ISSN 2312-5160

Current Issues of Mass Communication, Issue 24 (2018)

Journal homepage: http://comstudies.org

https://doi.org/10.17721/2312-5160.2018.24.08-21

UDC 007: 304: 001

Shifts in the Autonomic Nervous System Defined by the Valence of TV News

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ABSTRACT

The pattern and nature of autonomic nervous system responses largely depend on the type of emotion. The study was **aimed** at defining shifts in the autonomic nervous system that accompany the emotional activation under the influence of emotionally accented TV news.

Results indicated that a heart rate decelerated in a few minutes after the watching neutral video set. At the same time, throughout the viewing of the video, the activity of the parasympathetic system and the stress index decreased. Negatively accented TV news caused more complex changes. For men, the significant changes in heart rate were recorded only during the first TV news items. On the other hand, negative TV news stories elicited the most significant changes in parasympathetic system and stress index – these changes occurred in the middle of exposure to negative TV news set. The impact was stronger and more complicated for women and consisted of decreasing heart rate while watching TV news stories and accelerating heartbeats in the pause between them. A significant decrease in the parasympathetic system activity occurred after watching negative TV news. Regarding all the parameters, negative TV news stories exerted more significant influence on the psycho-physiological condition of the volunteers than neutral TV stories.

Our study **revealed** the short-term media effects of negative and neutral TV news on the activation patterns of the autonomic nervous system. The short-term reactions of the individual to the mass media are those bricks that underlie a large-scale picture of the media impact on a mass audience. The fact of the existence of short-term media effects gives the base for a further research on the cumulative nature of TV news content's impact on people, including the longitudinal perspective of media effects.

KEYWORDS: TV news; autonomic nervous system; heart rate; emotion.

ISSN 2312-5160

УДК 007: 304: 001

Зміни у вегетативній нервовій системі, спричинені валентністю телевізійних новин

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Резюме

Характер відповідей вегетативної нервової системи багато в чому залежить від типу емоцій. **Метою** дослідження було визначення змін у вегетативній нервовій системі, які супроводжують емоційну активацію під впливом емоційно акцентованих телевізійних новин.

Результати показали, що частота серцевих скорочень уповільнилася через кілька хвилин після перегляду добірки нейтрального відео. У той же час, протягом перегляду відео, активність парасимпатичної системи і індекс стресу зменшилися. Негативно акцентовані телевізійні новини викликали більш складні зміни. У чоловіків значні зміни частоти серцевих скорочень були зафіксовані лише під час перших телевізійних новин. З іншого боку, негативні телевізійні новини викликали найзначніші зміни в парасимпатичній системі та індекс стресу – ці зміни відбулися в середині процесу впливу добірки негативних телевізійних новин. Вплив був сильнішим і складнішим у жінок і полягав у зниженні частоти серцевих скорочень під час перегляду теленовин і прискоренні серцевих скорочень в паузі між ними. Значне зниження активності парасимпатичної системи відбувалося після перегляду негативних телевізійних новин. Що стосується всіх параметрів, то негативні телевізійні новини справляли більш значний вплив на психофізіологічний стан учасників дослідження, ніж нейтральні телесюжети.

Дослідження **виявило** короткочасні медіаефекти негативних і нейтральних телевізійних новин на моделі активації вегетативної нервової системи. Короткочасні реакції особистості на засоби масової інформації лежать в основі масштабної картини впливу ЗМІ на масову аудиторію. Факт існування короткострокових медіаефектів дає підстави для подальших досліджень щодо сукупного характеру впливу телевізійних новин на людей, включаючи довгострокову перспективу медійних впливів.

Ключові слова: телевізійні новини; вегетативна нервова система; частота пульсу; емоції.

ISSN 2312-5160

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Изменения в вегетативной нервной системе, вызванные валентностью телевизионных новостей
Характер ответов вегетативной нервной системы во многом зависит от типа эмоций. Целью исследования было определение изменений в вегетативной нервной системе, которые сопровождают эмоциональную активацию под влиянием эмоционально акцентированных телевизионных новостей.
Результаты показали, что частота сердечных сокращений замедлилась через несколько минут после просмотра подборки нейтрального видео. В то же время, в течение просмотра видео, активность парасимпатической системы и индекс стресса уменьшились. Негативно акцентированные телевизионные новости вызвали более сложные изменения. У мужчин значительные изменения частоты сердечных сокращений были зафиксированы только во время первых телевизионных новостей. С другой стороны, негативные телевизионные новости вызвали значительные изменения в парасимпатической системе и индекс стресса - эти изменения произошли в середине процесса влияния подборки негативных телевизионных новостей. Влияние было сильнее и сложнее у женщин и заключался в снижении частоты сердечных сокращений во время просмотра теленовостей и ускорении сердечных сокращений в паузе между ними. Значительное снижение активности парасимпатической системы происходило после просмотра негативных телевизионных новостей. Что касается всех параметров, то негативные телевизионные новости имели более значительное влияние на психофизиологическое состояние участников исследования, чем нейтральные телесюжеты.
Исследование выявило кратковременные медиа-эффекты негативных и нейтральных телевизионных новостей на модели активации вегетативной нервной системы. Кратковременные реакции личности на средства массовой информации лежат в основе масштабной картины влияния СМИ на массовую аудиторию. Факт существования краткосрочных медиа-эффектов дает основания для дальнейших исследований относительно совокупного характера влияния телевизионных новостей на людей, включая долгосрочную перспективу медийных воздействий.
Ключевые слова: телевизионные новости; вегетативная нервная система; частота пульса; эмоции.

1. Introduction

Negative film clips with extreme violence against humans give rise to acute stress (Gärtner, Grimm, & Bajbouj, 2015). This activates the rapid defence mechanism of the brain (Hermans et al, 2011) and induces the response in the autonomic nervous system (Tsigos, & Chrousos, 2002), including peripheral components, increased the heart rate and arterial blood pressure (Chrousos, 2009). It was established that more sensitive and selective measure of mental stress is heart rate variability (HRV). There was detected the increase in the low- to high-frequency ratio in the stress situation (Hjortskov et al., 2004). Decreased levels of parasympathetic modulation are associated with the acute psycho-physiological stress (Hall et al, 2004).

Psycho-physiological research has provided important insights about the physiological mechanisms of the psychological stress, including the involvement of autonomic nervous system

(sympathetic and parasympathetic branches). The interaction of two circuits, sympathetic and parasympathetic, is reflected in the changes of heart rate variability (HRV) (Taelman et al, 2009).

Main theoretical basis for media effects research involving heart rate measurements is Limited Capacity Model of Motivated Mediated Message Processing (LC4MP) initially proposed by Lang (2000). LC4MP suggests that human mechanism of media perception has a restricted ability to process and memorize media messages. Besides, this approach stresses the role of packaging as well as emotionally negative videos as chief factors that impede viewers' processing ability.

Heart rate is a measure of dualistic nature: emotional and attentional (cognitive). On one hand, it shows the level of physiological arousal, indicative of current emotional state. On the other hand, slowing heart rate demonstrates patterns of cognitive activation, known under the Orienting Response concept (Lang, 2014).

Heart Rate was widely used in empirical research about impact of TV violence on viewers. David, Nias, & Phil (1979) interpreted TV violence viewing as vicarious experience of violence that people observe not in natural circumstances, but via the television screen. Based on heart rate data, Bolls, Lang, & Potter (2001) showed that negative messages had received more attention than positive ones. Besides, Bolls, Lang, & Potter (2001) proved that heart rate acceleration was a good predictor of memorizing than message valence.

Fanti, Vanman, Henrich, & Avraamides (2009) conducted a study into short-term desensitization to media messages. In general, their findings demonstrate that repeated exposure to media violence reduces the psychological impact of television violence in the short term, therefore desensitizing viewers to media violence. Desensitization manifested itself through the fact that viewers tended to feel less sympathetic toward the victims of violence and actually enjoy more the violence portrayed in the media.

More specifically, Anitei & Chraif (2011a, 2011b) indicated that the influence of TV news with outright violence on reactions of the autonomous nervous system depended on the upbringing conditions, education, and criminal, violent environment. Violent, aggressive environment makes people insensitive to the television violence as well as "heavy viewing" of violence on TV. Both these assumptions support desensitization theory; in accordance with it, the extended/repeated exposure to the media valence leads to the less physiological response and less salient emotional arousal (Smith & Donnerstein, 1998: Carnagey & Anderson, 2003). Desensitization effects are applicable mainly to the violent media content (Krahé et al, 2011).

There was no change in the heart rate among young people from criminal problem neighbourhood while watching TV news with violence and aggression (Anitei & Chraif, 2011a). Instead, there was a significant change in HR watching the same content among youngsters that lived in non-criminal neighbourhood.

Physiological measurements, such as heart rate, along with the behaviour data, allow to identify relationship between the physiological and cognitive outputs of the participants. Focusing on emotionally grave and distressful events in the TV news, we investigated the stress factors of media. We aimed at examining the impact of emotionally accented TV news items on the autonomic nervous system depending on the intensity of violence.

Hypotheses of the study were the following:

H1: Negative TV news stories change HR stronger than neutral TV stories: acceleration vs deceleration.

Neutral TV-stories were accepted more favourably than neutral ones (Havrylets et al, 2013). Neutral videos caused boredom mostly while negative stories aroused more concentration, more marked emotions (anger and so on) (Havrylets et al, 2013; Havrylets et al, 2018). The valence of emotions determines the central control of heart rate, shifting attention to the emotionally relevant stimuli. It was so far emphasized that heart rate is regulated primarily by an amygdala under negative emotions and the hypothalamus under positive emotions. Observed prolonged HR de-

celeration was a result of exposition to negative stimulus and could be the component of mental processing of the negative valence (Kuniecki et al, 2002).

H2: There are sex differences in autonomic reactivity to negative TV news stories.

Sex differences in attitude to violence are described. Women are less engaged in real physical violence (Archer, 2004), less prefer media violence (Weaver, 2011; Kirsh, 2012) than men. Baron-Cohen (2009) indicated preparedness of the male brain to process the non-social events. Gender-specific effects lie in the association between trait anxiety and the cardiac defence response (López et al, 2016). Findings of Hartmann, Möller, & Krause (2014) indicated an absence of sex differences in the direct, physical, verbal, and indirect forms of aggression and anger. On the other hand, males are less empathetic, tend to morally justify physical violence more and have a greater need for sensation and aggression while playing video game than females. This gender gap between men and women in relation to violence in life and in media allows to assume the difference in the HR reaction on the two types of emotionally accented TV news stories.

The purpose and objectives of the study. The purpose of the study was to measure the short-term effects of emotionally accented video stimuli on heart rate (HR) and heart rate variability (HRV) (electrocardiography, ECG) and compare the data depending on the type of TV news items.

The following objectives were set:

• conduct an experiment and expose over 50 high-school students to 2 types of TV news stories: negative and neutral;

• process all received data;

• identify the patterns of the heart rate for negative and neutral news.

2. Research methods

2.1. Participants

53 healthy right-handed volunteers (33 women and 20 men), the first to third year biology and psychology students of the Taras Shevchenko National University of Kyiv, aged 18 to 21 years (M_{age} = 18.1, SD = 0.48 years) participated in this study. The participants were eligible to enrol in the study if they had normal or corrected-to-normal visual acuity, normal colour vision, had no clinical manifestations of mental or cognitive impairment, verbal or non-verbal learning disabilities. Exclusion criteria were: the use of psychoactive medication, drug or alcohol addiction and psychiatric or neurological complaints.

2.2. Methods of research

Methods of research were stipulated by the aim of the study that was to define the shifts in the autonomic nervous system that accompanied the emotional activation. The patter and nature of autonomic nervous system responses largely depend on the type of emotion. The variability of the heart rhythm is the reliable indicator of adaptive reactions, reflecting the degree of tension of regulatory systems under mental or physical stress. The registration of an electrocardiogram allows assessing the degree of emotional activation under the influence of emotionally accented TV news because it reflects the degree of activation of the autonomic nervous system during viewing.

2.3. General procedure

All the experimental sessions were conducted from 10 a.m. to 3 p.m. every day at the department of Physiology of Brain and Psychophysiology, Educational and Scientific Centre “Institute of Biology and Medicine” of the Taras Shevchenko National University of Kyiv. The participants were informed about the description of the study and confidentiality of the gathered information, and were asked to complete a paper version of the questionnaires. The questionnaires included demographic data (gender, age), questions concerning personality factors and personality structure, and emotional burnout.

The participants were seating in a comfortable armchair, in a dimly lit recording booth in front of a standard 17″ LCD monitor with a distance of 80 cm away from the computer screen. During the experiment, subjects were asked to look straight ahead and avoid excessive movements. We recorded ECG using the following protocol. After adaptation to the study condition (2 min), ECG was registered during the two periods of resting condition (one with eyes closed (3 min), the other with eyes open (1 min)) and while watching the video set (7 min 38 sec as a whole). Video stimuli were presented on the screen monitor (LG FLATRON L1717S "Samsung S27H650F, display diagonal 27", maximum display resolution 1920x1080, refresh rate 60 Hz, display brightness 250 cd / m², display contrast 1000:1) using the GOM Player 2.3.14.5270 (Gretech Online Movie Player) for Windows XP/7/8/10. Sounds with an intensity of about 70-85 dB were played from two nearby multimedia Hi-Fi stereo speakers (Genius SP-G06, frequency range 60 - 20000 Hz).

There were 10 videos with high video and audio quality, broken down into 2 blocks of negative and neutral TV news. Between each video we recorded 1.5-min-long EEG segments in the course of empty grey-coloured screen.

After the experiment, the participants were asked to evaluate hedonistic tone of video using a 10-grade scale from -5 to +5 (Tables 1, 2).

2.4. ECG recordings

The ECGs were recorded by 1st Einthoven`s standard lead placement using ECG-channel of EEG complex Neurocom (Ukraine, XAI-MEDICA). The recorded data array of RR intervals was processed using the algorithms for analysing heart rate variability. To characterize the processes of heart function regulation, the following indicators of heart rate variability were selected (Baevskiy et al, 2001). Heart rate (the derivative of the average arithmetic value of the data array of RR intervals) and the mode of RR intervals reflect the current level of functioning of the circulatory system, and consequently the energy needs of the body to a certain extent. The standard deviation of the RR intervals (SDNN) and the coefficient of variation (CV) characterize the autonomic regulation of the heart activity, internal processes associated with the automation of the cardiac muscle. The coefficient of variation (CV) is the normalized index of vegetative regulation of blood circulation. The mean deviation (MD) characterizes the total effect of autonomic regulation of blood circulation.

RMSSD (the square root of the sum of the squares of the difference in the values of the successive pairs of RR intervals) characterizes the parasympathetic central influences on heart activity. AMo (mode amplitude) - the central sympathetic ones, pNN50 (the percentage of pairs of successive RR intervals in the cardiogram differing by more than 50 ms) - the degree of predominance of the parasympathetic mechanisms over the sympathetic ones. Physiological meaning of these indicators is the following: the heart activity is regulated by two types of signals of the central nervous system – sympathetic and parasympathetic, and their action must be balanced. In particular, the sympathetic regulation consists of the heart rate accelerations and the parasympathetic regulation in decelerations. Based on this, the average value and variance of the RR intervals shows the mean level of functioning of the blood circulation system, and the RMSSD and pNN50 values reflect the activity of the cardiac parasympathetic control – the activation of the parasympathetic control of the heart is reflected in higher values of these parameters. Normally, the values of these indicators are equal: SDNN - 30-100 ms, RMSSD - 20-50 ms, CV - 3-12%. The pNN50 is presented as a percentage of number of difference values greater than 50 ms.

The stress index of regulatory systems or stress index (SI) characterizes the activity of the mechanisms of sympathetic regulation, the state of the central contour of regulation, the degree of predominance of the central mechanisms of regulation of cardiac activity over internal (autonomic) mechanisms, and also shows the degree of involvement of the physiological systems of the organism in stress. In norm, the SI varies within 80-150 conventional units. Strengthening of

sympathetic regulation under the emotional experiences, mental or physical loads leads to the fivefold to tenfold increase in SI.

2.5. Stimuli

The use of video (negative, neutral, positive) became a standard method for investigating emotion reactions (Aftanas et al, 1998; Soleymani, Pantic, & Pun, 2012; Kreibig et al, 2013). The changes in heart rate reflect the impact of the video on the mood and the emotional arousal of the viewers or their attention to the proposed message (Lang, 2014). We used two sets of videos, five items in each set, with emotionally negative and emotionally neutral news stories. All TV-stories, randomly chosen from the Internet, had been previously shown on TV. The videos in both sets were selected based on the emotional valence of the delivered information. Selection of the stimuli encompassed several steps in accordance with the principles described by Havrylets et al. (2016). Accordingly, from 50 randomly chosen TV news stories (25 negative and 25 neutral), 4 coders (2 males and 2 females), 1st grade students, assessed emotional valence of every news video in the pool using a 10-grade Likert-type scale based on the criteria "negative – positive" and "exciting – relaxing" (-5 - very negative, 0 - neutral, +5 - very positive). We divided the whole scale span into three parts: (1) negative TV news (valence values varying from -5 to -1), (2) neutral (valence values from -1 to +1), (3) positive (valence values from +1 to +5). All scores for each news story were generalized. As a result, the final negative video set consisted of 5 most negative and exciting TV news stories with scenes of outright violence or natural disasters, the neutral group of the videos with analytical reviews of markets or the ones reporting on specialized events with no direct mention of negative events (Table 1, 2).

Both video sets were of approximately equal duration (around 7 minutes 10 seconds each).

2.6. Ethical clearance

The study was approved by the Bioethics Commission of Educational and Scientific Centre "Institute of Biology and Medicine", Taras Shevchenko National University of Kyiv. Besides, written informed consent was obtained from each participant in accordance with the World Medical Association (WMA) declaration of Helsinki – ethical principles for the medical research involving human subjects (Helsinki, Finland, June 1964).

2.7. Data analysis

We carried out statistical data processing for the study with the use of the Wilcoxon signed-rank test, the nonparametric Mann–Whitney U test (StatSoft STATISTICA 64, version 10.0.1011.0). To determine the type of distribution, the Kolmogorov-Smirnov test was used. The differences were considered significant at $p < .05$.

3. Results and discussion

Preliminary, the coders assessed TV news stories with the use of two scales "unpleasant-pleasant" and "relaxing-activating" into experimental questionnaire. Consequently, all TV news stories were evaluated on these scales in the following way: neutral stories were regarded as neither pleasant nor unpleasant and rather relaxing, negative – more unpleasant and activating. We indicated that negative news worsen mood more significantly than the neutral ones. More than twice as much state anxiety is felt because of the negative set of videos, than of the neutral ones. (Havrylets et al, 2013; Havrylets, Tukaiev, & Rizun, 2018).

By analysing heart rate variability, we found the following changes in response of the cardiovascular system. We observed significant changes in heart rate of men a few minutes after the end of viewing the neutral TV news set, they showed a decrease in heart rate by 4.71% ($T = 0$, $Z = 3.059$, $p < 0.002$). At the same time, the activity of the parasympathetic link of the vegetative nervous system (RMSSD index) decreased during the whole experiment. Besides, a decrease in stress index was observed while viewing the first two TV news stories and after viewing the entire neutral TV news set. As for women, a significant decrease in heart rate was observed dur-

ing the last, 5th TV news story and at the end of the total TV news block (-2.2% respectively (T = 94, Z = 2.072, p <0.038), -8% (T = 105, Z = 2.62, p <0.009) and -1.85% (T = 89, Z = 2.2, p <0.028). We noted the coincidence of the maximum changes in heart rate with a decrease in influence of the parasympathetic link (RMSSD index) and a stress-index increase.

Negatively accented TV news caused more complex changes. Among men, a statistically significant increase in heart rate was detected only during viewing of the 1st TV news story (T = 26 Z = 1.66, p <0.05). The most significant changes in activity of the parasympathetic link (RMSSD index) and stress-index detected in the middle of the TV news set, while watching the 3rd TV news story, which can be explained by the subjective male perception of the features of this story (TV story reporting on self-immolation).

The impact of negative TV news stories was significant among women and manifested itself in reducing heart rate while watching the 2nd (T = 27 Z = 2.91, p <0.0036), the 3rd (T = 57, Z = 2, 46, p <0.01) and 5th TV news stories (T = 64, Z = 2.46, p <0.01) and increase in heart rate in the pauses between 4 and 5 TV news stories (T = 37, Z = 2, 11 p <0.03). The maximum decrease in RMSSD index and the parasympathetic central influences on heart activity occurred at the end of viewing the entire block of negative TV news. We noted the absence of changes in stress index, which turned out to be a feature of women's perception of video with violence. Changes in heart rate in the pauses between negative TV news stories and at the end of viewing the entire video set indicate the process of recalling by women just what they saw and heard, rumination and assimilation of perceived information and process of empathy.

Changes in cardiac activity are an important parameter for the analysis of reaction on emotional TV news content. It turned out that the neutral and negatively accented TV news stories elicited the diverse changes in activity of the autonomic nervous system, which was reflected in the dynamics of heart rate variability. We can assume that an increase in the heart rate among women during the pauses between negatively accented TV news stories reveals the better adaptive capabilities of women, since an increase in heart rate is an important adaptation mechanism for increasing the minute volume of blood circulation in order to quickly adjust its size with body's requirements for large physical or emotional loads. Our data correspond to the notion that women's response to emotion-eliciting films represents a sympathetically-driven defence response, while men's response is a parasympathetically-driven orienting reaction (Wilhelm et al, 2017). Therefore, our findings prompt us to accept both H1 and H2.

4. Conclusions

It was shown that emotional activation, while viewing neutral and negative TV news stories, is accompanied by shifts in the vegetative sphere of the organism, the character of which depends on the emotional evaluation of the video (valence of video). Neutral and negatively accented TV news stories caused different patterns of activity of the autonomic nervous system depending on gender, which manifested themselves in differences between the dynamics of heart rate variability of women and men in our experiment. The heart rate decrease was observed among men while watching the neutral TV news, and among women while watching the negative TV news. Some similar result was obtained in the study by Althaus et al (2014), whose heart rate findings did not show greater cardiac reactivity of women to aversive pictures with humans compared to men. In our study, men were bored when viewing neutral news. Boredom accompanies low autonomic arousal that is characterized by decelerated, low heart rate (Farrington, 1997). The increase in heart rate found among women in the pause between negatively accented TV news stories probably suggests their better adaptive capabilities than those of men. Our data is also in full accordance with the view that females demonstrate higher trait empathy than males (Rueckert & Naybar, 2008).

Thus, our study revealed the short-term media effects of negative and neutral TV news on the activation patterns of the autonomic nervous system. The short-term reactions of the individual to the mass media are those bricks that underlie a large-scale picture of the media impact on a mass audience. The fact of the existence of short-term media effects gives ground to further research on cumulative nature of TV news content's impact on people, including the longitudinal perspective of media effects.

Competing interests

The authors declare that they have no competing interests.

5. Tables

Table 1. Mean ratings of the emotionally neutral TV-news plots (M ± SD). Scales: -5 to +5.

Sequence in the video set	Stimuli	Duration	Characteristics	
			Pleasantness	Arousal potential
1	Publishers' Forum	1 min 25 sec	2.37±1.78	0.64±2.67
2	"Business kaleidoscope"-1, market review	1 min 15 sec	1.02±1.77	-0.15±2.11
3	Shale gas perspectives in Ukraine	1 min 27 sec.	0.94±2.29	0.30±2.47
4	"Business kaleidoscope"-2, market review	1 min 32 sec	0.96±1.77	-0.17±2.20
5	Forum of security firms	1 min 30 sec	1.19±1.73	0.28±2.35

Table 2. Mean ratings of the emotionally negative TV-news plots (M ± SD). Scales: -5 to +5.

Sequence in the video set	Stimuli	Duration	Characteristics	
			Pleasantness	Arousal potential
1	Tram in Odesa crashed into the car	1 min 51 sec	-2.17±1.87	1.32±1.77
2	Tsunami in Japan	1 min 49 sec	-2.23±1.75	1.23±1.89
3	Loser lover commits self-immolation	1 min 22 sec.	-3.13±1.79	1.70±2.14
4	Terrorist attack in the airport	0 min 32 sec	-2.34±1.78	1.23±1.82
5	Fighting between football fans in downtown	1 min 49 sec	-3.75±1.60	2.36±2.32

Table 3. ECG parameters while viewing emotionally neutral TV news in men group, n=20.

	Back-ground (closed eyes)	Back-ground (opened eyes)	TV news 1	Afteref-fect 1	TV news 2	Afteref-fect 2	TV news 3	Afteref-fect 3	TV news 4	Afteref-fect 4	TV news 5	Afteref-fect 5	Afteref-fect (opened eyes)	Afteref-fect (closed eyes)
HR	64,79	64,10	63,25	65,73	64,40	64,11	65,56	64,82	63,61	63,41	63,72	63,65	65,03	61,87
RR inter-vals, ms	828,74	826,40	827,20	832,94	834,48	822,16	825,27	820,22	828,89	826,28	847,95	879,31	828,74	826,40
SDNN, ms	99,54	89,48	92,54	86,98	96,25	82,99	89,99	89,32	78,12	85,79	78,79	108,66	103,12	89,83
CV	10,63	9,48	9,67	9,45	10,23	8,80	9,75	9,56	8,23	8,99	8,31	11,40	11,05	9,19
RMSSD	153,73	138,14	132,00	121,31	144,04	128,24	131,14	136,04	123,51	122,99	120,38	143,27	157,24	138,05
pNN50	66,67	61,11	61,11	66,67	72,22	72,22	66,67	72,22	77,78	61,11	66,67	72,22	77,78	66,67
mode	73,2	73,2	73,2	73,2	73,2	73,2	73,2	73,2	73,2	73,2	73,2	68,590	73,2	73,2
The stress index	62,03	68,10	51,04	66,74	49,74	66,01	63,85	66,01	65,76	62,63	60,86	35,14	51,46	40,12

Table 4. ECG parameters while viewing emotionally neutral TV news in women group, n=33.

	Back-ground (closed eyes)	Back-ground (opened eyes)	TV news 1	Afteref-fect 1	TV news 2	Afteref-fect 2	TV news 3	Afteref-fect 3	TV news 4	Afteref-fect 4	TV news 5	Afteref-fect 5	Afteref-fect (opened eyes)	Afteref-fect (closed eyes)
HR	74,06	74,2	74,07	73,66	73,49	74,55	74,32	74,96	73,98	74,42	72,48	68,59	74,17	72,72
RR inter-vals, ms	828,74	826,40	827,20	832,94	834,48	822,16	825,27	820,22	828,89	826,28	847,95	879,31	829,85	847,12
SDNN, ms	128,17	125,53	123,80	126,55	127,49	120,96	125,08	131,88	128,33	132,32	133,63	64,15	136,35	139,95
CV	15,47	15,19	14,97	15,19	15,28	14,71	15,16	16,08	15,48	16,01	15,76	7,30	16,43	16,52
RMSSD	183,89	184,45	176,92	179,10	188,80	167,64	188,78	193,70	185,14	184,62	196,86	94,66	195,55	193,16
pNN50	51,43	60	57,14	57,14	57,14	51,43	51,43	54,29	45,71	54,286	60	42,86	51,43	57,14
mode	72,6	58,44	61,8	72,6	73,2	58,26	58,44	58,44	65,4	73,2	58,62	73,2	73,2	58,26
The stress index	24,17	23,63	24,51	25,11	22,98	28,07	27,12	26,4	25,06	25,89	25,89	39,40	25,53	23,85

Table 5. ECG parameters while viewing emotionally negative TV news in men group, n=20.

	Back-ground (closed eyes)	Back-ground (opened eyes)	TV news 1	Aftereff-fect 1	TV news 2	Aftereff-fect 2	TV news 3	Aftereff-fect 3	TV news 4	Aftereff-fect 4	TV news 5	Aftereff-fect 5	Aftereff-fect (opened eyes)	Aftereff-fect (closed eyes)
HR	62,72	62,79	63,41	62,33	62,90	63,85	61,67	63,52	62,26	63,71	62,20	63,53	63,74	62,21
RR inter-vals, ms	964,94	965,46	953,98	971,53	962,32	948,64	986,11	953,88	973,62	951,09	973,65	954,77	950,49	971,47
SDNN, ms	88,29	97,67	85,49	93,12	89,07	91,88	120,19	93,80	99,19	94,03	95,12	99,30	93,76	81,81
CV	9,15	10,12	8,96	9,58	9,26	9,68	12,19	9,83	10,19	9,89	9,77	10,40	9,86	8,42
RMSSD	133,24	143,07	122,83	138,51	131,85	132,12	172,82	135,92	137,28	134,18	131,17	135,91	128,90	119,29
pNN50	52,63	63,16	57,89	52,63	57,89	57,89	55,56	57,89	68,42	57,89	68,42	68,42	63,16	52,63
mode	58,86	58,86	73,8	58,86	58,38	58,74	58,86	58,86	58,38	73,2	73,2	58,86	73,2	58,86
The stress index	59,18	41,57	66,01	45,38	66,01	66,01	27,89	62,89	38,49	68,09	40,12	42,14	55,24	64,79

Table 6. ECG parameters while viewing emotionally negative TV news in women group, n=33.

	Back-ground (closed eyes)	Back-ground (opened eyes)	TV news 1	Aftereff-fect 1	TV news 2	Aftereff-fect 2	TV news 3	Aftereff-fect 3	TV news 4	Aftereff-fect 4	TV news 5	Aftereff-fect 5	Aftereff-fect (opened eyes)	Aftereff-fect (closed eyes)
HR	72,67	71,94	72,51	72,62	70,65	72,86	70,93	72,58	71,86	73,78	70,75	72,42	71,90	72,29
RR inter-vals, ms	841,30	848,35	845,42	840,31	864,28	837,62	859,63	841,93	848,75	829,22	860,26	838,42	846,47	846,05
SDNN, ms	119,02	113,29	127,37	113,39	116,65	112,32	112,31	117,60	111,54	120,33	106,01	93,27	105,07	121,27
CV	14,14	13,36	15,07	13,49	13,49	13,41	13,06	13,97	13,14	14,51	12,32	11,12	12,42	14,33
RMSSD	157,39	143,17	152,49	145,11	137,78	139,66	145,72	163,25	135,74	166,56	145,13	114,47	153,18	158,98
pNN50	54,54	60,61	51,52	42,42	45,45	57,58	60,61	60,61	51,51	63,64	54,54	33,33	63,64	54,54
Mode	73,8	73,2	73,2	72,6	73,2	73,2	73,2	73,2	73,2	73,2	73,2	70,22824	73,8	73,2
The stress index	41,06	41,19	40,62	41,19	40,09	41,69	39,16	41,14	41,49	40,62	40,99	41,62	41,32	38,95

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