posture parameters was utilized. RULA and REBA were assessed from these posture parameters using CATIA software. Further, the study also reveals the relative significance of these posture parameters and identifies the most optimum parameters for minimum risk to driver's health.

Keywords: Posture parameters; RULA; REBA; Industrial vehicles; Ergonomics

Introduction

Human factors play crucial role in design of operator cabins for vehicles. This is important specifically for operators, who have to undergo long journeys carrying bulky items related to trade. In study by Zimmerma, Cook, & Rosecrance, (1997), it was found that such operators are subjected to physical ache a…. (under review)

TH-1918_136105008

Ergonomics based Design of Work Station and Modular Van for Improving Occupational well-being for Policewomen

Shilpi Bora, DebKumar Chakrabarti, and Akhil Garg

Abstract

A thorough scrutiny of the actual situation revealed critical lack of facilities and basic amenities for police women at workplace (the police stations). The analysis of the responses reflected that policewomen are subjected to stress at their outdoor duties and workplace. This is due to the lack of privacy and basic amenities. Womanhood issues at workplace with specific reference to basic amenities are one of the major problems during their duty. This study aims to propose ergonomic design interventions for enhancing occupational well-being of women police both at work office and outdoor duty. Further, the well-being of the women police at workplace was also evaluated using survey (for a particular police station), where some of proposed design interventions took place. The major objective of this study is to propose preliminary workstation design of police station with reference to womanhood specific issues. This is for enriching occupational wellness of the women police personnel. The improved atmosphere of workplace upsurges the probabilities of innovativeness, accomplishment and enhances the eminence of work productivity of Policewomen. In addition, design of modular Van for convenience is also proposed. In order to achieve it, surveys were conducted before and after certain design interventions in both all women and common police station. It was found that despite certain improvement in furniture, the satisfaction level and optimism increased tremendously.

Key words: Policewomen, Design intervention, Workstation, Occupational well-being

1. Introduction

In India, women comprise 24.4 per cent of the overall workforce, where safety has become essential to their physical, professional, intellectual and emotional well-being in their work place (Report on Employment, Planning & Policy for The Twelfth Five Year Plan by Labour, Employment & Manpower (Lem) Division Planning Commission; 2011). Lots of innovative fields are escalating fast and it is essential to accommodate the women police personnel in those domes. The timeworn inclinations should be set distinctly to set out for first-hand opportunities and potentials of improvement and accomplishment through more engrossment of women in workplace……. (under review)

A scrutiny of on-job stress and occupational well-being of Indian policewomen compared to Chinese policewomen

Shilpi Bora[1], Abhirup Chatterjee[2]✉, Debkumar Chakrabarti[3]

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Abstract. India and China is counted as relatively ancient and highest populated countries. Basic issues of womanhood, common in both the countries, have been reported to influence occupational well-being through on-job stress from factors like policies, conveniences, basic amenities and workplace environmental settings of women in police organization. There is scanty literature available to comprehend and envisage potential workplace stress factors and how they affect occupational well-being between policewomen in both the countries. The objective of this study thus was to scrutinise job stress of policewomen and occupational well-being context in both India and China on a comparative annotation. The survey was conducted on 43 and 31 policewomen from Guwahati and Hangzhou WPS respectively. A survey questionnaire was designed using standard procedures (including analysis of reliability and validity by Cronbach's alpha) to analyse job stress and occupational well-being. It was observed from survey that overall job stress of policewomen in Hangzhou is lower than that in Guwahati. This could perhaps be because of higher number of staff as well as better basic amenities in Hangzhou than Guwahati. These observations were consistent with the reported higher percentage of women workforce and also income in China than India. Womanhood issues at workplace with specific reference to basic amenities are one of the major problems during their duty. On the contrary, Indian policewomen were found to lack even basic facilities and an amiable workplace – giving rise to their on-job stress and affected occupational well-being.

Keywords. Indian policewomen, Chinese policewomen, Occupational well-being, Job stress, Basic amenities

Introduction. In India, women comprise 24.4 per cent of the overall workforce, where safety has become essential to their physical, professional, intellectual and emotional well-being in their work place [1]. Lots of innovative fields are escalating fast and it is essential to accommodate the women police personnel in those domes……..

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Implementation of Ergonomic Design Interventions to Improve Workplace Amenities for Assam Policewomen

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Abstract. Womanhood issues at workplace with specific reference to basic amenities are major problem in the police duties. This paper looks into the womanhood specific issues at Police Stations. Personal interview and individual responses to a subjective assessment questionnaire were recorded from forty policewomen of different ranks posted in Guwahati, Assam (N=40, purposive non-probability sampling) to have their views on these issues. A thorough scrutiny of the actual situation revealed critical lack of facilities and basic amenities for policewomen (pertinent to womanhood) at workplace, i.e. the general police stations. Analysis of the responses reflected policewomen to be under stress at their outdoor duties and workplace also, specifically due to the lack of privacy and conveniences facilities. This piece of work depicts the views and feelings of policewomen before and after implementation of proposed design interventions in an existing police station, thereby improvement of their occupational wellbeing.

Keywords: Womanhood issues in Police Force, Convenience Facilities, Police Station amenities, Occupational wellbeing

1. Introduction

Women contributions in law enforcement have progressed tremendously during the last three decades. Globally (as stated by UN women report, 2011), an average of just 9% of the police is women, with rates falling as low as 2% in some parts of the world. On average, women do not comprise more than 13% of the gross police force in any region. In most developed countries, women make up to 25% of the total force. Police job have traditionally been dominated by males. However, with more and more females entering the workforce and more prominence being placed on equivalent opportunity hiring, there has been a vast increase in the number of women becoming police (Jamil&Mohyuddin2015)…….

TH-1918_136105008

A Comparative study on measurement of job stress and workspace amenities for Policewomen in disturbed and undisturbed regions

Shilpi Bora, DebKumar Chakrabarti, and Akhil Garg

Abstract: The issues of women equality and biasedness in work culture are very prevalent in various organizations both technological and non-technological way. It is even profound in developing countries such as India, where it has been dragged since from very ancient times. Due to the increase in crime of women and child, there has been an effort to increase jobs/posts for women in police station. However, this increase is not associated with simultaneous enhancement of facilities required for them in work office. This may result in an additional stress in their jobs. As a first step for designing the workspace amenities, it is necessary to understand the existing amenities and also issues associated with job stress. Therefore, the main objective of this study is to quantify the job stress and workspace amenities in all women police station and mixed type (both male and female) police station. Two police stations in Guwahati and Six police stations in Tinsukia district (disturbed) were selected as the case studies for investigation. An integrated methodology was adopted considering survey, visual observation and interview for achieving the required objective. This study throws light on specific issues related to job stress faced by women working Police stations in disturbed area as compared to those in city (urban and undisturbed). Work space amenities in selected police stations were also quantified and compared. Discussion were made to understand the need of design issues linked with safety and privacy of women. Through this study, the design issues in work space in police stations are highlighted, that will further lead to design interventions using ergonomic principles.

Keywords: Women Police, Womanhood, Workspace, Privacy, Safety, Confidentiality

1. Introduction

There are lot of efforts made by governments around the world to enhance recruitment of women in police force in order to efficiently handle cases related to women and child crime. Based on the surveys conducted by previous researchers, several respondents revealed that policing is not an easy occupation for females due to lack of resources, separate amenities and communal gravities [1]……..(under review)

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Meghalaya tourism: Inculcating cultural image in developing enroute mini halts

Kharkongor, W.B., Paul, A., Bora, S., Chakrabarti, D.

Ergonomics Laboratory, Department of Design, IIT, Guwahati, India

Abstract :

Tourism has become a core interest in developing inter-community interaction and harmony between guest population and local host; it shares a lot about the place, the people, their culture and their lifestyle. Meghalaya Tourism fails to focus on the lesser known locations that have the potential to be used for tourism purpose. Literature seems to throw its focus on the popular final destination or tourists spots alone but very less focus is given to the Journey that leads to these spots. This project studied the possibility of introducing mini-halts or stopping stations on the way that connects Guwahati and Shillong to create a travelers' companion experience and provide them with a positive vibe as per their expectations. A pilot investigation on some tourists visiting Meghalaya to gather information on their opinion and suggestions of such enroute mini halts is done. Hofstede Models of Culture and Hofstede's Onion diagram are studied.

Office Workspace Design for Policewomen in Assam, India: Applications for Developing Countries

Shilpi Bora, Abhirup Chatterjee, Debkumar Chakrabarti

Abstract: Organizations of all the sectors around the world are increasingly revisiting their workplace strategies with due concern for women working therein. Limited office space and rigid work arrangements contribute to lesser job satisfaction and greater work impoundments for any organization. Flexible workspace strategies are indispensable to accommodate the progressive rise of modular workstations and involvement of women. Today's generation of employees deserves malleable office environments with employee-friendly job conditions and strategies. The workplace nowadays stands on rapid organizational changes in progressive and flexible work culture. Occupational well-being practices need to keep pace with the rapid changes in office-based work. Working at the office (workspace) with awkward postures or for long periods can cause pain, discomfort, and injury. The world is stirring towards the era of globalization and progress. The 4000 women police personnel constitute less than one per cent of the total police strength of India. Lots of innovative fields are growing fast, and it is important that we should accommodate women in those arenas. The timeworn trends should be set apart to set out for fresh opportunities and possibilities of development and success through more involvement of women in the workplace. The notion of women policing is gaining position throughout the world, and various countries are putting solemn efforts to mainstream women in policing. As the role of women policing in a society is budding, and thus it is also notable that the accessibility of women at general police stations should be considered. Accordingly, the impact of workspace at police station on the employee productivity has been widely deliberated as a crucial contributor to employee satisfaction leading to better functional motivation. Thus the present research aimed to look into the office workstation design of police station with reference to womanhood specific issues to uplift occupational wellbeing of the policewomen. Personal interview and individual responses… (Abstract)

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A study on Occupational well-being of Assam policewomen and scope of ergonomic design interventions

Shilpi Bora[1], Abhirup Chatterjee[2], Debkumar Chakrabarti[3]

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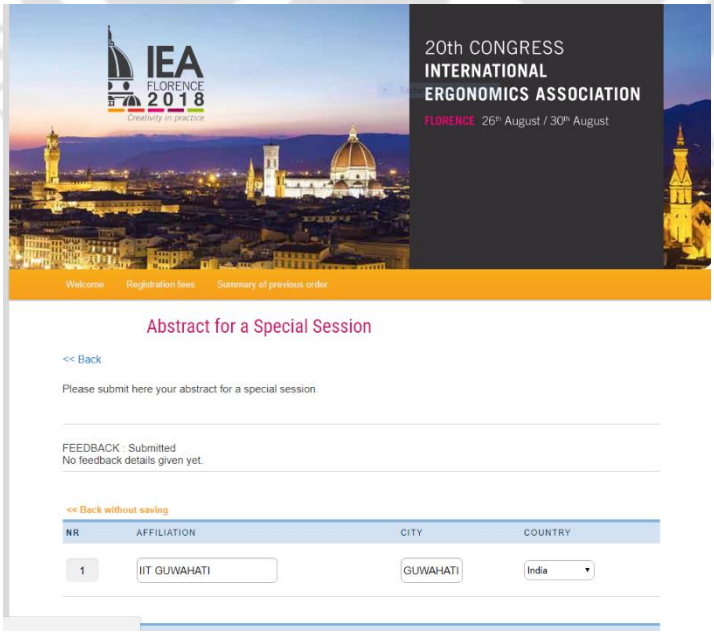
Abstract: Impact of environmental stress on occupation well-being of women engaged in police service requires thorough understanding, which is deemed obvious to inspire them to join police organization in India. The exploration and quantification of occupational stress at the workplace, and its consequence on occupational well-being, could also lead to changes in extant policies and norms. This might also be contributed to by ergonomic design intervention / design modification of existing infrastructure of police stations. Differences in security situations between regions could also influence environmental stress at the workplace / workstation for policewomen.

The objective of this study was to assess environmental stress at the workplace and consequences on occupational well-being of policewomen in two types of regions – one less disturbed area namely Guwahati, (a Metro city of Assam, also its capital city) and other declared as disturbed called Tinsukia, (a major business city of Assam). The study also attempted to address some ergonomic design interventions to improve the situation.

A questionnaire-based survey was designed to assess stress of policewomen at workplace, factors contributing to the stress and whether they underwrote the affecting of their occupational well-being. The survey was conducted on 43 policewomen from All Women Police Station (AWPS) of Guwahati and 22 policewomen from PS Tinsukia (Assam) to analyse job stress and occupational well-being. The questionnaire consisted of two main parts…….(abstract Submitted)



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Advances in Intelligent Systems and Computing
Volume 605, 2018, Pages 318-325AHFE 2017 International Conference on Social and Occupational Ergonomics, 2017; Los Angeles; United States; 17 July 2017 through 21 July 2017; Code 193729

An Ergonomic Interventional Approach to Improve Office Workspace for Policewomen in Assam, India

Shilpi Bora, Abhirup Chatterjee, Debkumar Chakrabarti

Ergonomics Laboratory, Department of design, IIT Guwahati, Guwahati – 781039, Assam, India. {shilpi.bora; drachatterjee; dc}@iitg.ernet.in

Abstract. Enhanced workstation is a prerequisite to escalate productivity, the same being applicable for the women police personnel involved in law-and-order enforcement. The paper deals with how the well-being of the women police at workplace was perceived after implementation of proposed ergonomic intervention. The study was conducted with existing All Women Police Station and other Police Stations in Guwahati, Assam, India, considering their occupational stress and hazards. In this descriptive study a sample of 30 women police was selected by purposive sampling and analyses were performed using responses to a questionnaire method and individual / group meetings. The aim of the study is to be look into office workstation design of police station with reference to womanhood specific issues to enrich occupational wellness of the women police personnel. Hence the improved atmosphere of workplace upsurges the probabilities of innovativeness, accomplishment and enhances the eminence of work productivity of Policewomen.

Keywords. Policewomen · Workstation modification · Occupational well-being · On-job satisfaction · Ergonomic intervention

1 Introduction

Over the preceding years, workplace has become an abundantly diverse environment. Organizations of all the domains across the globe are gradually envisaging their workplace approaches with due concern for women working within. Inadequate work place space and uncompromising work requirements contribute to reduced job satisfaction due to greater work pressure for any establishment. Flexible workspace strategies are crucial in order to accommodate the progressive upsurge of modular……..

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Analysis of stress at workplace of policewomen in Guwahati and China and scope of ergonomic interventions

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January 28, 2018

Dear Shilpi bora,

We are pleased to inform you that your submission has been accepted for presentation or demonstration at the 9th International Conference on Applied Human Factors and Ergonomics and the Affiliated Conferences to be held at Loews Sapphire Falls Resort, Universal Studios Orlando™, Florida, United States of America, 21-25 July, 2018. (http://ahfe2018.org)

Paper ID#: 1505

Paper Title: Analysis of stress at workplace of policewomen in Guwahati and China and scope of ergonomic interventions

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