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Coping with urbanization: A cardiometabolic risk? The THUSA study

Leoné Malan [a,*], Nicolaas T. Malan [a], Maria P. Wissing [b], Yackoob K. Seedat [c]

[a] School for Physiology, Nutrition and Consumer Sciences, North-West University, Potchefstroom Campus, Private Bag X6001, Potchefstroom 2520, South Africa
[b] School for Psychosocial Behavioural Sciences, North-West University, Potchefstroom Campus, Private Bag X6001, Potchefstroom 2520, South Africa
[c] The Renal Hypertension Unit, Nelson Mandela School of Medicine, University of Kwa-Zulu Natal, Durban 4001, South Africa

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ABSTRACT

An assessment of specific coping styles in rural–urban Africans is done to evaluate its contribution as cardiometabolic risk factor. In total, 608 apparently healthy Africans were included in a cross-sectional comparative study from the North-West Province in South Africa. The adapted and translated COPE Questionnaire classified participants according to their responses into active (AC) or passive (PC) copers. Fasting resting metabolic syndrome (MS) indicators using the WHO definition (glucose, high density lipoproteins, waist/hip ratio, hypertension prevalence, and triglyceride) and associated MS values, i.e. fibrinogen were obtained. The Finapres recorded resting blood pressure continuously. Co-variates for all statistical analyses included age, body mass index (BMI) and lifestyle factors (alcohol consumption, smoking habits and physical activity). The only MS values prevalent in urbanized participants were higher hypertension prevalence rates and fibrinogen (women only) compared to their rural counterparts. Adding coping styles, it was mainly the urbanized AC participants that indicated higher MS values (hypertension prevalence, glucose and fibrinogen) when compared to their rural and PC counterparts. In conclusion, urbanization is associated with enhanced blood pressure and fibrinogen (women) values only. Coping as cardiometabolic risk is accentuated in the urbanized AC group, especially the men. The urbanized AC group with their higher blood pressure values and more MS indicators appears to have behaviorally an AC style but physiologically a dissociated AC style.

1. Introduction

Rapid urbanization is a global trend. In 1994 it was estimated that 44.5% of all people were urbanized and it is projected that this figure will increase to 61.1% in 2025 (Seedat, 2007). The impact of urbanization in Africans has been associated with an elevated risk for cardiometabolic diseases, i.e. essential hypertension (Malan et al., 2006), increased obesity in women (Schutte and Olckers, 2007) and higher levels of stress (Seedat, 2000). The Medical Research Council Report (2007) of South Africa reported that heart disease, diabetes and stroke together constitute the second most important cause of death in South Africa after HIV/AIDS. This is also the case in other population groups in underdeveloped countries as shown recently by a meta-analysis which identified circulatory and metabolic disorders as a special area for action (Danaei et al., 2007).

Considering the above-mentioned findings the following questions arise: First, is urbanization/psychosocial stress *per se* contributing to increased cardiometabolic diseases or second, is it rather the inability to cope with urbanization which contributes to an increased prevalence of cardiometabolic diseases? Regarding question one, persistent psychosocial stress or urbanization has been associated with increases in blood pressure (Malan et al., 2006), stress, societal maladjustment and the metabolic syndrome (MS) (Misra and Vikram, 2004; Rosmond, 2005). This probably indicates a disruption of central regulatory systems (Björntorp, 2001; Rosmond, 2005; Steptoe et al., 2003). Regarding question two, the fundamental aim of any coping style is to eliminate, reduce or control the internal and external demands of the individual-environment interaction (Lazarus, 1993). It seems that the type of coping style used can affect health outcomes, particularly in the context of transitions in lifestyle (Kaplan, 1996; Ryff and Singer, 2002). The acceptance by an individual of a stressor as reality is a prerequisite for a problem-focused, effortful or active coping (AC) style (APA, 1995; Suzuki et al., 2003). On the other hand, a passive coping (PC)/emotion-focused style is characterized by low control over problems or distress (Gerin et al., 2000; Henry et al., 1986). Over time specific coping behaviors can induce stress-induced overactivity of the sympathetic nervous

* Corresponding author. Tel.: +27 18 299 2438; fax: +27 18 299 2433.
E-mail address: leone.malan@nwu.ac.za (L. Malan).

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system (SNS), exhibiting excessive cardiovascular risk factors (Julius, 1999) including hypertension (Appels, 1990; Malan et al., 2006) and MS risks (Rosmond, 2005). Whether the MS risk is more apparent in urbanized black Africans according to the World Health Organization guidelines (Grundy et al., 2005) is not clear but it seems that persistent psychosocial stress or urbanization could lead to increased allostatic load (McEwen, 2003) and less coping ability (Malan et al., 2006).

Malan et al. (2006) presented interesting findings on this issue. According to their results urbanized Africans with an active coping style showed higher cardiovascular risk compared to their rural counterparts. These findings contradict the findings of Henry et al., 1986. It was concluded that this might be the result of a decreased coping ability in AC Africans or more likely a dissociation between a physiological pattern and the psychological coping style with AC individuals exhibiting a typical PC physiological pattern during urbanization (Malan et al., 2006). In the present study which is embedded in the previous THUSA substudy, the cardiovascular results are extended with the main aim to scrutinize the contribution of coping styles as possible cardiometabolic risk factors in the development of the MS during urbanization.

2. Methods

The present study (described elsewhere by Malan et al. (2006)) is part of the THUSA study conducted in 1996–1998 (Transition and Health during Urbanization in South Africa) (Vorster et al., 2000). It was a cross-sectional comparative epidemiological study using census data to select proportionately more sites in densely populated areas in the North-West region, South Africa, to represent rural–urban areas. Since rural communities are often suspicious of research, randomization of a sample is often unacceptable to the study population (Yach et al., 1990). Due to logistical reasons and the fact that volunteers had to be used for blood sampling, a total random sample of subjects was not possible (Yach et al., 1990). Fieldworkers were trained with regard to the recruitment of participants and supplying information to the participants in their own language. They also had to ensure that the participants fasted overnight prior to the day of the study.

2.1. Participants

All recruited volunteers (269 men and 339 women) complying with the inclusion criteria of apparently healthy Setswana-speaking volunteers, aged 16–70 years were included in this study. Hereafter, the Setswana-speaking men and women are referred to as Africans. Exclusion criteria were: pregnancy, lactation, body temperature above 37.5 °C, drunkenness, acute or chronic medication (for infectious diseases including tuberculosis, hypertension (WHO, 2003), epilepsy, diabetes mellitus), malnutrition, a history of/or current psychotherapy, incomplete data set and participants scoring high on active as well as passive coping scales. Given the aim of the THUSA study, participants who stayed only temporarily in the city or rural area were also excluded.

Participants were divided into active coping (AC) and passive coping (PC) gender groups according to their responses to an adapted COPE Questionnaire (S-COPE) (Stapelberg, 1999), based on the original Carver COPE questionnaire (Carver et al., 1989). Hereafter, the two groups (AC and PC) were subdivided into rural–urban groups. The rural group included participants living in tribal areas and in farmland dwellings with limited access to water and electricity. The urban group included blue-collar participants living in the peri-urban fringe area of the greater metropolitan area and in established townships with full access to water and electricity.

2.2. Procedures

Data collection was performed between 07:00 and 13:00 and each individual was occupied for approximately 2 h. On arrival, the fasting participants were introduced to the experimental setup to minimise their anticipation stress (Obrist, 1981) and they completed the demographic, physical activity index (PAI) and psychological questionnaires individually in a structured interview format in their home language, with the aid of trained African fieldworkers under supervision of psychologists. After a period of rest of approximately 5–10 min, Riva-Rocci/Korotkoff blood pressure measurements in a resting sitting position were obtained. Then anthropometric measurements and resting blood sampling with a winged infusion set were obtained and serum and plasma samples were prepared according to standardized methods in the laboratory and stored at −80 °C.

Subsequently the subject was connected to the blood pressure measurement device and after an acclimatization period of at least 10 min, resting continuous blood pressure values of 1 min were recorded whilst in a sitting position. Blood pressure was regarded as resting when the systolic pressure did not change by more than 10 mmHg during the last minute of this period; otherwise, the resting period was extended by a maximum of 2 min. The Ethics Committee of the North-West University, Potchefstroom Campus approved the study. The study protocol conforms to the ethical guidelines of The World Medical Association Declaration of Helsinki (2004). Informed consent was obtained from the participants and the parents of under aged adolescents.

2.3. Questionnaires

Responses to the adapted, translated and validated COPE Questionnaire of Carver et al. (1989) divided the participants into active and passive coping groups by using median splits. Higher scores indicated more frequent use of a particular coping style. Participants presenting low and high scores on both were excluded (i.e. men, $N = 25$; women, $N = 33$) and, therefore, only independent clear responders for active or passive coping were retained. The COPE questionnaire is a multidimensional self-reporting questionnaire with 53 items. Each item was responded to on a 4-point Likert scale that varied from 1 (I usually do not) to 4 (I usually do). Stapelberg (1999) extracted a *validated culture specific factor* pattern from the original COPE through exploratory factor analysis (principal factors – maximum likelihood method of factor extraction with varimax rotation), indicating three clear and reliable factors forming the subscales of the S-COPE with loadings >0.30 and eigenvalues >1. These subscales are (1) active outreach-to-others, (2) surrender and resignation and (3) overt expression of distress. Cronbach alpha-reliability values varied from 0.85 to 0.70 for subscales in the S-COPE (Carver et al., 1989). The S-COPE has construct validity, but convergent and discriminant validity have not been determined (Stapelberg, 1999).

The first subscale was taken to indicate active coping (approach strategy with strong emphasis on engagement in active coping, actively seeking social support, commitment to tasks and controllability) (Cronbach alpha-reliability = 0.85). The second and third factors were combined for the purposes of this study to form a measure of passive or emotion-focused coping (avoidance strategy with strong emphasis on appraisals of threat or uncontrollability and expression of distress) (Cronbach alpha-reliability = 0.75). The active coping subscale included items such as "I talk to someone who could do something helpful about the problem", "I take direct action to deal with the problem", "and I try to find comfort in my religion". The passive coping subscale included items such as "I reduce the amount of effort I am putting into solving the problem", "I just give up trying to reach my goal", and "I become upset and am very aware of my feelings".

Self-reported alcohol consumption was measured according to consumption in gram over a 24 h period and analysed using software based on the South African Food Composition Tables (Langenhoven et al., 1991). Self-reporting smoking status (No/Yes) was obtained and assessed. PAI is a self-reporting questionnaire developed by Baecke et al. (1982). The physical activity data were coded and analysed according to the Baecke tertile scoring system: low/inactive (1–3.3), moderate (3.34–6.66) and most active/high (6.67–10) (Baecke et al., 1982).

2.4. Apparatus and physiological variables

The method of Peñáz recorded resting and stressor blood pressure (Silke and McAuley, 1998) using the FINger-Arterial-PRESure device which is non-invasive and monitors finger arterial blood pressure continuously on a beat-to-beat basis (Silke and McAuley, 1998). It is validated and suitable for determining relative changes in comparative studies and pressures obtained correspond closely to intra-arterial measurements (Imholz et al., 1998). As the systematic bias for Finapres systolic pressure was also demonstrated in other reports, the Riva-Rocci/Korotkoff method substantiated resting values for systolic and diastolic blood pressure (Silke and McAuley, 1998). Data were stored on magnetic tape by means of a Kyowa RTP-50A four-channel data recorder.

Fasting resting blood samples (using a winged infusion set −21G) were obtained from the medial cubital vein/vena cephalic in the non-dominant arm by a registered nurse. The biochemical analyses were executed in independent laboratories by using standardized methods: Serum high density lipoprotein (HDL) with the Merck Bench Method, serum triglycerides (TG) and glucose with the DAX method – Technicon Omnipak, plasma fibrinogen with the Claus method – Instrumentation Laboratories, ICL, Milan, Italy. We followed the World Health Organization's (WHO) definition of metabolic syndrome (Grundy et al., 2005) and used the following indicators: insulin resistance or impaired fasting glucose/glucose tolerance and two other risk factors: HDL, 0.9 mmol/l; TG, >1.7 mmol/l; WHR, >0.90 (men), >0.85 (women); HT, hypertension prevalence (systolic blood pressure (SBP), 140 mmHg and diastolic blood pressure (DBP), 90 mmHg); microalbuminuria. Unfortunately the latter measure was not obtained and could not be determined.

2.5. Data analysis

All processed data were analysed by means of STATISTICA version 7 (Statsoft, 2007). A 2 × 2 × 2 (coping × urbanization × gender) ANCOVA was performed on the cardiovascular variables, metabolic syndrome indicators and fibrinogen data. Co-variates included age, body mass index (BMI) and lifestyle factors (alcohol