



Liking, salt taste perception and use of table salt when consuming reduced-salt chicken stews in light of South Africa's new salt regulations



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ABSTRACT

This study investigated the impact of salt reduction on liking, salt taste perception, and use of table salt when consuming chicken stew in light of South Africa's new salt recommendations. In total, 432 South-African consumers (aged 35.2 ± 12.3 years) consumed a full portion of a chicken stew meal once at a central location. Four stock cube powders varying in salt content were used to prepare chicken stews: 1) no reduction – 2013 Na level; regular salt level as currently available on the South African market (24473 mg Na/100 g), 2) salt reduction smaller than 2016 level, i.e. 10%-reduced (22025 mg Na/100 g), 3) 2016 salt level, as per regulatory prescriptions (18000 mg Na/100 g), 4) 2019 salt level, as per regulatory prescriptions (13000 mg Na/100 g). Consumers were randomly allocated to consume one of the four meals. Liking, salt taste perception, and use of table salt and pepper were measured. Chicken stews prepared with reduced-salt stock powders were equally well-liked as chicken stews with the current salt level. Moreover, a gradual reduction of the salt in the chicken stews resulted in a reduced salt intake, up to an average of 19% for the total group compared to the benchmark 2013 Na level stew. However, 19% of consumers compensated by adding salt back to full compensation in some cases. More salt was added with increased reductions of salt in the meals, even to the point of full compensation. Further investigation into the impacts of nutrition communication and education about salt reduction on salt taste perception and use is needed. This research provides new consumer insights on salt use and emphasises the need for consumer-focused behaviour change approaches, in addition to reformulation of products.

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1. Introduction

Globally, current salt (sodium chloride: NaCl) intake is on average much higher than the recommended World Health Organization (WHO) level of 5 g of salt (2000 mg sodium) per day (Brown, Tzoulaki, Candeias, & Elliott, 2009; World Health Organisation, 2012). Excessive intake of dietary salt is a major contributor to cardiovascular diseases and stroke as it progressively raises blood pressure levels with age (He & MacGregor, 2003, 2010; Mohan & Campbell, 2009). Reducing sodium intake to 1500–2300 mg per

day (3.75–5.75 g salt/day) could lead to major improvements in cardiovascular health (Cook, Appel, & Whelton, 2014). In countries where effective salt reduction programmes were implemented, the prevalence of high blood pressure and cardiovascular diseases significantly decreased (He & MacGregor, 2009; Sutherland, Edwards, Shankar, & Dangour, 2013; Webster, Dunford, Hawkes, & Neal, 2011). It has also been suggested that reducing salt intake is the most cost-effective way of managing hypertension (Bertram, Steyn, Wentzel-Viljoen, Tollman, & Hofman, 2012; Bibbins-Domingo et al., 2010; Cobiac, Vos, & Veerman, 2010).

Total dietary salt intake is derived from three sources, namely: 1) commercially prepared or manufactured foods (e.g. bread, soup, snacks, olives and restaurant meals), 2) that which occurs naturally in foods, and 3) as discretionary salt (i.e. added by consumers at the

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table and/or during cooking). Most of the salt intake comes through consumption of commercially prepared or manufactured food products, but there are significant variations between countries (James, Ralph, & Sanchez-Castillo, 1987; Mattes & Donnelly, 1991). Discretionary salt is only 5–10% of total salt intake in the USA (Mattes & Donnelly, 1991), while in South Africa it is far higher at 32.8%, 42.2% and 45.5% for white, mixed ancestry, and black consumers respectively (Charlton et al., 2005). Thus far, the industry in some countries has already successfully lowered salt levels in many commercial foods (Dötsch et al., 2009; Webster et al., 2011; World Health Organisation, 2007) – without the consumer being aware of this. Nevertheless, the need for more salt reduction in consumer products remains pressing.

In South Africa (SA), the SA Hypertension Guidelines recommend a salt intake of less than 6 g/day (Na 2400 mg/day), based on the upper boundary of the recommended WHO level of 5–6 g/day (Seedat & Rayner, 2012). The average salt intake of South African adults, as measured by 24-h urine sodium excretion, is between nearly 6 and 10 g/day (Barlow, Connell, & Levendig, 1982; Charlton et al., 2005; Hoosen, Seedat, & Bhigjee, 1990; Norton & Woodiwiss, 2011). To reduce dietary salt consumption, the South African government has published mandatory regulations for the gradual reduction of salt over a period of six years in different commercial food categories, which come into effect in 2016 and 2019 (Department of Health, 2013). These food categories cover a range of food products: breads, meats, cereal products, fat spreads, snack foods and savoury products used in cooking. They were selected based on their contribution to salt intake. It is envisaged that limiting salt intake from these products will contribute to lowering blood pressure, which could significantly lower cardiovascular diseases in South Africa and hence will contribute to substantial health care savings. However, legislating salt levels in commercial foods is only one part of a national strategy. It is important for health professionals and educators to also provide appropriate practical nutrition education and promotion that will educate, motivate and enable consumers to change their dietary behaviour in a more healthy direction (Newson et al., 2013; Wentzel-Viljoen, Steyn, Ketterer, & Charlton, 2013). In addition, it is important to consider the impact of salt reduction on taste perception and liking of reduced-salt foods to ensure that consumers will like (or even prefer) these reformulated food products (Herbert, Bertenshaw, Zandstra, & Brunstrom, 2014; Liem, Toraman Aydin, & Zandstra, 2012; Willems, van Hout, Zijlstra, & Zandstra, 2014).

There is surprisingly little known about consumers' taste perception and liking of reduced-salt foods. Malherbe, Walsh, and van der Merwe (2003) reported that it is possible to reduce the sodium content of home-prepared composite dishes by about 30% without significantly changing acceptability. Another study on beef patties showed that, in Ireland and the United Kingdom, the patty with 50% less salt than the commercially available patties was preferred (Tobin, O'Sullivan, Hamill, & Kerry, 2012). In contrast, Mitchell, Brunton, and Wilkinson (2009) and Wang, Lee, and Lee (2014) showed that reduced-salt foods may be disliked initially. The current challenge lies in getting consumers to consume salt-reduced products repeatedly as a few studies have shown that liking for reduced-salt products can be increased when salt is gradually in small steps reduced over time (Bertino, Beauchamp, & Engelman, 1982; Blais et al., 1986; Bobowski, Rendahl, & Vickers, 2015; Bolhuis et al., 2011; Mattes, 1997). In these studies participants shifted their optimal preferred salt level towards lower salt concentrations over 8–16 weeks. The relationship between liking and salt intensity is described as a curve in which a certain salt concentration in food is preferred, and higher and lower concentrations are liked less (De Graaf, van Staveren, & Burema, 1996; Drewnowski, Henderson, Driscoll, & Rolls, 1996; Zandstra, De

Graaf, Mela, & Van Staveren, 2000). This curve is different for each individual and is among others based on prior food experience and customary use of salt and salty products in the diet (Mattes, 1997; Sullivan & Birch, 1990; Tuorila-Ollikainen, Salovaara, & Kurla, 1986; Zandstra et al., 2000). Ultimately, it is important to shift this curve to lower salt concentrations and the above-mentioned studies indicate that it is possible to 'learn' to prefer products with lower salt concentrations.

A concern with the new South African regulations is that large reductions in salt levels in commercial food may not be effective as consumers may increase their discretionary salt use to compensate for a loss in taste.

The current study is the first consumer study in South Africa to investigate consumer behaviour, attitudes and perceptions towards salt reduction in light of the country's new salt reduction regulations. More specifically, we assessed liking, perceived salt taste intensity and use of table salt for reduced-salt chicken stew meals. We hypothesized that liking and perceived salt taste intensity would decrease with increased reductions in salt, whereas use of table salt, while consuming the meal, would increase with larger reductions of salt.

2. Materials and methods

2.1. Participants

A group of 432 urban black South African consumers in the Tshwane metropolitan area were recruited by an independent market research agency to participate in the study. Consumers (only one per household) were included if they: 1) had not participated in any market research involving the tasting of food products in the past three months; 2) were regular consumers of chicken stew, i.e. at least twice a month; 3) available and willing to participate in the evaluation on the specific days; 4) not following a restricted diet and/or suffering from any type of food allergy; 5) between 18 and 65 years old and; 6) had an average gross household monthly income of R6 000–R16000 average monthly household income in South Africa at the time R9 364 (South African Audience Research Foundation, 2013). Consumers were not fully informed about the actual purpose of the study (i.e. assessing discretionary salt use) but were told beforehand that the activity consisted of tasting and eating a chicken stew meal at a central venue. Participants were briefed on the procedures and verbal informed consent was obtained prior to participation. At the end of the session, consumers had the opportunity to give written consent as to whether or not their answers could be included in the data set. Participants received a store voucher of R150. Ethical approval for the study was obtained from the Faculty of Natural and Agricultural Science of the University of Pretoria (application EC 140606-053).

2.2. Food product

A meal consisting of chicken stew with rice for lunch/dinner was used. Stock cube powders varying in sodium (Na) content (Table 1) were used to prepare four different chicken stews: 1) no salt reduction – 2013 Na level; regular salt level as currently available on the South African market (24473 mg Na/100 g), 2) salt reduction lower than 2016 level, i.e. 10%-reduced (22025 mg Na/100 g), 3) 2016 salt level, as per regulatory prescriptions (18000 mg Na/100 g), 4) 2019 salt level, as per regulatory prescriptions (13000 mg Na/100 g). Subjects were randomly assigned to four groups to eat a full portion of one of the four chicken stews once.

Representative samples of the stock cube powders (in triplicate), and homogenized edible portions of prepared chicken stews (chicken bone removed) (eight samples per treatment) and rice

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