Appendix – A: Summary: Colour experience pyramid

1) Personal Relationships	Learnt responses; express a person's likes/dislikes, indifferences to the hues. One might love green or hate red due to personal relationship to such colour.
2) Influence of trends, fashion, styles	Learnt responses - The trends in colour application have an impact on the experience and perception of colour.
3) Cultural Influences and Mannerisms	Learned responses - Colour associations, symbolisms, impressions and mannerisms that are characteristic of a specific culture, group of people, region also play a main role in how colour is experienced and used.
4) Conscious Symbolism; Associative power of colour	The associations, impressions, symbolisms made on a conscious, level. To some extent learned responses yet there are numerous associations having universal interpretations; research have shown basic agreement among most people in all cultures; blue with sky and water/ green-nature/red-revolution… "The associative power of colour has an ultimate effect on whether an architectural space is perceived as being friendly, warm, cold, inspiring, sad, dirty, dynamic, harsh, expensive, cheap, aloof, etc." Symbolism of colour is predominant in religion, medicine, mythology, healing, alchemy, art, astrology…etc. Colourful metaphors ; feeling blue: depressed While there are many modern associations, many have been inherited from the past, remain actively in use and show remarkable consistence in meaning over time.
5) Collective unconscious	The associations from the collective unconscious which are primordial and connected to the mankind's entire experience since their origin on the planet. This association, similar to biological reactions, are not controlled or caused by the intellect or conscious rational thought based on personal experience amassed during our lifetime. -Collective unconscious is the part of the psyche which has no connection to conscious, rational thought. -Existence is not dependent upon personal experiences gathered during once lifetime. -Archetypes or the original patterns or model from which other things of the same kind are made; fundamental images formed in our development as a species; images which are inherited from the ancestral past. (Millions of year's memories are stored in the genetic building plan of our brain). -In born consciousness/knowledge' *"Colours too are part of primordial images of Archetypal significance";* Initial feelings and origins of aesthetic qualities of

	colour connected over many millennia.
6) Biological reactions to a colour stimulus.	-Forms the base for colour association which cannot be controlled / changed; not controlled or caused by intellect/conscious rational thought, -Biologically fixed, beyond ones control. -The inescapable innate biological reactions which are beyond ones control, **Colour as a message carrier** -An inherited characteristic of survival (photosynthesis, pollination, search for food, propagation of species) – the ability to see colours and the sensitivity of the eyes of different species evolved with the necessity for survival. (Humans have total colour vision suggesting that the total spectrum is necessary for his survival biologically and beyond; psychologically.) -Signal character(message carrying) of colour – protection and preservation/threat (warning signals to predators) and attraction (erotic attraction towards the mate) Display/camouflage. -Distinguish between edible (safe to eat) and inedible (unsafe) -Colours help to understand and interpret the nature for humans. (the modern man's response to colour show traces of this evolutionary heritage) **Inducing fixed biological functions in humans and animals;** A neural pathway carries light and colour stimulation to the hypothalamic mid brain, and on to the penile and pituitary glands (master glands which control the entire endocrine system) ending up with production and release of hormones. -Many effects are formed by visible light; colour in the form of light. -Coloured lights are found to act through the skin as well. (use of blue light to cure infant jaundice is a standard medical practice for decades)

Source: Mahnke (1996)

Appendix – B: Summary of Literature Review: Parameters of colour Perception.

External parameters	Description
Wavelength and frequency	Colours are perceived as "warm" or "cool" related to the dominant wavelength of the colour (Ballast, 2002). High wavelength colours are said to be warm and low wavelength colours are believed to be cool (Plack & Shick 1974, Wineman 1979, Walters et al 1982, Whitfield &Wiltshire 1990, Stone 2001 and Ballast 2002).
Colour reflectance value, Colour absorption, Emissivity	A coloured surface that reflects 90% of the light that hits it is seen as white. If it reflects 5% we see black (Rihlama, 1999). The amount of radiant energy absorbed or reflected (light reflectance value) from an object is influenced by its colour and texture. Dark colours have a low light reflectance value whereas light colours have high reflectance values (Earth Science with Vernier, 2014). The implications of surface colour for performance criteria on surface performing solar insulating functions in hot climates should be obvious. Ward-Harvey (2009).

Surface Reflectance/Absorption

Surface	Solar Radiation Short Wavelengths		Terrestrial Radiation Long Wavelengths	
	Absorption Emissivity	Reflectance	Absorption Emissivity	Reflectance
Fresh Whitewash	.12	.88	.90	.10
White Paint	.20	.80	.90	.10
Light Coloured Paint	.40	.60	.90	.10
Dark coloured paint	.70	.30	.90	.10
Black Pint	.85	.15	.90	.10

Source: Ward-Harvey (2009).

Dimensions of colour	What is important than the colour itself is the colour dimensions and their relationships; contrast of value, saturation, (Kwallek, 2005).
Colour combination (Effects of single colours, two colours, three colours, patterns)	A colour scheme comprising of a combination of colours generates results different from a single colour (Kwallek, 2005). A colour scheme alone may impact mood (Kwallek, 2005). Pattern is an immediate associate of colour. It is the repetition of shapes or forms. They can be a mix of flowing, branching, spiralling geometric shapes (Daggett, Cobble and Gertel, 2008).
Source of light and level of lighting.	Rihlama (1999), the experience of colour of the environment depends essentially on the quality of light. The hues of colour may vary when seen under incandescent (tungsten)

	light-bulb, from what is seen under daylight. Darker colours are seen as more darker while lighter colours appear more brownish (Shevell and; Kingdom , 2008).
Time of exposure to coloured surface / environment	Had the impacts of colour on office workers been tested for prolonged periods, the effects would have differed substantially (Kwallek et al, 1997). Even though higher arousal level, brain activity, heart rate and respiration could be experienced at the initiation of exposure to red, the levels fall to below normal after prolonged exposure (MCM research Limited, 1992)
Properties of the surface applied: Finish (Texture; mat, gloss, semi-gloss)	In addition to the shape, the quality of the surface affects the way the light rays are reflected (Rihlama, 1999).
Other Practical aspects	Method of colour selection, matching and production will have a bearing on the colour produced. Area applied: The impact of colour applied in a small area is different from the same colour applied in a large area. Thickness of the pain coat: The impact of colour stimuli will depend on the thickness of the paint coat.
Internal/personal Parameters	
Factors of the eye	According to a recent study by University of Rochester dramatic differences could be seen in the number of color-sensitive cones in the retina. (Williams, 2005 cited in University of Rochester ,2005)
Condition of eye sight-Vision	New research shows that one person's blue can be perceived by another person as red. I.e people do not see colours as the same. (Hughes, 2012) Jay Neitz, a colour vision scientist from the University of Washington (as cited in Hughes, 2012) states that recent experiments leads us to believe that people do not see the same colours. Birds and reptiles are tetrachromatic and are capable of seeing in to the infrared and ultraviolet spectra. Human tetrachromats have an extra photoreceptor which is most sensitive to colour in the scale between red and green, which makes them more sensitive to all colours within the normal human range. (Stafford, 2012).
Age	A gradual decrease with age could be seen in the ability to see colours. (American Optometric Association,2013) As the population ages, changes on the visual system related to age increases. Eye diseases related to changes due to age leads to severe visual impairment (Peli , 2001).
Gender	Recent studies have discovered slight differences between the manner in which Males' and females' brains process (Macrae, 2012). Females are better at discriminating among colours. (Owen,2012). In order to experience the same hue, males may require a slightly longer wavelength than females (Journal Biology of Sex Differences as

	cited in Owen,2012). Grass is experienced as greener by women than men while an orange may be perceived as redder by man than to a woman. (Owen,2012). The experiments from the City University of New York also showed that men struggle to distinguish subtle differences in shades of yellow, green and blue (Macrae, 2012). As clarified by the differences in male vs. female colour visions cannot be explained by any dissimilarity in the structure of the eye (Abramov, 2012 cited in Macrae (2012). Gender might influence the cross-modal effects of colour (Landgrebe et al.,2008).
Personal /Individual/psychological variations of perception moulded by socio, cultural, religious and experiential constructs	Individual responses to color and light have been considered by few researchers (Kwallek, 2005). "Color is a psychological property" of the visual experiences of human beings (Palmer 1999, p. 95). "Seldom, surely, is the psychological part of an appearance in nature so great as it is in the case of colour" (Beer 1992 as cited in Mahnke, 1996).
Screening ability towards external stimuli of the person	Difference in the screening ability may be a cause for individuals to respond to the environment in a particular way (Mehrabian, 1976). Differences in the ability to screen-out unrelated external stimuli by human beings may have an influence on the experience of different colours and the corresponding impacts of colour on human emotions and behaviour (Kwallek, 2005).
Primordial , evolutionary connotations	"Colour vision is not uniquely human, nor did it evolve in isolation. It is the result of a very deep history within a dynamic world of colour and light, which began long before our vertebrate ancestors left the oceans some 370 million years ago" (King,2005)
Health condition pertaining to vision	Diabetes impair vision (Krall 1978 , Moss, Klein. and Klein1998) A human being with a healthy sense of sight can discern about 160 different hues (Rihlama,1999) Colour deficiency is usually an inherited condition. However, loss of colour recognition could also be consequenced by diseases or injury causing damage to the retina or the optic nerve (American Optometric Association, 2013). Diabetes is found to causes damage to the retina threatening vision which has been identified to be the leading cause of blindness among working-age Americans (U.S. National Institutes of Health (NIH) (Sieving, 2012).
Medications	Colour vision can be affected by certain drugs which are used to treat high blood pressure, nervous disorders, heart problems, psychological issues and infections (American Optometric Association, 2013).

Appendix – C: Internal Parameters of Thermal Perception

Internal/Personal Parameters	Description
A. Metabolic Heat Production	Metabolic heat generation is supposed to be the most essential personal variable of the perception of thermal comfort. Metabolic heat production is the largest source that imparts heat to the body (Larry, 2011). Maintaining the core body temperature in the normal range (37ºC +/- 1ºC) is vital for its optimum performance and metabolic heat production. King (2004) states that the oxidation of food in the visceral organs and tissues of the body core is a constant source of metabolic heat generation. Hydrocarbon fuel intake in the form of food is primarily either directly converted into neurological activity or kinetic mechanical energy in the muscle tissue, stored as fat, or directly burned up or oxidized with the primary by-products being carbon dioxide, water and heat. This food-to-heat conversion process is called metabolism (Wilson and Belshe 2001). Human physiology too can affect the thermal comfort perception due to increased amount of body fat or differences in the metabolic rate which could make people feel warmer. This can quite significantly vary among individuals (Huizenga et al., 2001).
Factors pertaining to metabolic heat production.	Metabolic heat production is a dynamic phenomenon which varies due to diverse factors namely; age, body temperature, gender, sleep cycle, height, weight and skin surface area, pregnancy, menstruation, lactation, growth, prolonged fasting, infection and other diseases, recent ingestion of food, muscular activity, emotional state, ambient temperature, hormones and other conditions (Vander, Sherman and Luciano 1980 as cited in Wilson and Belshe 2001). Increased metabolic activity will enable a person to perceive an elevated thermal level.
Factors pertaining to core body temperature	It should be considered that body temperature will be varied from person to person due to several factors namely: Age, individual variations, ambient temperature(AT), gender, regions of the body , body mass index(BMI), time of the day; circadian rhythm, topographical/regional changes, metabolic rate, exposure to light, consumption of food, consumption of alcoholic drinks, physical activities, fasting, sleep deprivation , sicknesses-(See Appendix- D)
B. Clothing Insulation.	According to laboratory studies, a naked person sitting quietly is

	comfortable at 82.4°F (Fanger, 1970). Clothing insulates the human body from losing heat to the environment. People in all parts of the world existing in widely variable climates have evolved a plethora of clothing styles appropriate for local climate needs to protect themselves from both heat and cold and controlling moisture movement (Wilson and Belshe 2001).
C. Natural Body Responses; Thermo regulation	Warm-blooded creatures including human beings are able to adapt and live in a wide range of environments via a complex system by which they generate their own heat and regulate the internal temperatures (Wilson and Belshe ,2001).This process of controlling body temperature is identified as thermoregulation. Body temperature is kept constant by balancing both heat gain and heat loss. Hypothalamus is the basic body controller for thermal comfort. Being a gland at the base of the brain it is essentially a thermostat set at 98.6°F. When it senses that the body is losing heat faster than it is generating it, it secretes hormones and sends nerve impulses to various parts of the body to increase the metabolic rate, constrict blood vessels and other changes. Under over-heated situations, the hypothalamus sends out just the opposite signals. When certain pathogens or disease trigger the brain, many of these same temperance regulators are brought into play to raise the core body temperature to help fight off these viral and bacterial invaders (Wilson and Belshe, 2001). According to Carr (2011), humans are capable of tolerating core body temperatures below 35ºC or above 41ºC only for very brief periods. Humans have developed effective and specialized physiological responses which finely coordinate and involve several body systems in order to conserve, produce or eliminate body heat in these conditions.
D. Activity Level	All thermoregulatory responses are supported and based on activity level. The body generates heat at widely varying levels depending on activity (Wilson and Belshe 2001). Therefore, the activity in which a person is involved will also contribute in determining thermal perception. Eagan as cited in Wilson and Belshe (2001) identifies the relationship between activity and heat generated.
E. Conduction from Body	Conduction of body heat through direct contact with cold surfaces is a far more efficient mode of heat transfer than convective losses to the air. Bare feet on cold floors are clearly more of a source of local discomfort than bare hands in air of the same temperature. Direct contact with cold surfaces allows these heat sinks to draw out body heat (Wilson and Belshe 2001).
F. CO and Other Chemical Reactions	Human bodies are indeed very complex systems with chemical stimuli and responses affecting all biological and physical activities.

	Besides the known health effects of even low levels of CO, this toxin also influences our perceptions of thermal comfort. Under conditions of reduced oxygen levels and increased levels of CO (Carbon Monoxide) or CO2 (Carbon Dioxide), the heart increases the blood flow in order to try to deliver sufficient oxygen to body tissues. With increased blood flow, there can be a false sense of warmth and comfort with a feeling of well-being and lethargy (Wilson and Belshe 2001).
G. Skin condition	Thermal conductivity, adapted skin temperature and the change of temperature and the thermal properties of the contact surface affect the thermal sensation derived from a particular temperature (Hedge, 2008).
H. Thyroid Problems	A person generates on average about 65% energy and 35% heat within the body cells during the burning process of calories for energy. This is so only for situations where the thyroid hormone, which governs the metabolic rate, works optimally within the cells. If the working temperature of a person is less than 97.8F, it reflects that the thyroid function is sluggish (Richards, 2012)
I. Ovulation	A natural increase of 2^{o} F could be seen during the ovulation process (Richards, 2012).
J. Adaptation/ Homeostasis	It may be expected that people with long-lasting adaptation to hot climates have lower sensitivity to them and higher sensitivity to cold climates, and vice versa – people durably adapted to cold climates have lower sensitivity to them and higher sensitivity to warm climatic conditions (Mateeva, 2011). Reports suggest that people who stay for prolonged periods in air conditioned (AC) environments have a lesser thermal adaptability than people in naturally ventilated (NV) environments. People in NV environments physiologically show a stronger capacity in responding to heat shock over people in AC environments. The results indicate that the people in NV environments can adapt well to warm environments (Yu et al, 2012).
J. Alliesthesia	Alliesthesia is explained as the condition were either a pleasant or an unpleasant experience is being generated by the same stimuli on same person depending on the internal state of the subject (Cabanac, 1971 as cited in Dear 2011). An example that can be taken is that when a subject is thirsty water tastes pleasant, yet when the thirst has been quenched the same water might not be that desirable. Another example is that when a subject is hungry the desirability of food increases and food is perceived as

	pleasant (positive Alliesthesia) whereas the same food becomes undesirable (negative Alliesthesia) when the desire to eat extinguishes. Cabanac (1992 as cited in Dear, 2011) notes that a hypothermic subject reports contentment when exposed to moderate heat whereas a hyperthermic subject will report pleasure when exposed to cold.
K. Health condition pertaining to skin sensitivity	Certain diseases can impair warm and cold perception of human skin. Cutaneous lesions in leprosy-diagnosed patients are characterized by alterations in thermosensation (Villarroel, Orsini, Grossi & Antunes (2007). Stress can make the skin more sensitive and more reactive (American Academy of Dermatology, 2014).
L. Psychological Parameters	"It has been shown that the thermal perception is regulated not only by the physical thermal level of stimuli but it also appears to interact with other perceptual or cognitive processes" (Kanaya, Matsushima and Yokosawa, 2012).

Appendix – D: Factors of Core Body Temperature hypothetically assumed to correlate with Thermal Perception

Parameter of CBT	Description
Individual variations	Considerable individual variations shown by subjects in their daily temperature fluctuations. Some of the readings were wide as 1.3^{O}C (2.4^{o}F) while others having oscillations as narrow as 0.05^{o}C (0.10F) (Mackowiak, Wasserman and Levine,1992).
Ambient Temperature	Ambient Temperature is a predictor of normal body temperature (Lu and Dai,2009)
Gender	Average temperature of a female is higher than a male; Male temp- 98.10^{o}F, Female Temp - 98.39^{o}F (Harvard University,2006) Women tend to show a slightly higher temperature than men (Wunderlich 1871,Mackowiak, Wasserman and Levine ,1992 and Sund-Levander ,Forsberg and Wahren (2002). **Special aspects of females contributing to CBT** Ovulation: A natural increase of 2^{o}F in basal temperature could be seen at ovulation (Richards, 2012). A CBT increase of about half a degree could be seen in almost all women as the hormone progesterone which is generated by the ovary just after ovulation tends to heat things up. It returns to normal only after the completion of menstruation. John and Kippley (1996) suggest that the rise in temperature only could be seen within a three day period. Swedan (2001) states that an temperature elevation of 0.15 to 0.45^{o} C could be observed in women due to the metabolic rate caused by elevated levels of progesterone during ovulation and drops to pre-ovulatory levels into few days of menstruation. The nature of the ovulation cycle and the day of ovulation of a female will be differed drastically from individual to individual which could directly affect the temperature readings. Therefore it is advisable not to use females as subjects to come up with a more valid result. (N, H. Salgado, personal communication, March 5, 2013, H. Meegaswatte, personal communication, March 8, 2013) Pregnancy: A measurement of elevated temperature levels for duration of 18 consecutive days almost certainly means that a woman is pregnant (Weschler,2002)
Age	Metabolic heat production of a person will change as per the age (Vander, Sherman and Luciano 1980 as cited in Wilson and Belshe, 2001) consequently affecting CBT. Humans can have variations in the body temperature depending on their age. Age 03 to 10 yrs - 35.5 to 38° C, age 11 to 65 yrs - 35.2 to 38° C and above 65 yrs - 35.6 to 37.5° C. A Harvard university study in 2006 done using 150 older people

	found that their average temperature was below 98.6°F and in fact never reached that level.
Regions of the body	Temperature reading varies from region to region in the body and thus it is important to take note of the region when assessing body temperature (Sund-Levander, Forsberg and Wahren ,2002).
Body Mass Index	BMI is a significant predictor of normal body temperature (Lu and Dai ,2009).Accordingly, factors of BMI have an impact of CBT.

BMI < 18.5		**18.2%**	Indicates under weight
BMI	**18.5 — 24.9**	52.7%	Indicate normal weight
BMI	**25—29**	22.5%	Indicate Over weight
BMI	**3O <**	6.7%	Indicate Obesity

(extrapolated from NFSS, 2010)

Source: Talat,M.(October,2011).

Weight		**Height**		**Average BMI**	**Reference**
Male	Female	Male	Female		
		5' 4.5" (Average)	5" (Average)		(Abeysekera & Shahnavas 1987 as cited in Short Persons Support 2012)
		5 ft 4 1/2 in" (Average)	4 ft 11 1/2 in" (Average)		(Ranasinghe et al, 2010)
Asian average body weight - 57.7 kg					(Walpole et al. (2012)
				18.5 Kgm2 - 23 Kgm2 - Asian standards	H. Meegaswatte, personal communication, March 8, 2013
				18.5 — 24.9 Kgm2	(extrapolated from NFSS, 2010)

BMI – Literature for Sri Lankan figures

Metabolic rate	Elert, (2005) reports that variations could be observed in the normal human body temperature due to the rate of metabolism. Faster the rate of metabolism higher the normal body temperature and vice versa.
Time of the day ; Circadian rhythm: Diurnal variation in body temperature,	Body temperature decreases at night relating to the sleep cycle of humans (Kreider, Buskirk and Bass, 1958, Weinert and Waterhouse, 2007). Temperature readings (means) varied with the time of the day. The

	variation was observed to be 0.5 ^{o} F to 0.9 ^{o} F. The lowest was recorded n the morning hours between 2 am and 8 am whereas the highest was recorded in the afternoon hours between 4 to 9 m. (Wunderlich, 1871 as Cited in Mackowiak, Wasserman and Levine ,1992). The amplitude of diurnal variation might be as high as 1.0°C (1.8°F) (Tauber ,1990 as Cited in Mackowiak, Wasserman and Levine ,1992). Core body temperature could be observed to be lowest in the mornings (36.7 °C) and highest in the evening (37.2°C) and follows a circadian cycle (King, 2004).
Topographical/regional changes.	Mackowiak, Wasserman and Levine, (1992) in their investigation found that there is a trend for the temperature to be higher among black subjects over the white subjects that took part in their research on CBT.
Exposure to light	Bright light is affecting the core body temperature and this was seen with subjects exposed to a bright light where the CBT was higher than when exposed to a dim light. The effect of this is mediated through the eyes of a person (Dijk, Cajochen and Borbély ,1991).
Consumption of food	Food with a high calorific value could increase the body temperature after consumption. Nair (2012). Hot spicy foods in general could be categorized as stimulants which raise the CBT due to stimulation of the circulation (Brody (1983) reported in NY times). McLelland, (2014) reports that the National Council of Strength and Fitness has stated that the amount of heat generated from a source depends on the type of the food and its calorific value. He further states that the thermo genesis is known as the process through which the human body gains heat through dietary sources.
Consumption of alcoholic drinks	Alcoholic drink consumption could have an increase in the body temperature during night and a decrease during daytime (Nair,2012)
Physical activities	Physical activities tend to increase the body temperature (Nair,2012)
Fasting	Body temperature is lowered during fasting (Nair,2012) and during starvation a fall in body temperature could be observed (Landsberg et al, 2009).
Sleep deprivation	Another reason for decrease in core body temperature is sleep deprivation (Nair, 2012). Laboratory experiments show that a drop in temperature is observed in people who have been deprived of sleep (Patel and Hu, 2008).
Sicknesses	Body temperature is an indicator of health status (Lu and Dai, 2009) E.g: Sleeplessness, Emotional Imbalances, Hypothermia, Hyperthermia, Hyperthyroidism, Hypothyroidism, Endocrine Issues, Hormone Imbalances, Blood Sugar, Cholesterol, Skin Problems, Cardio Vascular Problems, Swellings, Kidney Disorders, Fatty Liver etc etc) -Salgado (personal communication, 6 March 2013).

Appendix – E: Participant Variables of Thermal Perception

Variable	Controlling measures
Metabolic heat production (Most essential personal variable of the perception of thermal comfort).	Cannot control as the subjects were selected via simple random sampling. BMI value was included as a confounder in the regression model. Asian average BMI= 19-23 Kg/m2
Clothing insulation	Controlled by making the subjects wear a fixed dress specially designed with The same material - Cotton Same colour - Black Same body coverage
Natural body responses- (thermo regulation process that constantly balances both heat gain and heat loss from the body	This was supposed to be controlled automatically when all the external parameters are fixed and maintained at a constant level.
Activity level (The body generates heat at widely varying levels depending on activity contributing to TP)	Controlled by allowing the participants to get involved in identical activities in each WS; comfortably seated and rating the thermal perceptions (participants engaged in any physical activity screened via the interview and the initial temperature measurements prior to entering the WSs).
Reactions to CO and other chemicals	Controlled by making the laboratory environment free from chemical stimuli.
Conduction from body	Direct contact with cold surfaces was avoided in WSs; The worktop and the chair to be seated were made of timber. Specially designed identical lab slippers to avoid direct contact with the floor.
Sensitivity/ screening ability towards external stimuli ;warm /cool conditions	Cannot be controlled- Included as a confounder in the model (Sen_Warm/ Sen_Cool) .
Rate of Sweating	Cannot be controlled- Included as a confounder in the model (RoS).
Factors leading to core body temperature resulting a change in Thermal Perception (DATA - Temporal Artery Temperature)	
Ambient Temperature and humidity	Controlled via conducting the study in a controlled lab environment (26^{o}C, 50%rh)
Time of the day; circadian rhythm	Test time zone included as a confounder in the model. (TTZ)
Topographical/regional changes and homeostasis effect	This was controlled by including the average temperature of the region/home town in to the regression model as a confounder (HT_Temp) .
Individual variations in temperature	This was included in the model as Temporal Artery Temperature values (Diff_RTAT_Avg WTAT10_1 and Diff_BTAT_AvgWTAT10_1) .

Age	Included as a confounder variable in the regression model. (Age)
Gender (Female: ovulation, pregnancy)	Controlled by selecting only a male sample to assure more accuracy in data.
Body Mass Index	(BMI) – Added to the regression model.
Metabolic rate	Added to regression model represented by BMI.
Consumption of food	Controlled by instructing the subjects to have a specified balanced meal 2 hours prior to entering the WS.
Consumption of alcoholic drinks	Controlled via initial guidelines and the screening interview before entering the lab.
Physical activities	Controlled via initial guidelines and the screening interview before entering the lab.
Fasting	Controlled via initial guidelines and the screening interview before entering the lab.
Sleep deprivation	Controlled via initial guidelines and screening at the medical test and interview before entering the lab.
Sicknesses	Controlled via initial guidelines and screening at the medical test and interview before entering the lab.
Exposure to light	Controlled by providing the same lighting for each workstation (350 lux)
Regions of the body	Controlled by taking the body temperature measurement only from the forehead area. (R_TAT and B_TAT)
Regional adaptation/Homeostasis to thermal conditions.	This was included in the model by including the average temperature of the region/home town in to the regression model. (HT_Temp)

A.A. Hettiarachchi (03/9906), Senior Lecturer, Faculty of Architecture, University of Moratuwa, Sri Lanka
Contact ;0716864355, anishka_h@yahoo.com , 21st March 2013

Appendix- F

Letter of Consent

Name ..... Index No..... .....

Department ..... Date .....

PhD research on colour associated human thermal perception (03/9906)

I am Anishka Hettiarachchi, A senior lecturer attached to the Department of Architecture, University of Moratuwa. I would like to invite you to take part in the research study titled **Colour Associated human thermal perception** conducted by me at the Department of Architecture.

The purpose of this research is to investigate the possibility of colour to alter human's thermal environment, significantly the core body temperature. Through this association the possibilities of introducing color as an energy conservation tool in built environment will be questioned.

Your participation in this study is voluntary. You are free to not participate at all or to withdraw from the study at any time despite consenting to take part earlier. Please notify me as soon as you decide to withdraw your consent.

Methodology – You are required to sit in three colour cubicles for a time period of 10 - 15 minutes each and fill in a questionnaire on what you perceive while in the cubicles. Your forehead temperature will be measured via a non-invasive infra-red temporal artery thermometer.

Procedure –

- **First screening** – Here you are required to fill out a questionnaire briefing your medical history. This questionnaire will be handed over to you at your department.

- **Second screening** - You undergo a basic vision test and a medical inspection by a doctor at the Department of Architecture. Once you have passed through these steps you will be given a date and time to come for the trial. You are provided with an instruction sheet on what should be avoided immediately prior to the research date.

- **Final screening and visit to the lab** – Research will commence at this visit. On the research date you will be asked a few questions to ascertain that you have complied with the basic requirements. Special clothing and lab slippers will be provided and you will proceed to the research.

Being a participant in this research study you will help test the research statement above and will also gain good exposure on scientific research.

There are no particular health risks, hazards and discomforts that you undergo as a subject of this research.

Confidentiality of all records is guaranteed and no information by which you can be identified will be released or published. These data will never be used in such a way that you could be identified in any way in any public presentation or publication without your express permission.

If you have questions about any of the tests / procedures / information /instructions please feel free to ask me at any time.

Location of the Research – Seminar room, Faculty of Architecture

Contact – mob – 0716864355, 0718246746

E-mail - anishka_h@yahoo.com

Once you have carefully read through the above procedure and if you agree voluntarily to take part in this research, please place your signature below and return this sheet to the undersigned.

.....

Anishka Hettiarachchi.

I do consent to take part in the above research.

Name - .....

Signature - .....

Date -.....

Appendix G - Preliminary Questionnaire – *To be filled by Research Subject*

(This preliminary investigation is conducted to select eligible subjects for a PhD research study conducted by A.A. Hettiarachchi (03/9906), Senior Lecturer, Faculty of Architecture, University of Moratuwa, Sri Lanka)

Name		**Weight** (Kg)	
Department		**Height** (m)	
Index no		**BMI** (Kg/m2)	
Academic year		**Age**	
Religion		**Date**	
Nationality		**Contact No**	
Address			

1. **Have you checked your eyesight before? (** *Yes / No)*
   If YES, your vision as per doctors diagnosis –
   Normal / Colour blind / blurred / short sighted / long sighted
2. **Do you wear spectacles while conducting your day-to-day activities? –** (*Yes / No)*
3. **Have you visited any doctor during last One Month? -** (*Yes / No*)
   If YES please give the date and ailment.
   ……
   ……
   ……
4. **Are you on any long term medication? (Yes / No) If YES please specify your ailment.**
   ……
   ……
   ……
   ……
5. **How would you describe your rate of sweating? (** *Very low / low / Normal / high / very high* **)**
6. **How would you describe your sensitivity to warm and cool conditions?**
   Sensitivity to warm conditions *(Very low / low / Normal / high / very high)*
   Sensitivity to cool conditions *(Very low / low / Normal / high / very high)*
7. **Please underline the statement that mostly closely describes your tolerance to heat/cold**
   (I can tolerate both heat and cold / I can tolerate heat but cannot tolerate cold / I can tolerate cold but cannot tolerate heat / I cannot tolerate both heat and cold)
8. **Recommendation** (Done by the investigator) **: (Recommend / not recommend)**

Appendix H - Medical Information Sheet

– *To be filled by the medical officer after examining the subject*

(This medical investigation is conducted by a medical practitioner to screen the final sample for a PhD research study conducted by A.A. Hettiarachchi (03/9906), Senior Lecturer, Faculty of Architecture, University of Moratuwa, Sri Lanka)

Name		**Age**	
Department		**Academic Year**	
Index no		**Contact no**	

Height …….. **Weight……** **BMI……..**

Vision (R)…… ☐ *Normal* ☐ *Impaired*

Vision (L)…… ☐ *Normal* ☐ *Impaired*

Colour Vision ☐ *Normal* ☐ *Impaired ……..*

General health condition of the subject

Criteria	**value**	**Recommendation**	**Criteria**	**value**	**Recommendation**
Body temperature		(High, Normal, Low)	Blood pressure		(High, Normal, Low)
Pulse rate/heart rate		(High, Normal, Low)	Respiration rate		(High, Normal, Low)
Height		Weight		BMI	
Any infection		Yes / No	Skin ailments		Yes / No
Hyperthyroidism / Hypothyroidism		Yes / No	Blood sugar		Yes / No
Hypothermia / hyperthermia		Yes / No	Endocrine Issues		Yes / No
Swellings		Yes / No	Cardio Vascular Problems		Yes / No
Emotional Imbalances		Yes / No	Liver/kidney disorders		Yes / No

Special Comments (If any)

……

……

Recommendation to proceed with the test**: *Recommended / not recommended***

…… …… …… ……

Medical officer's name Signature / Stamp Date

Appendix I - Instructions to Research Subjects

You are are kindly requested to follow the guidelines mentioned below.

- Please arrive at the lab **on time.** DO NOT **get late.**
- Please have a balanced diet (usual, average amount. Don't eat too much or too less).
- Please have the above diet **as per the time specified.**
- Please be kind enough to reveal your current health condition before entering the lab. Please mention if you are under any medication.
- Don't get involved in any physical/muscular activity on the scheduled date.
- Please don't drink any hot/cool drinks three hours prior to the research timing.
- Please don't consume foods/short eats/chewing gums which are hot & spicy, with mint, clove flavours...Etc.
- Please don't consume any form of drugs/alcohol on the scheduled date.
- Do not stay awake too long in the night prior to the test. Sleep well.
- Your face especially the forehead area should be well cleansed before coming to the lab. The forehead should be very clean without sweat, water, oil, dust, balm, moisturisers and powder as temperature will be read above forehead.
- When you enter the lab please remove your cloths and wear the specially designed lab suit / lab slippers. Please note that the undergarments should be comfortable, made of cotton (preferably in black).
- You will have to fill a questionnaire while seated in each workstation.
- Your forehead temperature will be measured in 5 minutes intervals while you are seated and filling the questionnaires in each Work Station.
- Your commitment and enthusiasm in this regard is highly appreciated.

THANK YOU

Appendix – J: Sample Schedule

Date: 5th April 2013 – Friday - Research Subject's Details								
Slot No	ID No	**Name**	**Dept**	**Medical Test**	**Last Meal**	**Arrival**	**Research Time**	**Attendance**
5-01A	112624R	Galhena D.S.J.	QS	2nd April	07.00	08.15	08.30 - 09.20	
5-02A	112625V	Gamage G.D.A.S.	QS	2nd April	07.50	09.05	09.20 - 10.10	
Tea Break 10.10 a. m - 10.30 a. m								
5-03A	112631K	Hettiarachchi W.S.	QS	2nd April	09.00	10.15	10.30 - 11.20	
5-04A	112641P	Kumara M.W.S.(SAMAN)	QS	2nd April	09.50	11.05	11.20 - 12.10	
5-05A	112619G	Dilshan T.A.K.	QS	2nd April	10.40	11.55	12.10 - 01.00	
Interval 1.00 p. m – 2.00 p. m								
5-06A	112651V	Madushan J.A.C.	QS	2nd April	12.30	01.45	02.00 - 02.50	
5-07A	112653E	Medirigama M.R.P.A.B.	QS	2nd April	01.20	02.35	02.50 - 03.40	
Tea Break 3.40 p. m – 4.00 p. m								
5-08A	112654H	Mudannage M.V.K.	QS	2nd April	02.30	03.45	04.00 - 04.50	
5-09A	112656P	Nivehithan T.	QS	2nd April	03.20	04.35	04.50 - 05.40	
5-10A	112638m	Jayathissa.K.H.N.P	QS	2nd April	04.10	05.25	05.40 - 06.30	
S-11a	102130	Nandana G.G.M.P	Archi 2Y	23rd April	10.40	11.55	12.10 - 01.00	

Appendix K - Information Sheet – *To be filled by the investigator after interviewing the subject prior to entering the lab to continue with the trial*

(This interview is conducted to select the final sample for a PhD research study conducted by A.A. Hettiarachchi (03/9906), Senior Lecturer, Faculty of Architecture, University of Moratuwa, Sri Lanka)

<table>
<tr><td>Name</td><td></td><td>Index No</td><td></td></tr>
<tr><td>Department</td><td></td><td>Academic year</td><td></td></tr>
<tr><td>Scheduled time</td><td>……a. m / p. m</td><td rowspan="2">Time gap</td><td rowspan="2">……..Hrs
……..minutes</td></tr>
<tr><td>Last meal taken at</td><td>……..a. m / p. m</td></tr>
<tr><td colspan="2">Type of food ingested ……

Amount? .....</td><td colspan="2">Satisfactory/ not satisfactory</td></tr>
<tr><td colspan="2">Any hot /cool drinks consumed within the last three hours?</td><td colspan="2">Yes / no</td></tr>
<tr><td colspan="2">Any spicy or minty food consumed within the last three hours?</td><td colspan="2">Yes / no</td></tr>
<tr><td colspan="2">Liquor / drugs taken within the past 36 hours</td><td colspan="2">Yes / no</td></tr>
<tr><td colspan="2">Involvement in any physical/ muscular activities within last three hours</td><td colspan="2">Yes / no</td></tr>
<tr><td colspan="2">Sleep pattern last night</td><td colspan="2">Normal / not normal</td></tr>
<tr><td>No of sleeping hours (last night)</td><td>…….. Hrs …….. minutes</td><td colspan="2">Satisfactory / not satisfactory</td></tr>
<tr><td colspan="2">Undergoing any mental imbalances</td><td colspan="2">Yes / no
If yes ; Stress /depression / other</td></tr>
<tr><td colspan="2">Undergoing any medication since the previous screening process:</td><td colspan="2">Yes / No</td></tr>
<tr><td colspan="2">General health condition after the last screening process:</td><td colspan="2">Normal / having complications</td></tr>
<tr><td colspan="4">Special comments if any
……
……
……
……
……
……
……
……</td></tr>
<tr><td colspan="2">Final Recommendation on suitability to take part in the study:</td><td colspan="2">Recommended / not recommended.</td></tr>
</table>

Appendix – L: Data Sheet

Name.		Index No		Date	26th April	Time	

SEC_EDU: **FVC:** **LFVC :** **Exposure to colour:**

White Cubicle	2	4	6	8	10
Ten minutes					

White IN cubicle Temperature..... S T..... White OUT cubicle Temperature.....

RED / BLUE Cubicle	5	10	15
Fifteen minutes			

Notes:

RED / BLUE IN cubicle Temperature.....ST..... RED / BLUE OUT cubicle Temperature.....

White Cubicle	2	4	6	8	10
Ten minutes					

White IN cubicle Temperature..... ST..... White OUT cubicle Temperature.....

RED / BLUE Cubicle	5	10	15
Fifteen minutes			

Notes:

RED / BLUE IN cubicle Temperature.....ST ..... RED / BLUE OUT cubicle Temperature.....

Appendix M - Questionnaire – *To be filled by Research Subject*

(This investigation is conducted to test the impact of colour on thermal perception for a PhD research study conducted by A.A. Hettiarachchi (03/9906), Senior Lecturer, Faculty of Architecture, University of Moratuwa, Sri Lanka)

Name		**Index No**	
Department		**Academic Year**	

Colour of the work station **(√)** ☐ **White** ☐ **Red** ☐ **Blue**

Please write down your thoughts, feelings, emotions and memories **related to the colour of the work station.**

.....

.....

.....

.....

Rate your feeling of warmth/coolness inside this work station with reference to its colour, in the five point scale given below. Please tick off (√) the appropriate box below.

Very Cool *(Cold)* **-2**	**Cool** **-1**	**Neutral** *(Neither Warm nor cool)* **0**	**Warm** **+1**	**Very Warm** *(Hot)* **+2**

List down the **activities you would prefer to perform** within this space. (Or any larger space that would have **the same colour scheme**)

EXERGEN Temporal Artery Thermometer

Instructions For Use

Quick Check-List:

- Read instructions completely before using
- See www.temporalscanner.com for Educational Video
- Remove protective cap before using
- Reads arterial temperature, which is a core temperature very close to rectal temperature (See pg. 9)
- Sensor should be clean (See pg. 12)
- If perspiration is present see pg. 7

TemporalScanner™ 2000C

More accurate than ear
- Harvard Medical School study on infants [1]

Accuracy Comparable to rectal
- multiple hospital studies [2]

Important Safety Instructions

READ ALL INSTRUCTIONS BEFORE USING

When using the product, especially when children are present, basic safety precautions should always be followed, including the following:

- This product is intended for household use only. For information on thermometers for professional use, please see www.exergen.com, or call 617-923-9900.
- Use this product only for its intended use as described in this manual.
- Use of this product is not intended as a substitute for consultation with your physician.
- Do not take temperature over scar tissue, open sores or abrasions.
- Basic safety precautions should always be observed, especially when this product is used by, on or near children or invalids.
- The operating environmental temperature range for this product is 60 to 104°F (15.5 to 40°C).
- Always store this thermometer in a clean, dry place where it will not become excessively cold (-4°F/-20°C), or hot (122°F/50°C).
- The thermometer is not shockproof. Do not drop it or expose it to electrical shocks.
- This thermometer is not intended to be sterile. Do not try to sterilize it. Follow the cleaning instructions as described in this manual.
- Do not use this thermometer if it is not working properly, if it has been exposed to temperature extremes, damaged, been subject to electrical shocks or immersed in water.
- There are no parts that you can service yourself except for the battery, which you should replace when low following the instructions in this manual. For service, examination, repair, or adjustments, return your thermometer to Exergen.
- Do not operate where aerosol spray products are being used or where oxygen is being administered.
- Do not take temperatures with this thermometer near places that are very hot, such as fireplaces and stoves.
- Do not use this thermometer outdoors.
- Never drop or insert any object into any opening.

- If your thermometer will not be used regularly, remove the battery to prevent possible damage due to chemical leakage. If the battery leaks, remove carefully. Do not allow bare skin to touch leaking fluid.
- Dispose of used batteries properly. Do not wrap them in metal or aluminum foil. Wrap them in newspaper before disposing of them. Do not burn them. Battery may explode if overheated.

SAVE THESE INSTRUCTIONS.

Table of Contents

Introduction

Congratulations and thank you for purchasing the Exergen TemporalScanner Thermometer for consumer use. Your new TemporalScanner Thermometer is a totally non-invasive system with advanced infrared technology providing maximum ease of use with quick, consistently accurate measurements. Advanced, patented technology measures temperatures with a gentle stroke across the forehead.

The TemporalScanner Thermometer has been clinically tested for accuracy compared to rectal thermometers and temperature sensors inserted in the heart during course of patient treatment[2] and accepted for use in major hospitals, making it the ideal thermometer for use with newborns, infants, children or adults.

The TemporalScanner has patented software, providing arterial heat balance. This unique process determines temperature by accurately measuring the balance between the tissues warming from arterial blood and tissues cooling/ warming caused by heat loss/gain to the environment.

Why take temperature measurements at the skin surface over the temporal artery?

The best place to measure temperature is the center of the heart, but this can be done only under a doctor's supervision. Doctors know that measurement of the blood temperature in a major artery accurately reflects true body temperature. The TemporalScanner Thermometer is designed to measure the temperature of the skin surface over the temporal artery, a major artery of the head.

The temporal artery is connected to the heart via the carotid artery, directly leading from the aorta, the main trunk of the arterial system. It offers constant blood flow. It is the only such artery positioned close enough to the skin surface to provide access needed to take an accurate measurement. It is easy to use because it is ideally located at the front portion of the forehead. The TemporalScanner is easier and gentler to use than other types of measurement devices such as oral, rectal, underarm and in-ear thermometers because it is truly non-invasive.

How does the TemporalScanner Thermometer work?

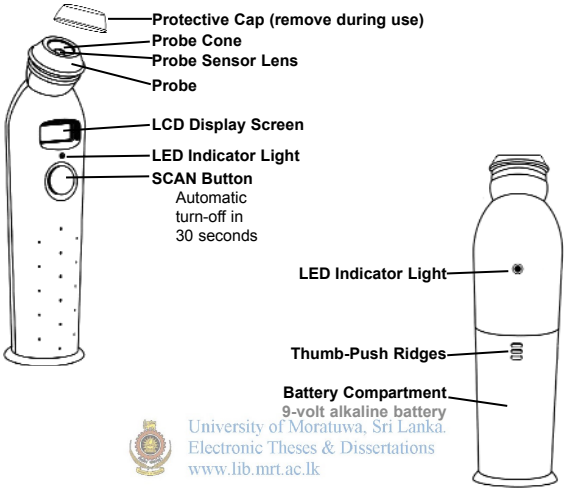
As you gently stroke the thermometer across the forehead crossing over the temporal artery, the sensor in its probe performs two processes:

First it scans like a video camera, capturing naturally emitted infrared heat from the arterial blood supply at about 1000 times per second, locking in the highest temperature it senses and;

Second, at the same time, a patented system measures the ambient temperature of the area where the temperature is being taken. The patented "arterial heat balance" (AHB) software then synthesizes the two separate readings to accurately determine and display body temperature.

As with any thermometer, taking temperatures properly is critical to obtaining accurate temperatures, so please read all instructions carefully and thoroughly before using this product.

Before Using, Familiarize Yourself with the Instrument



- To Scan: Depress the button. The instrument will continually scan for the highest temperature (peak) as long as the button is depressed.

- Beeping and LED flashing: Beep and LED flashing indicate a rise to a higher temperature, similar to a radar detector. Slow beeping indicates that the instrument is still scanning, but not finding any higher temperatures.

- Retain Reading: The reading will remain on the display for 30 seconds after the button is released.

- To Restart: Depress the button to restart. It is not necessary to wait until the display is clear, the thermometer will immediately begin a new scan each time the button is depressed.

Measuring TA Temperature

What you ***should*** know before using the TAT:

- Measure only the side of the head exposed to the environment. Anything covering the area to be measured (hair, hat, wig, bandages) would insulate the area, resulting in falsely high readings.
- Slide the thermometer straight across the forehead, not down the side of the face. Midline on the forehead, the TA is about a millimeter below the skin, whereas at the side of the face, the TA is much deeper, and measuring there would result in falsely low readings.
- When taking the temperature behind the ear lobe (if there is perspiration on the forehead, see pg 7), first push away any hair, exposing the area. Then, tuck the thermometer on the neck under the ear lobe, in the soft conical depression, (the place where perfume might be applied).
- Wait about 30 seconds before measuring the same person again to avoid excessive cooling of the skin.
- An infant is frequently swaddled in blankets and clothing covering the neck area. Unless visibly sweaty, one measurement at the TA area is typically all that is required. Should you feel the temperature is low, then push aside any clothing or blankets covering the neck area for ~30 seconds or so, and repeat the measurement on the neck behind the ear.

Factors that may affect measurement accuracy:

The patented AHB technology in your TemporalScanner actually makes two separate measurements (1) the temperature of the skin over the temporal artery, and (2) the temperature of the room. To determine the most accurate reading, it measures both temperatures some 1000 times a second as you sweep the TemporalScanner across the forehead. The AHB system then calculates how much the blood has cooled down during its journey from the heart to the skin over the temporal artery and makes allowance for this in the temperature it displays. The result is a highly accurate reading - delivered extremely fast and with no discomfort.

To ensure that the reading always reflects the body temperature accurately, you need to take account of the following factors which may affect an accurate reading.

Sweating:

When a fever resolves, your body may bring its temperature down by sweating.

The TemporalScanner detects this reduction in temperature immediately - long before a rectal thermometer can do so. However, sweating also causes extra cooling of the skin. As a result the reading given by the TemporalScanner may be low. You should therefore either wait until the sweating has stopped (wiping the forehead is not recommended, since the sweating immediately begins again), or use the following method, which has been clinically proven to provide accurate results.

1. Scan the temperature as normal, keeping the button depressed
2. Gently nestle the TemporalScanner on neck directly behind ear lobe
3. Release the button and read the temperature

Note: Normally, the artery behind the ear lobe does not provide a sufficiently accurate reading. However, this area is less affected by sweating than the forehead. In addition, during sweating, increased blood flow produces higher skin temperature, equivalent to TA, resulting in a good reflection of body temperature.

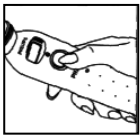
Environmental effects:

As part of its AHB system, the TemporalScanner measures the temperature of the surrounding environment. For this measurement to be accurate, it needs to have become acclimatised to the temperature of the room in which it is to be used. If it is taken from a cold room into a hot room, or vice versa, allow it to acclimate for at least 30 minutes before using it. Avoid holding the TemporalScanner by the head, as it will mistake the temperature of your hand for that of the room.

What else should I know?

If your child is agitated, or squirms away before you have completed your measurement, just keep the button depressed and you can continue the measurement without having to wait.

How to Take a Temperature



1. Remove protective cap before use. Be sure lens is clean. If not, clean with cotton swab dipped in alcohol and let dry. Hold the thermometer as shown.

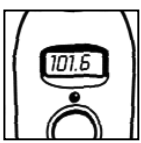
2. Gently position the probe flush (flat) on the center of the forehead, midway between the eyebrow and the hairline. Press and hold the SCAN button.

3. Lightly slide the thermometer across the forehead keeping the sensor flat and in contact with the skin until you reach the hairline.

→ You will hear a beeping and a red light will blink to indicate a measurement is taking place.

→ If perspiration is present, continue to hold button depressed, lift probe from forehead and touch the neck just behind the ear lobe.

4. Release the SCAN button and remove the thermometer from the head.



5. Read the temperature on the display. Thermometer will shut off automatically after 30 seconds. To turn thermometer off immediately, press and release the button quickly.

6. Replace the protective cap on thermometer to protect the sensor when not in use.

Clinical Temperature Information

Normal Body Temperature (BT)

Normal BT is not a single temperature, but a range of temperatures influenced by age, time of day, and measurement site. You can establish your family's normal ranges by taking a number of temperatures from each member during a day and keeping records of them. Many people may not have an elevated temperature even if they are ill. These include, but are not limited to, infants under 90 days old, people on steroids, antibiotics or antipyretics (acetaminophen, ibuprofen, aspirin), people with compromised immune systems (including the elderly and those having HIV/AIDS). Consult your doctor if you feel someone is ill even if their temperature is not elevated.

An elevated temperature or fever is often viewed as a danger sign. In fact, fever can be beneficial. It should be evaluated in the light of other physical symptoms. A doctor should be consulted in the following situations where fever is present: vomiting, diarrhea, changes in appetite, activity or breathing, or with children who are irritable, lethargic or unusually sleepy.

Normal Temporal Artery (TA) Temperature: The range of normal TA temperatures has been established by a large study by Dr. Keith Powell[4], for which he reports "After using the Temporal Scanner Infrared Thermometer to determine the range of normal temperatures in over 2300 infants and children (see table below from his study[5]) the staff in our 15 pediatric practices won't use any other thermometer. The Temporal Scanner is accurate, fast, non-invasive, and well tolerated by children of all ages." A temperature higher than those shown in the table is normally considered to be a fever, but consult your doctor for medical advice. For ages greater than 18 years, 100.1°F (37.8°C) should be used.

Age	Upper limit of normal temperature
0-2 months	100.7°F (38.1°C)
3-47 months	100.3°F (37.9°C)
4-9 years	100.1°F (37.8°C)
10-18 years	100.1°F (37.8°C)

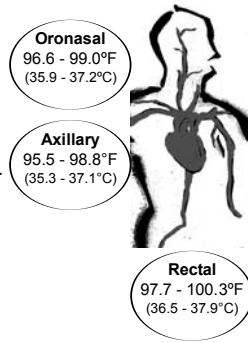
On a stable resting individual, temporal artery temperature is about the same as a rectal temperature, and approximately 0.8°F (0.4°C) higher than an optimum oral temperature. However, during fever episodes, the difference can be much higher, mainly because of the much greater speed of the TA compared to ear, oral, or rectal sites in responding to change in fever.

Normal Rectal and Oral Temperature: According to the American Academy of Pediatrics,[3] ordinarily, a rectal reading of 100° F (37.8°C) or less, or an oral reading of 99° F (37.2°C) or less, is considered normal, while higher readings indicate fever.

General Rule of Thumb: Rectal temperature is about 2°F (1°C) higher than underarm, about 1°F (0.5°C) higher than oral temperature.[6]

Expect the Differences: Arterial temperature measurement leads all other methods in identifying fever or falling of an elevated temperature, and is unaffected by activities of daily living. Accordingly, it will sometimes be different from other methods — *but accurate*.

Normal Body Temperature Ranges at Various Measurement Sites



Oral Temperature Artifacts:

Oral temperature can be misleading, and many individuals with fever can have a "normal" temperature.[7] Mouth breathing, rapid breathing, and hot or cold fluids are a few of the artifacts that can distort the reading, as can inability of the individual to cooperate. Accordingly, comparisons with TA may not be reliable.

Rectal Temperature Artifacts: Rectal temperature should only be considered as a good approximation of core temperature when the patient's thermal balance is stable,[8] and may be misleading after antipyretics, physical exercise, or other intervention that may change temperature quickly.

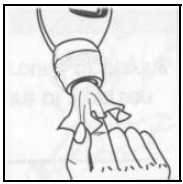
Axillary Temperature Artifacts: Based on strong evidence cited by the National Institutes for Health, *"axillary temperature is contraindicated in critically ill adults, and its use in the general patient population should be discouraged due to its unreliable correlation with core temperature and its poor reproducibility."* [9]

References:

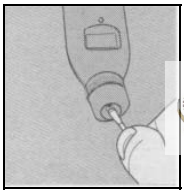
1. Greene DS, Fleisher GR. Accuracy of a noninvasive temporal artery thermometer for use in infants, *Arch Pediatr Med* 2001 Mar;155(3):376-381
2. Studies on file at Exergen. Published or presented studies available from Exergen.
3. *Caring for Baby and Young Child: Birth to Age 5*, American Academy of Pediatrics, Bantam 1999.
4. Keith R. Powell, M.D., Dr. Noah Miller Chair of Pediatrics, Children's Hospital Medical Center of Akron, and Professor and Chair of Pediatrics, Northeastern Ohio Universities College of Medicine.
5. Roy S, Powell K, Gerson LW. Non-invasive temporal artery temperature (TAT) measurements in healthy infants, children, and adolescents. European Society for Pediatric Infectious Diseases, 2002 Conference, Vilnius, Lithuania, May 29-31, 2002.
6. Kuzucu EY. Measurement of temperature. *Int Anesthesiol Clin,* 3(3):435-49, May, 1965
7. Tandberg D, Sklar D. Effect of tachypnea on the estimation of body temperature by an oral thermometer. *NE J Med*, 308, 945-46,1983
8. Houdas Y, et al. Human body temperature. Ch 5, p89, Plenum Press, 1982, USA, UK
9. O'Grady NP, Barie PS, Bartlett JG, et al. Practice guidelines for evaluating new fever in critically ill adult patients. Task Force of the Society of Critical Care Medicine and the Infectious Diseases Society of America. *Clin Infect Dis* 1998 May:26(5):1042-59

Cleaning the Instrument

The TemporalScanner is an optical instrument. Like a camera or eye glasses, a dirty lens will distort the view. If the thermometer is unable to see the heat clearly, it will be unable to measure it accurately, resulting in low readings.



- Probe lens and cone should be shiny clean, if not, wipe with a small cloth or swab moistened with alcohol.

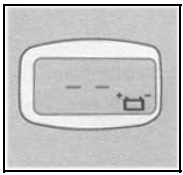


- Hold upside-down to prevent excess moisture from entering the sensor area. It will not harm the sensor, but if it becomes too wet, you will be unable to take a temperature until it dries.

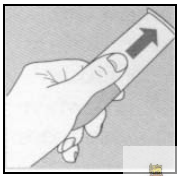
- Thermometer case can be cleaned with any hospital approved disinfectant, alcohol, even bleach solutions. Avoid gritty, abrasive cleaners as they can scratch the thermometer.

- Do not hold the TemporalScanner under the faucet or submerge in water. It is not water-proof.

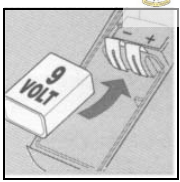
Changing the Battery



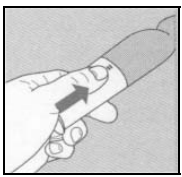
Blinking battery icon with temperature displayed: battery is low but will still operate correctly. Replace soon.
Blinking battery icon with 2 dashes: not enough energy in the battery to measure correct temperature. Replace battery.



Remove the battery compartment door by pushing down on the ridges with your thumb, and pushing away as indicated. Use both thumbs, if necessary.



Insert an alkaline 9-volt battery as illustrated, with the positive (small terminal) always on the right.



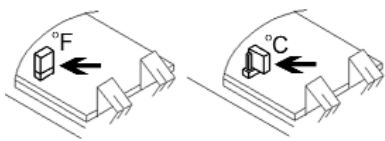
Replace the battery compartment door as indicated, with a push of your thumb on the ridges.

Display Messages

Scn	A flickering Scn on display is visible during measurement. At completion, releasing the button will display and lock temperature on the screen for 30 seconds.
HI	The target temperature measured is higher than 107.6°F (42°C).
LO	The target temperature measured is lower than 60°F (15.5°C).
HI. A	Temperature of the thermometer is higher than 104°F (40°C). Let the instrument acclimatize for about 30 minutes in a cooler area in which it will be used.
LO. A	The temperature of the thermometer is lower than 60°F (15.5°C). Let instrument acclimatize for about 30 minutes in a warmer area in which it will be used.
Err	EMI/RFI (like static on a radio) protection is preventing a temperature from being taken. Wait a minute and you should be able to proceed. If not, reset by removing and replacing the battery. Be sure battery is tightly connected. Call Customer Service if error message reappears.

°C/°F Conversion

Remove the battery cover and battery. Remove the clip shown by the arrow. Replace the clip in either the °C position or the °F position shown by the diagram. Replace battery and battery cover.



Product Specifications

Clinical Accuracy	Meets ASTM E1965-98 and EN60601-1 standards for electronic and radiation thermometers to the extent applicable to thermometers which measure the surface of the skin over the temporal artery.
Regulatory Approvals	CE Mark to -0197, TUV, Declaration of Conformity-ISO 9003/08.94, NIST certifiable traceable calibrations, UL listed.
EMI/RFI Protection	Error message displayed
Calibration Protection	Error message displayed
Temperature Range	15.5 to 42°C (60 to 107.6°F)
Operating Environment	15.5 to 40°C (60 to 104°F)
Resolution	0.1°C or °F
Response Time	Approximately 0.04 second
Time Displayed on Screen	30 seconds before automatic shutdown
Battery Life	Approximately 7,500 readings
Size	7.0 in x 1.75 in x 1.25 in (17.8 cm x 4.45 cm x 3.18 cm)
Weight	4.5 oz (130 grams) incl batt
Display Type	High contrast LCD
Construction Method	Impact resistant casing, hermetically sealed sensing system
Warranty	1 Year
Laboratory Error:	See below
Storage Range:	-4°F to 122°F (-20°C to 50°C)
Patents	Protected by the following US patents: 4636091, 5012813, 5199436, 5653238, 5874736, 6045257, 6047205, 6056435, 6292685, 6299347, 6319206, 6402371 Other US and foreign patents pending.

ASTM laboratory accuracy requirements in the display range of 37° to 39°C (98 to102°F) for IR thermometers is +/-0.2°C(+/-0.4°F) whereas for mercury-in-glass and electronic thermometers, the requirement per ASTM standards E667-86 and E1112 is +/-0.1°C (+/-0.2°F).
*Full responsibility for this product meeting applicable portions of this standard is assumed by Exergen Corporation, Watertown, MA 02472

One Year Warranty

Exergen Corporation warrants each new Exergen TemporalScanner 2000C (except battery) against defects in materials or workmanship for a period of one year from the date of purchase, and agrees to repair or replace any defective product without charge.

IMPORTANT: This warranty does not cover damage resulting from accident, misuse or abuse, lack of reasonable care, the affixing of any attachment not provided with the product or loss of parts or subjecting the product to any but the specified battery.* Use of unauthorized replacement parts will void this warranty.

Exergen Corporation will not pay for warranty service performed by a non-authorized repair service and will not reimburse the customer for damage resulting from warranty service performed by a non-authorized repair service. No responsibility is assumed for any special, incidental or consequential damages.

In order to obtain warranty service, simply call Exergen Corporation Customer Service, 617-923-9900, for a Return Material Authorization number (RMA). Then send the product, postage or shipping prepaid, to Exergen in accordance with the instructions given with the RMA number. It is suggested that for your protection, you ship the product, insurance prepaid. Damage occurring during shipment is not covered by this warranty.

NOTE: No other warranty, written or verbal, is authorized by Exergen Corporation. This warranty gives you specific legal rights and you may also have other rights which vary from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion and limitations may not apply to you.

*Read enclosed instructions carefully.

Made in U.S.A.

c UL us LISTED 36LB

This symbol on the product's nameplate means it is listed by Underwriters' Laboratories, Inc.

CE 0197

Developed, designed, and manufactured by Exergen Corporation in the USA

EXERGEN CORPORATION, 400 PLEASANT STREET . WATERTOWN, MA 02472
PHONE: 617.923.9900 FAX: 617.923.9911
www.exergen.com

P/N 818541 Rev 6

We measure it. testo

Mini data logger Temperature

testo 174T

- Display of current temperature value
- High data security
- Large display
- Fast data analysis and documentation on a PC
- Waterproof according to IP65
- Measurement data memory for 16,000 measurement values

°C

Illustration 1:1

The mini data logger for temperature, testo 174T, is ideal for accompanying transports. Simply positioned close to the goods, e. g. in containers and refrigerated rooms, the data logger monitors temperature continuously, securely and unobtrusively. The free software ComSoft Basic allows fast programming of the data logger and easy analysis.

The integrated NTC probe stands for high accuracy. Its large measuring range and compact design make the testo 174T the competent assistant for almost any temperature recording job.

Technical data / Accessories

testo 174T

testo 174T mini data logger, 1-channel, incl. wall bracket, battery (2 x CR 2032 lithium) and calibration protocol

Part no. 0572 1560

Set testo 174T

testo 174T mini data logger set, 1-channel, incl. USB interface for programming and reading out the logger, wall bracket, battery (2 x CR 2032 lithium) and calibration protocol

Part no. 0572 0561

Sensor type	NTC
Meas. range	-30 to +70 °C
Accuracy ±1 digit	±0,5 °C (-30 to +70 °C)
Resolution	0,1 °C

General technical data

Channels	1 x internal
Battery type	2 lithium batteries (CR2032)
Battery life	500 days (15 min measuring cycle, +25 °C)
Oper. temp.	-30 to +70 °C
Storage temp.	-40 to +70 °C
Dimensions	60 x 38 x 18,5 mm
Protection class	IP65
Measuring rate	1 min - 24 h
Memory	16.000 readings

Accessories	Part no.	
Accessories for measuring instrument		
USB interface for programming and readout of the loggers testo 174T and testo 174H	0572 0500	
Lithium battery CR 2032 button cell (please order 2 batteries per logger)	0515 0028	
ComSoft Basic, Basic software for programming and readout of Testo data loggers; graphic and tabular measurement value presentation as well as export function. (if free download with registration not desired)	0572 0580	
ComSoft Professional, Pro software incl. data archiving	0554 1704	
ComSoft CFR 21 Part 11, Software for requirements according to CFR 21 Part 11 for Testo data loggers	0554 1705	
ISO calibration certificate temperature temperature probe; calibration points -18°C; 0°C; +40°C per channel/instrument	0520 0153	

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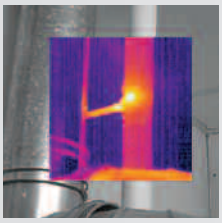
FLIR

FLIR i60

NEW!

Thermal Imaging InfraRed Camera

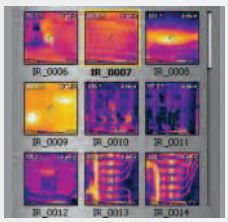
High Resolution Visible Light Camera with Fusion (PIP)



Fusion - Picture in Picture

Built-in Laser Pointer

Built-in Illuminator Lights

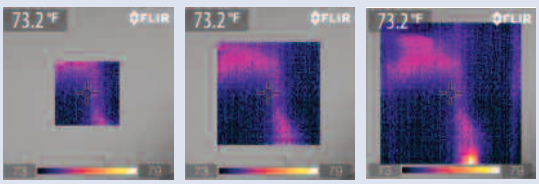


Thumbnail Image Gallery

FLIR i60 Features

- *Latest Infrared Detector Technology*
- *Fusion Picture in Picture (PIP)*
- *Bright LED Lamps for Quality Visible Images*
- *Thermal Sensitivity of <0.1°C @ 25°C*
- *Lightweight — Weighs only 1.3lbs*
- *Easy One-handed Operation*
- *3.5" LCD with Razor Sharp Resolution*
- *Convenient Thumbnail Image Gallery*

- **Visible Light Digital Camera** — 2.3MP resolution with LED lamps provides sharp images regardless of lighting conditions
- **Infrared Thermal Resolution** — High resolution of 32,400 pixels (180 x 180)
- **Scalable Fusion Picture in Picture (PIP)** — Displays thermal image super-imposed over a digital image and is scalable to resize the thermal image
- **Auto Hot/Cold Spot Marker** — Shows a spot within the area that automatically finds the hottest or coldest spot within the box
- **0.1°C Thermal Sensitivity** — Provides the resolution needed to find problems faster and easier
- **Wide Temperature Range** — Measures from -4 to 662°F (-20 to 350°C) targeting electrical and industrial applications
- **Thumbnail Image Gallery** — Allows quick search of stored images
- **Laser LocatIR™ Pointer** — Pinpoints the hot spot on the IR image with the real physical target
- **Laser Marker** — Marks the point on the IR displayed image as to where the Laser pointer is targeting
- **Radiometric JPEG Images** — Patented technology used to save images in standard JPEG format for easy e-mailing and analysis using QuickReport™ PC Software (included)
- **1GB microSD Card** — Stores more than 1000 Radiometric JPEG images
- **Li-Ion Rechargable Battery** — Replaceable battery lasts for 5hrs of continuous use
- **Area (Min/Max) Mode** — Spot marker shows the Minumum or the Maximum Temperature reading within the selected area
- **Includes** — 1GB micro SD Card, miniSD adaptor, Li-Ion rechargeable battery, power supply, QuickReport™ software, USB cable, lens cap, hand strap, and heavy duty case

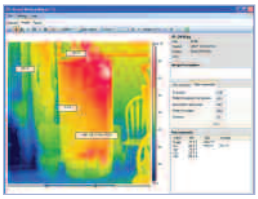


Scalable Picture-in-Picture Fusion
Allows for easier identification and interpretation of infrared images. This advanced technology enhances the value of an infrared image by allowing you to overlay it directly over the corresponding visible image. This functionality combines the benefits of both the infrared image and visual picture at the push of a button. The scalabilty feature permits you to resize the thermal image as needed on a large 3.5" color display.

Easy-to-Use
One-handed operation simple Thumb-Press combo button is unsurpassed for quick and easy menu access and feature selection.

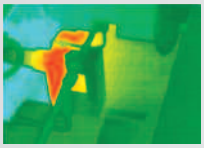
The Difference is Training

Get the most out of your FLIR IR camera investment with world-class instruction through the Infrared Training Center (ITC), the largest infrared applications training organization in the world. The ITC's Level 1 Infrared Thermography Training Course is geared to the new infrared camera user and focuses on its use for a variety of condition monitoring/predictive maintenance applications. Level 2 and Level 3 certificate courses for more advanced infrared training are also available. Courses are taught by certified instructors with extensive experience in a wide variety of infrared thermography and thermal imaging applications. ITC certifications are recognized by major professional organizations.

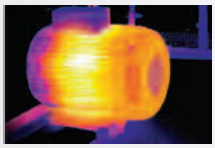


QuickReport™ PC software enables user to analyze Temperature of all thermal pixels of any FLIR Camera JPEG images

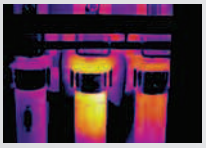
Applications



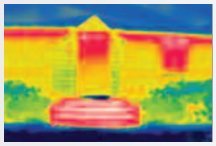
Motor: Bearing Problem



Motor: Internal Winding Problem



Electrial: Hot Fuses



Building: Heat Loss

FLIR i60 Specifications

Features	
Temperature range	-4°F to 662°F (-20°C to 350°C)
Temperature accuracy	±2°C or ±2% of reading
Image Storage (1GB micro SD card)	1000 Images
Emissivity Table	0.1 to 1.0 (adjustable)

Imaging Performance / Image Presentation	
Field of view/min focus distance	25° X 25°/0.10m (3.9")
Thermal sensitivity (N.E.T.D)	<0.1°C at 25°C
Detector Type - Focal plane array (FPA) uncooled microbolometer	32,400 pixels (180 x 180)
Spectral range	7.5 to 13µm
Display	3.5" color LCD
Video output	MPEG-4 via USB
Image Modes	Thermal, Visual, Fusion
Fusion Picture in Picture (PIP)	Scalable
Visible Light Camera Resolution	2.3 Megapixels
Laser / Classification	Yes / Class 2
Laser Type	Semiconductor AlGaInP; Diode Laser: 1mW/635nm
Laser Marker Function	On Infrared image
Spot (center) Measurement mode	Yes
Auto Hot/Cold Spot Marker	Yes
Area (min/max) Measurement mode	Yes
Image Controls	Palettes (Iron, Rainbow, and Black/White), level, span, auto adjust (continuous/manual)
Focus	Manual
Set-up controls	Date/time, info, LCD intensity, power down, and 21 languages
Battery Type/operating time	Li-Ion/ 5 hours, Display shows battery status
Dimensions/Weight	9.3x3.2x6.9" (235x81x175mm)/<1.32lbs (600g), including battery

Ordering Information

Part Number	Product Description	Price
FLIR i60	Thermal Imaging InfraRed Camera with Laser and scalable PIP	
ACCESSORIES		
1196398	Li-Ion Rechargeable Battery	
1910399	AC Adapter Charger (110-240V, U.S. Plug)	
1910490	Cigarette Lighter Adapter Kit, 12VDC (1.2m cable)	
1196474	2-Bay Battery Charger including Power Supply (U.S. plug)	
1122000	Camera Pouch Case	
CERTIFICATION TRAINING		
3300149	ITC Level 1 Certification Training per attendee	

IP54 Splashproof Dustproof

1 YEAR WARRANTY

Tel: 1.800.464.6372
CANADA: 1.800.613.0507
www.goinfrared.com

Specifications and prices subject to change without notice. Rev. 9/02/08-R1

FLIR™

Appendix – Q: Philips AJ3121 digital clock

Convenience

•Alarms: 24-hour alarm reset, Buzzer Alarm, Radio Alarm, Repeat alarm (snooze), Sleep timer
•Clock/Version: Digital
•Display Digits: 4
•Display Type: 4-digit display

Sound

•Output power (RMS): 100 mW
•Sound System: Mono
•Volume Control: rotary

Tuner/Reception/Transmission

•Antenna: FM Antenna
•Tuner Bands: AM, FM

Accessories

•Included accessories: User Manual, Warranty certificate

Dimensions

•Product dimensions (W x H x D): 177.1 x 48.1 x 122.8 mm
•Product weight: 0.53 kg
•Packaging type: D-box
•Packaging dimensions (W x H x D): 183 x 150 x 58 mm
•Weight incl. Packaging: 0.61 kg

Power

•Battery type: 6F22
•Battery voltage: 9 V
•Mains power

•Number of batteries: 1

Table 1- Appendix Q: First 6 plates of Ishihara Test for color

Number of Plate	Normal Person	Person with red green deficiency	Person with total colour blindness and weakness.
1	12	12	12
2	8	3	x
3	6	5	x
4	29	70	x
5	57	35	x
6	5	2	x

Note: The mark x shows that the plate cannot be read
Source: Ishihara test book for color-blindness – Latest Edition

5 subjects were detected to be colour-blind. All 5 were further specified to be total colour-blind as none of them were able to read beyond the 1st plate *(12).* These subjects were tested via the same trial designed for the normal sighted subjects and the data/ findings were presented, analyzed and concluded separately out of the sample as this is beyond the scope of the research.

As the prime outcome of this study it was attempted to look in to possible relationships of CTP to take place beyond visual/colour perception. The possibility of CTP to be perceived by even total colour blind subjects, suggesting any linkages beyond colour vision was focused here. If CTP could be perceived by total Colour-blind subjects, it could possibly take place via any of the processes suggested below.

- The skin; an actual thermal sensation induced by colour,
- The union of two sensory pathways; triggering one sensory path leading to the processing of another sensory organ; a cross link between the visual sense and the thermal sense suggesting synesthesia.
- Metaphysical connotations; Harmonic correspondence between colour energy and the energy points of human energy field.

b) Findings

The findings provided here cannot be taken as conclusive due to the small sample size. On the other hand it might not be possible to generalize this result to the normal

While 0% perceived RWS to be cool, 0% perceived BWS to be warm confirming the dual response to colour red and blue. Also it can be seen that colour blind subjects have been more responsive to red colour treatment than blue.

The tested colorblind subjects confirmed to be devoid of colour vision, have experienced a thermal perception triggered by colour stimuli revealing sensory association beyond colour perception in this regard. In other words thermal information related to colour has been transmitted via a perception process other than vision.

-Feelings, emotions and suggested activities - Colour blind subjects.

The feelings, emotions and preferred activities proposed by each colour blind subject in RWS and BWS are mentioned below for analysis purposes.

Feelings and emotions – RWS

Table 2- Appendix Q: Emotions – Colour-Blind –RWS

Subject	Feelings and emotions associated with RWS
Subject-1	Cannot feel peace, brightness ok, warmer to skin, annoying, body warming up gradually with time passes.
Subject-2	Unsuitable feeling, like sitting in fire
Subject-3	Upset feelings, don't like, recall past wrong doings, mind is blocked, confused mind, gives a headache and anger, need to leave soon, restless
Subject-4	Not comfortable, not comfortable to eyes, really worrying feeling, sleepy
Subject-5	Recall the moments characterized by sad feelings in life, feeling tight, do not feel any freshness,

Summary: The majority of feelings/ emotions triggered in RWS are negative, undesirable and express discomfort**.**

Feelings and emotions – BWS

Table 3- Appendix Q: Emotions – Colour-Blind –BWS

Subject	Feelings and emotions associated with BWS
Subject-1	Comfortable, warm than white less warm than red, could think and stare without doing

	anything, special environment around me, positive feelings.
Subject-2	Nice feeling, prefer this environment
Subject-3	Remember sensitive and emotional memories that bring joy, feels in between red and white, fine situation and like it, feels as in water, preferred
Subject-4	kind of dark but friendly to eyes,
Subject-5	Feel extremely tight, difficult to stay, feel that head is intensely warm, mind is confused, Heavy difficult feeling to head, feeling very uncomfortable to both mind and boy, feeling tired, feeling restless.

Summary: The feelings/ emotions triggered in BWS are positive and desirable (80%) , except for subject 5.

Activities suggested – RWS

Table 4 - Appendix Q: – Activities – Colour-Blind –RWS

Subject	Activities associated with RWS
Subject 1	Exercise, perform something that warms the body,
Subject 2	Hard to sit here, cant think anything to do
Subject 3	Cannot do anything,
Subject 4	Browsing on the net, cannot stay for long, activities which does matter where you are - like face book browsing
Subject 5	Not much of a dislikeness to stay here, sleepy, feel like sleeping,

Summary: Not much preferred to perform activities in RWS.

Activities suggested – BWS

Table 5- Appendix Q: – Activities – Colour-Blind – BWS

Subject	Activities associated with RWS
Subject 1	thinking, listening to music, sleeping without any disturbance, reading
Subject 2	read a book, sleep, study, think
Subject 3	good to create an environment which brings joy, read a book, watch movie, sing, dance and be happy, good to think
Subject 4	Sleeping, playing games, eating and many activities, watching movie.
Subject 5	Nothing can be done, feel like leaving ASAP

Summary: Preferred to perform in a calm pacified state in BWS except for subject 5 who seems to be highly disturbed by the blue treatment.

As seen in the written explanation of subjects, the impact of colour has been felt to the skin, eyes, body and head. A significant finding was that each subject was able to correctly distinguish colour of the workstations as red and blue though they are colour blind. Identification of colours might take place via the interpretation of thermal energy emitted by colour, based on experiences and memories having archaic, primordial connotations. Another explanation could be the sensitivity of human energy field which possibly detect colour radiation via harmonic resonance. However, this lies beyond the scope of the research design.

As established by neuropsychologist Kurt Goldstein (as cited in Daggett at el, 2008) blind individuals, have skin that "sees" in Technicolor, which is explained as dermo-optic vision. Accordingly it could be assumed that colour blind's skin too is adopted to be sensitive in a similar manner.

c) Analysis

The research findings obtained from the colorblind subjects supported that RWS is being perceived as warm/ very warm by a majority while most remained neutral in BWS. Also none perceived RWS as cool and BWS as warm supporting to the dual response to red and blue treatments. This demonstrates that, despite being colorblind, the subject would still feel the thermal aspect of colour stimuli suggesting a process beyond colour perception. Feelings, emotions and suggested activities experienced by colorblind subjects were scrutinized to explain the nature of this association. However this analysis was done based on the responses of 5 subjects thus cannot be substantiated.

One Colour blind subject *(subject 1)* reported that the warmth was felt to the skin; body during exposure to RWS. He also claimed to feel less warm in BWS than in RWS. The explanations of Subject 5 demonstrated a highly disturbed nature in BWS

and reported that his head is intensely warm. He further clarified that the impact of the colour (blue) was felt by the head, body as well as mind. Also several colour-blind subjects provided witness for emotional associations triggered by colour as well. Subject 4 identified BWS to be friendly to eyes, and RWS as not comfortable to eyes, resulting in a worrying feeling inducing sleepiness. Revealing the learnt associations, subject 5 recalled the moments characterized by sad feelings in life in RWS, while subject 3 recalled the memories joy in BWS. Subject 3 while witnessing feelings and emotions related to anger, complained to having a headache in RWS, supporting the biological or bodily reactions to colour red. However these responses also could be highly manipulated by the learnt/ innate psychological parameters in line with the outcome derived from normal sighted subjects.

The revealed responses imply that these subjects, though blind for the visual aspect of colour, have felt and perceived the thermal aspect as well as all the other aspects related to colour perception; feelings and emotions as well as physiological reactions corresponding to colour.

It could be speculated that this experience is taking place via a different means of perception compensating the loss of colour vision; supposedly the thermal sensitivity of the skin in a more developed manner than a person with normal vision, a synesthetic response or a psychological reaction triggered by the vibrating energy of colour (frequency/wavelength) via the human energy field linking him to all emotional and behavioral traits, molded with memories and experiences learnt as well as primordial.

d) Conclusion and recommendations:

Colour-blind subjects, though theoretically unable to see colour via visual perception process, have experienced a thermal perception in dual nature associated with red and blue colour treatments. This finding suggests the possibility of linkages of CTP beyond visual perception. The observations done with colour-blind subjects open up novel research directions on possibilities of CTP to take place via other paradigms of perception apart from vision, supposed via skin, human energy field via vibration

and synesthesia . However the findings with colour-blind subjects cannot be generalized as the number of subjects considered represent a small number (05) and needs to be supported with further investigations using a larger sample size.

To conclude, colour-blind subjects may open up novel research directions on possibilities of CTP to take place via other paradigms of perception apart from vision (via skin, human energy field via vibration, synesthesia etc).

Appendix – S: Complex Sampling: Ordinal Regression - RTP - Full Model

RTP = b0 (Sec_Edu) + b1 (FVC) + b2 x LoE + b3 x Vis + b4 x RoS + b5 x Sen_Warm + b6 x Sen_Cool + b7 x Rlgn + b8 x Rce + b9 x TTZ+b10 x R_Psy + b11 x R_Pre + b12 x BMI + b13 x R_SFT + b14 x OT + b15 x HT_Temp + b16 x Diff_RTAT_Avg - WTAT10_1 + b17 x Age

Sample Design Information

The model used a valid sample size of 111 selected out of a total population of 321 belonging to 04 different departments with a sample design degree of freedom of 107.

Below table represents the different variables and the responses in their weighted counts and weighted percentages. Signifies the data set that was used in running the model for RTP.

Variable	Response Category	Weighted Count	Weighted Percent (%)
RTP[a]	RTP=1	2.9	.9
	2	20.8	6.5
	3	91.1	28.4
	4	148.6	46.3
	RTP(Base level)	57.7	18.0
Sec_Edu	1	194.1	60.4
	2	88.5	27.6
	3	19.0	5.9
	4	19.5	6.1
FVC	1	73.5	22.9
	2	178.8	55.7
	3	68.8	21.4
LoE	1	79.4	24.7
	2	88.5	27.6
	3	153.2	47.7
Vis	1	212.9	66.3
	2	108.2	33.7
RoS	1	101.3	31.5
	2	204.3	63.6
	3	15.5	4.8
Sen_Warm	1	19.4	6.0
	2	96.2	30.0
	3	205.5	64.0
Sen_Cool	1	21.8	6.8
	2	73.8	23.0
	3	225.5	70.2

Age_M	1	199.0	62.0
	2	122.1	38.0
Rlgn	1	255.3	79.5
	2	24.2	7.5
	3	19.3	6.0
	4	22.3	6.9
Rce_M	1	266.8	83.1
	2	54.3	16.9
	1	62.5	19.5
	2	21.6	6.7
	3	47.4	14.8
	4	38.6	12.0
	5	18.4	5.7
	6	30.0	9.3
	7	24.1	7.5
	8	20.7	6.4
	9	28.4	8.8
	10	29.4	9.2
R_Psy	1	179.3	55.8
	2	3.4	1.1
	3	138.4	43.1
R_Pre	1	66.9	20.8
	2	213.7	66.6
	3	40.5	12.6
Population Size		321.1	100.0

a. Dependent variable values are sorted in ascending order.

Pseudo R Squares - Goodness of fit.

Cox and Snell	.474
Nagelkerke	.517
McFadden	.258

Dependent Variable: RTP (Ascending)
Model: (Threshold), Sec_Edu, FVC, LoE, Vis, RoS, Sen_Warm, Sen_Cool, Age_M, Rlgn, Rce_M, TTZ, R_Psy, R_Pre, HT_Temp, BMI, Diff_RTAT_AvgWTAT10_1, R_SFT, OT
Link function: Logit

Tests of Model Effects

Source	df1	df2	Wald F	Sig.
Sec_Edu	3.000	105.000	3.780	.013
FVC	2.000	106.000	5.882	.004
LoE	2.000	106.000	1.874	.159
Vis	1.000	107.000	.346	.558
RoS	2.000	106.000	.279	.757
Sen_Warm	2.000	106.000	1.664	.194
Sen_Cool	2.000	106.000	.080	.924
Age_M	1.000	107.000	.004	.951
Rlgn	3.000	105.000	2.669	.051

Source	df1	df2	Wald F	Sig.
Rce_M	1.000	107.000	.786	.377
TTZ	9.000	99.000	.874	.551
R_Psy	2.000	106.000	6.400	.002
R_Pre	2.000	106.000	6.962	.001
HT_Temp	1.000	107.000	.422	.517
BMI	1.000	107.000	2.710	.103
Diff_RTAT_AvgWTAT10_1	1.000	107.000	.353	.554
R_SFT	1.000	107.000	.442	.508
OT	1.000	107.000	1.773	.186

Dependent Variable: RTP (Ascending)
Model: (Threshold), Sec_Edu, FVC, LoE, Vis, RoS, Sen_Warm, Sen_Cool, Age_M, Rlgn, Rce_M, TTZ, R_Psy, R_Pre, HT_Temp, BMI, Diff_RTAT_AvgWTAT10_1, R_SFT, OT
Link function: Logit

Parameter estimates

Parameter		B
Threshold	[RTP=1]	-38.721
	[RTP=2]	-36.122
	[RTP=3]	-33.179
	[RTP=4]	-29.896
Regression	[Sec_Edu =1]	-2.284
	[Sec_Edu =2]	.108
	[Sec_Edu =3]	-.079
	[Sec_Edu =4]	.000[a]
	[FVC=1]	-3.665
	[FVC=2]	-1.171
	[FVC=3]	.000[a]
	[LoE=1]	-.994
	[LoE=2]	1.177
	[LoE=3]	.000[a]
	[Vis=1]	-.397
	[Vis=2]	.000[a]
	[RoS=1]	1.056
	[RoS=2]	.612
	[RoS=3]	.000[a]
	[Sen_Warm=1]	-1.853
	[Sen_Warm=2]	-.987

Parameter	B
[Sen_Warm=3]	.000[a]
[Sen_Cool=1]	.078
[Sen_Cool=2]	.249
[Sen_Cool=3]	.000[a]
[Age_M=1]	.032
[Age_M=2]	.000[a]
[Rlgn=1]	2.817
[Rlgn=2]	3.193
[Rlgn=3]	3.508
[Rlgn=4]	.000[a]
[Rce_M=1]	-1.254
[Rce_M=2]	.000[a]
[TTZ=1]	-1.131
[TTZ=2]	1.078
[TTZ=3]	.071
[TTZ=4]	.972
[TTZ=5]	.068
[TTZ=6]	1.362
[TTZ=7]	1.706
[TTZ=8]	.114
[TTZ=9]	.248
[TTZ=10]	.000[a]
[R_Psy=1]	1.971
[R_Psy=2]	-2.611
[R_Psy=3]	.000[a]
[R_Pre=1]	2.257
[R_Pre=2]	3.122
[R_Pre=3]	.000[a]
HT_Temp	-.065
BMI	.183
Diff_RTAT_AvgWTAT10_1	.860
R_SFT	-.227
OT	-.160

Dependent Variable: RTP (Ascending)

Model: (Threshold), Sec_Edu, FVC, LoE, Vis, RoS, Sen_Warm, Sen_Cool, Age_M, Rlgn, Rce_M, TTZ, R_Psy, R_Pre, HT_Temp, BMI, Diff_RTAT_AvgWTAT10_1, R_SFT, OT

Link function: Logit

Classification

Observed	Predicted					
	1	2	3	4	5	Percent Correct
1	.000	.000	2.900	.000	.000	.0%
2	.000	3.400	15.500	1.900	.000	16.3%
3	.000	3.400	54.400	33.300	.000	59.7%
4	.000	.000	24.600	114.500	9.500	77.1%
5	.000	.000	1.900	31.800	24.000	41.6%
Overall Percent	.0%	2.1%	30.9%	56.5%	10.4%	61.1%

Dependent Variable: RTP (Ascending)
Model: (Threshold), Sec_Edu, FVC, LoE, Vis, RoS, Sen_Warm, Sen_Cool, Age_M, Rlgn, Rce_M, TTZ, R_Psy, R_Pre, HT_Temp, BMI, Diff_RTAT_AvgWTAT10_1, R_SFT, OT
Link function: Logit

As per Tests of Model Effects it was seen that, LoE, Vis, RoS, Sen_Warm, Sen_Cool, Age_M, Rce_M, TTZ, HT_Temp, BMI,Diff_RTAT_AvgWTAT10_1, R_SFT, OT were statistically insignificant for the model. Accordingly CSOLRM was re-run excluding the insignificant parameters. The output is given in chapter eight.

Appendix - T: Complex sampling: Ordinal Regression – BTP full Model

BTP = b0 x Sec_Edu + b1 x FVC + b2 x LoE + b3 x Vis + b4 x RoS + b5 x Sen_Warm + b6 x Sen_Cool + b7 x Rlgn + b8 x Rce + b9 x TTZ+b10 x B_Psy + b11 x B_Pre + b12 x BMI + b13 x B_SFT + b14 x OT + b15 x HT_Temp + b16 x Diff_BTAT_AvgWTAT10_17 + b18 x Age

Sample Design Information

The model used a valid sample size of 111 selected out of a total population of 321 belonging to 04 different departments with a sample design degree of freedom of 107.

Below table represents the different variables and the responses in their weighted counts and weighted percentages. Signifies the data set that was used in running the model for RTP.

Categorical Variable Information

Variable	Response Category	Weighted Count	Weighted Percent (%)
BTPa	1	47.2	14.7
	2	143.5	44.6
	3	99.6	31.0
	4	31.0	9.7
A/L_Streme	1	194.1	60.4
	2	88.5	27.6
	3	19.0	5.9
	4	19.5	6.1
FVC	1	73.5	22.9
	2	178.8	55.7
	3	68.8	21.4
LoE	1	79.4	24.7
	2	88.5	27.6
	3	153.2	47.7
Vis	1	212.9	66.3
	2	108.2	33.7
RoS	1	101.3	31.5
	2	204.3	63.6
	3	15.5	4.8
Sen_Warm	1	19.4	6.0
	2	96.2	30.0
	3	205.5	64.0
Sen_Cool	1	21.8	6.8
	2	73.8	23.0
	3	225.5	70.2
Age_M	1	199.0	62.0

Variable	Response Category	Weighted Count	Weighted Percent (%)
	2	122.1	38.0
Rlgn	1	255.3	79.5
	2	24.2	7.5
	3	19.3	6.0
	4	22.3	6.9
Rce_M	1	266.8	83.1
	2	54.3	16.9
TTZ	1	62.5	19.5
	2	21.6	6.7
	3	47.4	14.8
	4	38.6	12.0
	5	18.4	5.7
	6	30.0	9.3
	7	24.1	7.5
	8	20.7	6.4
	9	28.4	8.8
	10	29.4	9.2
B_Psy	1	13.9	4.3
	2	219.0	68.2
	3	88.2	27.5
B_Pre	1	195.7	60.9
	2	55.4	17.3
	3	70.0	21.8
Population Size		321.1	100.0

a. Dependent variable values are sorted in ascending order.

Pseudo R Squares – Goodness of fit

Cox and Snell	.545
Nagelkerke	.596
McFadden	.320

Dependent Variable: BTP (Ascending)
Model: (Threshold), Sec_Edu, FVC, LoE, Vis, RoS, Sen_Warm, Sen_Cool, Age_M, Rlgn, Rce_M, TTZ, B_Psy, B_Pre, BMI, Diff_BTAT_AvgWTAT10_1, B_SFT, OT, HT_Temp
Link function: Logit

Test of Model Effects

Source	df1	df2	Wald F	Sig.
Sec_Edu	3.000	105.000	4.118	.008
FVC	2.000	106.000	1.720	.184
LoE	2.000	106.000	.178	.837
Vis	1.000	107.000	1.739	.190
RoS	2.000	106.000	2.214	.114

Sen_Warm	2.000	106.000	.032	.969
Sen_Cool	2.000	106.000	.373	.689
Age_M	1.000	107.000	6.622	.011
Rlgn	3.000	105.000	.984	.403
Rce_M	1.000	107.000	1.787	.184
TTZ	9.000	99.000	.757	.656
B_Psy	2.000	106.000	2.499	.087
B_Pre	2.000	106.000	2.565	.082
BMI	1.000	107.000	.733	.394
Diff_BTAT_AvgWTAT10_1	1.000	107.000	.174	.677
B_SFT	1.000	107.000	6.219	.014
OT	1.000	107.000	.858	.356
HT_Temp	1.000	107.000	.368	.545

Dependent Variable: BTP (Ascending)
Model: (Threshold), Sec_Edu, FVC, LoE, Vis, RoS, Sen_Warm, Sen_Cool, Age_M, Rlgn, Rce_M, TTZ, B_Psy, B_Pre, BMI, Diff_BTAT_AvgWTAT10_1, B_SFT, OT, HT_Temp
Link function: Logit

As per Tests of Model Effects it was seen that, FVC, LoE, Vis, RoS, Sen_Warm, Sen_Cool, ,Rlgn, Rce_M, TTZ, BMI, Diff_BTAT_AvgWTAT10_1, B_SFT, OT, HT_Temp are insignificant for BTP.

Classification Table

Observed	Predicted 1	2	3	4	Percent Correct
1	20.800	24.500	1.900	.000	44.1%
2	5.700	112.400	25.200	.000	78.4%
3	.000	24.900	68.400	6.300	68.7%
4	.000	5.300	17.000	8.700	28.1%
Overall Percent	8.3%	52.0%	35.0%	4.7%	65.5%

Dependent Variable: BTP (Ascending)
Model: (Threshold), Sec_Edu, FVC, LoE, Vis, RoS, Sen_Warm, Sen_Cool, Age_M, Rlgn, Rce_M, TTZ, B_Psy, B_Pre, BMI, Diff_BTAT_AvgWTAT10_1, B_SFT, OT, HT_Temp
Link function: Logit

Accordingly CSOLRM - BTP was re-run excluding the insignificant parameters. The output is given in chapter eight.

Appendix – U: Coding of Feelings / Emotions

Coding of Feelings / Emotions	
Code no	Feelings / Emotions
a) Codes 1-16 Positive Emotions **(Preferred/desirable/ Feel good/positive thoughts/good thoughts or memories recalled)**	1. Comfortable /easy/feel good/better/pleasing /; 1) to mind,2) to eyes (pleasant looking) ,3) to body,4) to head5) Heart 6) Breathing
	2. Happy Emotions/positive
	3. Calm/ relaxed /very calm/quiet/silent, Tranquil/peaceful/restful/soothing/ consoling.1) To mind 2) To body
	4. Fresh/pure/clean/ novel/clear/clarity/refreshing/ No regrets / simple/
	5. Free/Expanded / spacious /lightweight /endless/expanding
	6. Energetic/Active/Power/busy/excited/motivated/ /cheerful/not lazy/rigorous.
	7. Concentrate /focus.
	8. Can stay or work for a long time/ Do not feel passing time
	9. Feel to drink or eat. 1) Hungry 2)-thirsty
	10. Light
	11. Religious/Spiritual Feelings/holiness/heavenly
	12. Surprising
	13. 1- Romantic, spiritual ,2- Sexual/lust/desire /erotic
	14. Mystique
	15. Dreaming/ thinking/planning
	16. Safe feeling /familiar /normal
b) Codes 17 -32 Negative emotions. **(Not preferred/ disturbing/feel Bad/negative thoughts/bad thoughts or memories recalled)**	17. Uncomfortable/uneasy/feel bad; 1) to mind, 2) to eyes (present looking) , 3) to body, 4) to head /head ache 5)Heart
	18. Sad /sorrowful emotions.
	19. Bad/ Unpleasant emotions/Undesirable / ugly/rejecting.
	20. Feel strange/not normal/Not familiar/ different.
	21. Lazy/monotonous/board/de-motivating/not feeling active/tired/dull.
	22. Tight/tensed/compact/closed feeling/ feel smaller space /imprisoned/arrested/rowdy.
	23. Violent/aggressive /loose temper/anger/rage/rough.
	24. Danger/alert.

	25. Fed up/Irritating/annoying/displeasure/ tired/frustration/bothered/anxious/nervous/worried/restless/agitated/troubled/ wired /worried/ nervous/uneasy/ horrific/disgusting.
	26. Fear/horror/ scared/ alert/
	27. Dark /gloomy
	28. Cannot concentrate/ Confusing /messed up/rough/busy.
	29. Can't stay or work for a long time/Un inviting quality/need to leave quickly/rejecting/feel the time
	30. Stressed/pressure/
	31. Loneliness/alone/ emptiness /isolation/felling highlighted /blank/lost/exposed.
	32. Sleepy
c) Mixed/neutral feelings/emotions	33. Mixed/neutral feelings/emotions
d) Warmness /coolness	34. Cool/very cool/low temperature; 1) to mind,2) to eyes,3) to body,4) to head,5)skin ,6)Heart 7) feet 8) in the room
	35. Warm/high temperature: 1) to mind,2) to eyes ,3) to body,4) to head,5) skin ,6)Heart ,7)feet, 8) In the room
e) Expressing biological reactions	36. Pain/ache/suffering/heaviness/stiffness; 1) to eyes,2) to body,3) to head, 4)Neck,5) Heart
	37. Pulse-1) Increase 2) Decrease
	38. Sweating ,1)Increase 2) Decrease
	39. Blood flow; 1) Increase 2) decreased
	40. Brain : 1) stimulated , 2) Pacified
	41. Temperature: 1) Increase 2) Decrease.
	42. Heart Beat: 1) Increased 2) decreased.
	43. Faintish/ dizzy
	44. Vision 1) Increased 2) decreased.
f) Learnt Associations	45. Learnt Feelings/emotions

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