It is ‘Monkey bread’ for Male Kenyan Teachers’ Workplace Comfort

Nickson Moseti Ongaki, John Fredrick Moerwa Omwoyo, Faith Wavinya Musa
Jomo Kenyatta University of Agriculture and Technology P.O Box 62000 Nairobi, Kenya
Correspondence E-mail: nickson.moseti@gmail.com

Abstract.
Contact with nature offers comfort, which in turn has a strong and positive relationship with workers health, safety, well-being and productivity. The mechanisms involved include lowered stress, improved social interactions, faster recovery from illness, reduced mental fatigue, increased attention, higher productivity, reduced violence, increased pain tolerance and lowered perceptions of discomfort. Such benefits have stimulated studies to explore tree species that if brought to the workplace could offer such comfort. The Savannah hypothesis as advanced by Orians postulates, that people like to see trees with spreading forms that indicate strong possibility for accessing water, food and security, and the genetic basis of this relationship has been clarified. Studies on tree species from the Savannah from the viewpoint of workplace human comfort are extremely limited yet stress at work is on the rise forcing people to look for relaxation and healing. Savannah species of trees may hold the key to workplace human comfort especially if carefully selected. The most preferred form for these trees has also not yet been established. The objective of the study was therefore, to investigate this hypothesis, among rural-based primary school teachers, by identifying the most preferred visually attractive Savannah species of trees that would confer maximum comfort for them, what form it should take and determine ratings of four physical stress comfort factors. Sixty-six teachers from Nyakach District, Kenya, identified through snowball sampling technique participated in the cross sectional study. The attractiveness of the 5 tree silhouettes and 5 form/context types was determined using paired comparison method with a 5-point rating scale. The repeated measures analysis of variance(ANOVA) of the paired-comparisons showed main effects in all respondent categories while Student-Newman-Keuls (S-N-K) of multiple comparisons revealed that, for teachers workplace comfort, the highest rating of attractiveness was for Cocos nucifera (Palm) but for males, ‘monkey bread’ tree, Adansonia digitata, an indigenous Savannah species, was rated higher than all others. There was also a higher positive preference for 2m x 1m size photographs. Potted plants were least desirable, as was Mango, effectively lending credence to the Savannah Hypothesis. Rating of workplace conditions indicated possibility of the existence of high stress levels occasioned by physical factors in the teaching environment. Further study is recommended to explain the determinants...
for gender differences in the observed preferences and to also obtain empirical data on physical comfort factors.

**Keywords**- Teachers Comfort, Stress, Savannah Hypothesis, Baobab, Palm.

**Introduction and Literature Review**

The definition of workplace comfort is not straightforward (Miller, 2008) although extensive evidence available show that comfort has a strong and positive impact on safety, health wellbeing of workers and productivity. He adds that the definition of the word comfort is ‘as elusive as the blind men’s elephant’ but concludes that it is a ‘positive feeling of ease and well-being’ (Miller, 2008). In her 1859 *Notes on Nursing*, Florence Nightingale recognized that patients who were comfortable tended to regain health. Over a century later, research by Kolcaba and Wykle (1996) has verified “comfortable patients heal faster, cope better, become rehabilitated more thoroughly, and die more peacefully that do the uncomfortable” (Kolcaba and Wykle, 1996). But comfort is subjective, dynamic, changeable and filtered uniquely, it is also holistic—the body is influenced by the mind, which is affected by emotions. In her Comfort Theory Model, Kolcaba (2003) identifies three states of comfort: *relief*, which is the alleviation of discomfort; *ease* which is a neutral state of contentment; and *renewal* (later changed to *transcendence*), which refers to the active, hopeful aspect of comfort in the sense of its root word, *comfortare*, which also means to strengthen (Kolcaba, 2003). Vischer (2008) has defined comfort as a tripartite continuum of physical, functional and psychological comfort while Tutton and Seers (2003) reports that ‘comfort measures are not comfort unless the patient perceives them as comforting (Vischer, 2008; Tutton and Seers, 2003). Tutton and Seers (2003) concludes that comfort is “what the patient or worker says it is” Tutton and Seers, 2003). The Concise Oxford English Dictionary (2006) and Random House Webster’s Unabridged Dictionary (1997) define comfort as ‘state of ease and freedom from pain or constraint; consolation from grief or anxiety; cause to feel happy’ (COED, 2006; RHWDUD, 1997). Longman Dictionary of Contemporary English (2003) adds that comfort is a feeling of being physically relaxed and satisfied or if someone or something makes you feel calmer, happier or more hopeful (LDCE, 2003). The aspect of psychological comfort could mean pleasing architecture, visual interest, art on the walls, or natural elements such as a fountain, plants, or an aquarium. The effect of beauty—the aesthetic element of a work environment may be the most unquantifiable contributor to psychological comfort in the workplace (Miller, 2008). In a paper by Bergs (2008), it is argued that dissatisfaction with comfort has a 10% negative influence on productivity (Bergs, 2008).

Several studies on psychophysiology have suggested that a plant environment seems to provide the preferred form of physiologically measurable stress reduction (Chang and Chen, 2005; Coleman and Mattson, 1995; Doxon et al., 1987; Kim and Mattson, 2002; Liu et al., 2003, 2004; Lohr et al., 1996; Owen, 1994; Park, 2002; Park et al., 2004; Tomono, 2003; Ulrich et al., 1981)
1991; Verderbe and Reuman, 1987). This relaxation occurs remarkably quickly, within 3-6 minutes (Ulrich, 1992; Ulrich and Simons, 1986). People in a plant environment not only showed faster physical recovery from stress, but also improved psychological (Kaplan, 2001; Kaplan and Kaplan, 1995; Ulrich, 1979), emotional (Adachi et al., 2000; Chang, 2000; Cho, 2002; Kim and Mattson, 2002; Owen, 1994; Park, 2002; Tomono, 2003; Ulrich, 1981, Ulrich et al., 1991; Yamane et al., 2004), and cognitive states (Cimprich, 1993; Hartig et al., 1991; Liu et al., 2003, 2004; Tennessen and Cimprich, 1995). Viewing plants has been linked to positive health outcomes of individuals, such as pain reduction, less need for analgesics, and faster recovery from surgery (Diette et al., 2003; Lohr and Pearson-Mims, 2000; Park, 2002; Ulrich, 1984; Ulrich et al., 1993). There are certainly extensive evidences that the presence of plants may significantly improve stress and enhances the teachers’ health, safety and well-being (Cooper Marcus and Barnes, 1999; Gerlach-Spriggs et al., 1998; Hartig et al., 1999; Parsons et al., 1994; Ulrich, 1999; Ulrich and Parsons, 1992).

Numerous researchers have documented high levels of stress among teachers regardless of what level they teach (Reglin and Reitzammer, 1997; Sago, 1995; Tuetteeman and Punch, 1992, Mokad, 2005) which appears to be an international phenomenon (Gaziel, 1993). The main sources of stress for teachers are society (with a mean rating of 2.87), parents (mean rating - 2.60), teaching (mean rating – 2.29), pupils (mean rating – 1.79), supervision (mean rating – 1.79), curriculum (mean rating – 1.42), colleagues (mean rating – 1.28) and administration (mean rating – 1.08) (Mokad, 2005). Stress has been associated with anxiety, depression, neurotic impairment, and other psychological symptomatology (Brown and Harris, 1989; Dohrenwend and Dohrenwend, 1974, 1978; Hollister, 1983; Rodin and Voshart, 1986). Stressors consume and deplete energy and prolonged stress contributes to fatigue (Aistars, 1987; Irvine et al., 1991) and weaken the body’s immune system, increase susceptibility to infectious disease, and delay wound repair (Kiecolt-Glaser et al., 1995). Mokad (2005) reported that teachers have adopted coping strategies such as watching TV (62%), talking with friends (59%), praying (54%), relaxation (38%), reading (38%), forgetting work (34%), playing sports and travelling (23%). These strategies may impact negatively on teachers’ productivity. This is despite the current widespread knowledge that natural environments hold positive attention, may block negative thoughts, and produce stress-reducing effects (Kaplan, 1992b, 1992c; Ulrich, 1983) due to human’s evolutionary development in the Savannah 4 million years ago (Orians, 1980, 1986). The presence of plants may brighten the teaching environment and create an attractive, soothing and restorative atmosphere from workplace stress factors. Plants uniquely restore people to physical, psychological, and emotional well-being. They provide a comfortable and restful
retreat to occupants spending their time in a stressful workplace (Park, 2006).
The trees to be brought into the workplace for comfort must be carefully selected
(Miyake, 2006). One of the trees with spreading canopies, Acacia tortilis, has attracted considerable research interest since it is believed that it should be much preferred because humans have an innate preference for savannah-like settings that arises from their evolutionary history on the savannas of East Africa (Balling and Falk, 1982). But an information gap exists with regard to universal preference of Acacia tortilis, with spreading canopies and non-existent data on what form the most preferred tree should assume within the workplace to confer the desired comfort to employees. The present study therefore attempted to find out from rural-based primary school teachers, their most preferred tree species and what form it should take. Further information was also sought on the current rating of four stress-inducing physical factors - noise, lighting, heat and dust.

Subjects, Materials and Methods
Demographic Characteristics of Respondents
The study sample consisted of 59.7% male and 38.8% females. The gender distribution of the respondents is further illustrated in Fig 1.

The highest education levels for both males and females are shown in Fig 2 and Fig 3 respectively.
Age Distribution of Respondents

The average age of respondents was 39.4 years (standard deviation =10.719, n=65). (See Fig 4).

Tree Silhouettes studied

The tree species evaluated through the paired comparison method were A - Acacia tortilis, B-Adansonia digitata, C-Euphorbia candelabrum, D-Mangifera indica, E-Cocos nucifera. The actual silhouettes used in the study are displayed in Fig 5.
Fig 5: Tree Silhouettes studied

Forms/Contexts studied –

The different forms/contexts evaluated were: A- Potted plants; B- MURALS (WALL PAINTINGS); C- 2m x 1m size photographs; D- Plastic plants and E- Cloth paintings.

Results and Discussions

Nyakach Teachers’ Tree Preferences

The repeated measures ANOVA revealed significant main effect of tree shapes \((F = 5.165; \text{df}=3.873; \text{Epsilon (E)}(\text{Greenhouse-Geisser})=0.968; \eta^2=0.074;\text{statistical power} = 0.962; \text{significance} =0.001)\). The Student-Newman-Keuls (S-N-K) analysis of multiple comparisons unveiled three subgroups. The Palm-Baobab-Euphorbia subgroup was rated higher than all the other tree silhouettes indicating that there were no significant differences between any pairs of any of them. Palm was rated higher than any other trees. The second subgroup had Euphorbia and Acacia while the last rated subgroup had Mango and Acacia. Baobab was rated no. 2. Mango was rated as the least attractive. Fig 6 shows the graphic representation.

Fig 6: Graphic Illustration of Nyakach Teachers Tree Preferences
It was concluded that the most attractive tree species among Nyakach teachers was Palm while Mango was the least attractive.

_Nyakach District Male Teachers’ Tree Preferences_

The repeated measures ANOVA exposed almost borderline significant main effect of tree shapes \((F = 4.315; \text{df}=3.495; \text{Epsilon(E)(Greenhouse-Geisser)}=0.874; \eta^2=0.1000; \text{statistical power } = 0.896; \text{significance } =0.004)\). All the tree shapes fell within a single subgroup (this means that there was no significant differences between any pairs of all of them).

Baobab was significantly higher than any other trees. Acacia was rated the least attractive among male teachers in Nyakach District. Fig 7 illustrates these results.

Fig 7 – Graphic illustration of Nyakach District Male Teachers’ Tree Preferences

![Graphic illustration of Nyakach District Male Teachers’ Tree Preferences](image)

Baobab was the most preferred visually attractive tree species among male teachers\((n=40)\) in Nyakach District while the least attractive was Mango.

_Nyakach District Female Teachers Tree Preferences_

The repeated measures ANOVA did not bring forward any significant main effect of tree shapes \((F = 1.2890; \text{df}=3.378; \text{Epsilon(E)(Greenhouse-Geisser)}=0.845; \eta^2=0.049; \text{statistical power } = 0.354; \text{significance } =0.283)\). So, all the trees were within the same subgroup. The findings suggest that there were no significant differences between any pairs of all the tree shapes. Palm was rated higher than any other trees. Mango was rated the least attractive tree species. The findings are as shown in the graphic illustration in Fig 8.

![Graphic illustration of Nyakach District Female Teachers Tree Preferences](image)
In the present study, results assert that female teachers in Nyakach District consider Palm as the most attractive tree shape that should be brought into the workplace for maximum comfort. They also rated Mango as the least attractive.

**Primary School Teachers Form Preferences**

The repeated measures ANOVA showed a highly significant main effects of form/context types (F = 7.089; df=3.002; Epsilon(E)(Greenhouse-Geisser)=0.750; eta²=0.106; statistical power = 0.980; significance =0.000). The analysis of paired comparisons also proved the existence of two subgroups. There were, therefore, significant differences between pairs of all the forms/contexts in each subset. The cloth paintings-murals-2m x 1m size photographs subgroup was rated higher than all other form types. The 2m x 1m size photographs had the highest mean score. Plastic plants-potted plants subgroup had the least mean score. Potted plants form type was rated last. Fig 9 demonstrates these results.

For *primary school teachers*, 2m x 1m photographs form type was the most preferred form/context of introducing the best tree shape into the workplace. Potted plants form type was least preferred. Cloth paintings, murals and 2m x 1m size photographs were rated in the same category. In the male teachers’ category, the most preferred form was 2m x 1m size photographs (see Fig 10) while their female
counterparts most preferred form type was murals (wall paintings) (see Fig 11).

Fig 10: Graphic representation of Male Teachers’ Form Preferences

![Graphic representation of Male Teachers’ Form Preferences](image)

Fig 11: Graphic representation of Female Teachers’ Form Preferences

![Graphic representation of Female Teachers’ Form Preferences](image)

**Summary Rating of Workplace Conditions**

Six percent of the workplaces were rated as very noisy while only 3% were considered very silent. Sixty-two percent (62%) and 26.9% were perceived to be moderately noisy and moderately silent respectively. Forty percent of respondents indicated exposures to very poor lighting (too much light) and 5.5% (too dark) revealing that at least 45.5% of workplaces may pose not only health risk but also increased discomfort to exposed teachers. Thermal discomfort was indicated in more than a third (35%) of the workplaces of teachers while another 33% indicated that their workplaces were too dusty. Female teachers recorded a higher perception of noise, thermal, poor lighting and dust conditions than male teachers. Perceptions of excess discomfort may be widespread among teachers and gender may be playing a role in determining sensitivity to these stress inducing factors.

**Implications of the Preferences for Adansonia digitata and Cocos nucifera**

Both *Adansonia digitata* and *Cocos nucifera* are established sources of food, water (or indicative sources of water nearby), and can be used to make shelter, besides being associated with emotional, cognitive, aesthetic, and even spiritual development (Gruenwald and Galizia, 2005; Bally, 2006; Wilson, 1993) as postulated in the Savannah Hypothesis (Orians, 1980, 1986). Baobab can store up to 120,000 litres of water inside
the swollen, fire-resistant trunk and keep it portable for many years and serve as a reserve during drought (Schütt and Wolf, 1996). The pulp has high nutritional value with more than five times the Vitamin C content of oranges among others (Manfredini et al., 2002; Täufel, 1993). The extracts from baobab fruit, seeds and leaves have scientifically–proven medicinal properties (Le Grand, 1989; Milza, 2002). Baobab’s ability to shed leaves and remain without leaves nine months in a year offered opportunity to use the tree for security and food scavenging purposes. These characteristics were critical during the evolutionary period and may have determined the current observed preference for Baobab. *Cocos nucifera*, on the hand, where it grows, provides almost all the necessities of life—food, drink, oil, medicine, fiber, timber, thatch, mats, fuel, and domestic utensils. For good reason, it has been called the “tree of heaven” and “tree of life.”(Bally, 2006). The clear liquid in the interior of a coconut fruit (coconut water) is a refreshing and cool, acclaimed by many to be the “perfect drink and in a healthy, undamaged coconut, the water is sterile. Coconut may also connote presence of vast waters nearby and abundance of food such as fish, crustaceans and others. Coconut trees may grow up to 40 meters in height therefore offering real chances as observatory for both prey (for security reasons) and food (Muruka, 2009; Muruka, et al., 2010; Bally 2006). Therefore, the Savannah Hypothesis is supported.

**The Dwindling Preference for Acacia and Mango**

The preference for *Acacia tortilis*, if was previously genetically determined, seems to have changed and responded to what Fjeld (1996) calls ‘very minor changes’ in human biology, physiology or genetics over the last 10,000 years (Fjeld, 1996). These ‘very minor changes’ in genetics might have had profound impact on the genetic maps that denoted preference for Acacia during early human evolution. Mango may expose Man to hidden security risks within its thick canopies thus contributing to the negative affiliation observed.

**The Low Preference for Potted Plants**

Miyake (2000) has reported that foliage potted plants occupy some working spaces hence obstacle for walking and they disturb workers (Miyake, 2000). Potted plants also require attention, care such as regular pruning, watering, spraying with pesticides, carefully arranging them, diligent dusting and expert consultations. Such care requires human, technical and budget support indicating a high possibility that such observed low preferences for potted plants may have been informed by such perceptions.

**Conclusions**

The present findings support the Savannah Hypothesis as postulated by Orians(Orians, 1980,1986), and further show that for maximum workplace comfort, teachers in Nyakach prefer the ‘Monkey Bread Tree’, *Adansonia digitata*, (also known as baobab) as the most attractive tree species. Teachers’ most preferred form or context type (2m x 1m size photographs) do not consume workspaces, possibly indicating lack of space for functional comfort at present. In
addition, stress may be highly common among primary school teachers as revealed by the rating of current workplace conditions especially with respect to noise, thermal, lighting and level of dustiness. Female teachers could be more sensitive than male teachers as shown by the observed higher thresholds.

Recommendations

It is recommended that:

1. Teachers’ workplaces require urgent evaluation to obtain empirical data on workplace stressors to enable adoption of effective remedial measures.
2. School managers should be exposed to training opportunities in educational ergonomics to enable cope and adopt new low-cost occupational health management strategies.
3. Further studies should focus on eliciting responses on actual preferences complemented by the paired comparison method.
4. Urban, Muslim, Hindus and other religious groups of teachers should be included in future studies. The present study had only Christian respondents.
5. School workplace designers need to incorporate aesthetics involving trees during the design of teachers’ workplaces.

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