

A Comparative Role of Thyroid Hormones in Mother and Foreign Language Speakers

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ABSTARCT

This study was conducted on the basis of a hypothesis, "second language may create stress". The subjects selected for this study were divided into two groups i.e. group A (Punjabi language speakers) and group B (English language speakers). In each group there were 20 boys. Statistically significant ($P < 0.05$) changes were observed in thyroid hormones (TH) as well as in blood pressure after the speech between the Punjabi and English speakers. It has been extensively researched that the biological systems are responsible for spoken language. It has been concluded by this study that second language create stress by changing biochemical parameters particularly TH in human beings.

Keywords: Language, stress, Punjabi, English, thyroid hormones, blood pressure

INTRODUCTION

The first language which a person learns and used in his country is called mother tongue or native language. Always first language learned from birth or within the critical period. It speaks the best and represented identity. In some countries, the terms native language or mother tongue refer to the language of one's ethnic group rather than one's first language. Other language which is learned after first is called second language. Stress is a state of threatened homeostasis, if a person cannot handle stress, it produces physiological and biochemical changes. These changes lead to oxidative stress (Das and Chainy, 2004). Stress interferes with gastrointestinal integrity, leading to bacterial imbalances, which over time can deplete active T3 production. Oxidative stress is due to the increased production of reactive oxygen species (ROS) by the mitochondrial electron carriers (Venditti and Di Meo, 2006). Under oxidative stress the thyroid hormones secretion may be fluctuated and as a result various metabolic as well as physical changes could be observed in the biological system. As a result, variations in the levels of antioxidants are evident (Villanueva *et al.*, 2013).

Pakistan is a South Asian Country. About 67% population of Pakistan is living in the Punjab province. The native language of this region is Punjabi (Pakistan Census, 2014). Many foreign languages are also spoken in this region.

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MATERIALS AND METHODS

In this study the subjects of the experiment were 15 to 17 years old students. All the subjects were boys of a high school situated in Lahore, the capital of the Punjab province. The native language of these boys was Punjabi. They were behaving with normal mental and hearing abilities. At the time of this study these students were attending school regularly and had been learning English for last ten years. The subjects selected for this study were divided into two groups i.e. group A and group B. In each group there were 20 boys. The biological markers including blood pressure and thyroid hormones i.e. T3, T4 and TSH levels were evaluated in this study. Blood pressure is the force that moves blood through our circulatory system. The blood pressure was measured by sphygmomanometer. Thyroid hormone levels were performed by enzyme linked immunosorbent assay (ELIZA kit).

Statistical analysis: General linear model (repeated measures) was used to find out the statistical significant difference among the groups. $P < 0.05$ was considered statistically significant.

RESULTS

The levels of TSH were fluctuated between the Punjabi and English language speakers and statistically significant difference was observed ($P < 0.05$). The levels of TSH were increased (11.64%) in Punjabi speakers after the speech, while levels of TSH were decreased (27.33%) in English speakers after the speech (Table-1) reflecting that the speech in English has some sort of stress in the individuals whose mother language is not English. Similarly, the levels of T4 were also statistically significant ($P < 0.05$) between the studied groups. The levels of T4 were increased (18.30%) in Punjabi

speakers after the speech, while levels of T4 were decreased (36.02%) in English speakers after the speech (Table 1).

On the other hand, the decrease in T3 levels was observed in Punjabi (0.68%) and English (20.13%) speakers after the speech (Table-1). The levels of T3 were observed statistically non-significant ($P>0.05$)

between the studied groups. The blood pressure before the speech was found to be non-significant ($P>0.05$) between the Punjabi and English speakers (Table-2). On the other hand, statistically significant ($P<0.05$) elevation was observed between the Punjabi and English speakers after the speech (4.61%).

Table-1: Levels of Thyroid hormones between the groups before and after speech

	TSH	TSH	T3	T3	T4	T4
	Before	After	Before	After	Before	After
Group	mIU/L	mIU/L	pg/mL	pg/mL	pg/mL	pg/mL
Punjabi (n=20)	2.58±1.23*	2.92±0.94*	4.36±1.03	4.33±0.86	1.25±0.47*	1.53±0.42*
English (n=20)	3.0±0.86*	2.18±0.72*	4.32±1.05	3.45±0.95	1.36±0.49*	0.87±0.16*
P- value	.000		.065		.000	

Table-2: Blood pressure between the groups before and after speech

	Blood pressure- systolic	Blood pressure- diastolic	Blood pressure- systolic	Blood pressure- diastolic
	Before		After	
Group	mmHg	mmHg	mmHg	mmHg
Punjabi (n=20)	116±4.46	77±4.1	124±6.40*	81±3.2*
English (n=20)	116±4.61	76±4.1	130±7.94*	80±3.97*
P- value	0.299		.000	

DISCUSSION

A phenomenon is known as the language-familiarity effects in talker identification (Goggin *et al.*, 1991). This study was conducted on the basis of a hypothesis that “second language may create stress”. This has been observed through current study that there are statistically significant changes among the levels of different biomarkers in the speakers of two different languages including mother (Punjabi) as well as foreign (English) languages. The results demonstrated statistically significant ($P<0.05$) changes in the blood pressure of group A (native) and group B (English) after speech. The blood pressure values of group B subject are higher than group A after speech (Table 2).

The thyroid stimulating hormone (TSH) is produced by pituitary gland situated in the brain. During stress its production is decreased through the action of glucocorticoids (Helmreich *et al.*, 2005; Ranabir and Reetu, 2011). TSH stimulates the thyroid gland to produce T3 and T4. It has been observed in current study that there are statistically significant ($P<0.05$) changes in TH levels of group A and group B after speech (Table 1).

Thyroid hormones (TH) are responsible for the metabolism of proteins, lipids and carbohydrates in virtually all the cells. Degradation of carbohydrates for the synthesis of ATP in the cells is another important aspect of TH. The production of reactive oxygen species (ROS) is associated with the synthesis of ATP that is further linked in oxidative stress. Generally metabolic rate of biological system

is affected by thyroid hormones including anabolic and catabolic reactions (Villanueva *et al.*, 2013). The major secreted hormones of thyroid gland are triiodothyronine (T3) and thyroxine (T4). T3 is secreted in lesser amount as compared to T4. Both these hormones are present in bound and free form in the circulatory system. They are bound with plasma proteins but free form of T3 and T4 is biologically active and has the ability to interact with specific receptors present in plasma membrane, cytoplasm, mitochondria as well as nucleus. Nuclear receptors are more inclined to bind with T3 as compared to T4. Therefore, T3 is accepted as biologically more active form of thyroid hormones than T4. The conversion of T4 into T3 takes place in liver as well as other peripheral tissues. The levels of TSH and T4 were observed statistically significant ($P<0.05$) in the current study between the studied groups (Table-1), while the levels of T3 were statistically non-significant ($P>0.05$).

The thyroid hormones may play a key role in inducing the oxidative stress. Stress stimulates the brain to release Corticotrophin-releasing hormone. This hormone messages the pituitary gland to release thyroid stimulating hormone (TSH), which after conversion sends a message to the adrenal glands produces cortisol. But both cortisol and corticotrophin-releasing hormone can inhibit TSH production and the conversion of T4 to T3 (thyroid hormones), while every cell in the body uses T3 for healthy functions. The decrease in the levels of T3 can lead to symptoms like: fatigue, cold intolerance, weight gain, memory loss, poor concentration,

depression and infertility etc (Herman *et al.*, 2003). The present study learned to identify voices speaking a familiar (native) or unfamiliar (foreign) language stress, suppresses the pituitary gland which is responsible for releasing thyroid stimulating hormone (TSH) which then leads to T4 and T3 release.

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