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Phytotherapeutic modulation of the impact of facial expressions in intense physical stress

Modularea fitoterapică a impactului expresiilor faciale, în stresul de efort fizic intens

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Abstract

Background. Facial expressions (FE) can have an important impact on physiological and psychological reactions, under the conditions of physical exercise. On the other hand, it is known that there are plants that can modulate the impact of stress on the human body.

Aims. The aim of the present research is the evaluation of phytotherapeutic modulation of the impact of FE in intense physical stress.

Methods. Sedentary volunteers (n = 24 males) were divided into two groups: a) no treatment (C = 12) and b) who received a phytotherapeutic product containing plants with an adaptogenic role, PAD (AD = 12). The chosen FEs were: neutral (N), disappointment (D) and encouragement (E). FEs were displayed on a screen in front of the subject. Physical stress (PS) was represented by a short-term intense physical effort, made on a Monark Ergomedic 839E cycle ergometer. PAD administration was 2x1 capsules/day, 21 days. The analyzed indicators were heart rate (HR), anxiety (A) and glycemia (G). Statistical analysis was made on the basis of the Student test.

Results. HR: compared with AD, C values were significantly higher immediately pre- and post-stress. A and G: values in C were significantly higher compared to AD, immediately pre- and post-stress.

Conclusions. 1) Influence of PS+N/D/E was significantly more intense on C versus AD, more intense on FC and A than on G. 2) FE type D increased and FE type E reduced physical stress, while N did not influence it. 3) Compared to C, PAD decreased the effect of FE type D and increased the FE type E effect. 4) PAD could be used as a modulator of FE impact on physical stress, and this involvement should be studied through further research.

Key words: facial expressions, physical stress, heart rate, anxiety, glycemia, phytotherapeutic modulation

Rezumat

Premize. Expresiile faciale (EF) pot avea un impact important asupra reacțiilor fiziologice și psihologice, în condițiile realizării unui efort fizic. Pe de altă parte, se știe că există plante care pot modula impactul stresului asupra organismului uman.

Obiective. Obiectivul studiului este evaluarea modulării fitoterapice a impactului EF, în stresul de efort fizic intens.

Metodă. Subiecții voluntari sedentari (n=24 bărbați) au fost împărțiți în două grupe: a) fără tratament (C=12) și b) care a primit un produs fitoterapic, conținând plante cu rol adaptogen, PAD (AD=12). EF alese au fost: neutru (N), dezamăgire (D) și incurajare (Î), EF au fost afișate pe un ecran situat în fața subiectului. Stresul a fost reprezentat de un efort fizic intens și de scurtă durată, realizat cu un cicloergometru Ergomedic 839e Monark. Administrarea PAD a fost de 2x1 cps/zi, 21 zile. Indicatorii analizați au fost frecvența cardiacă (FC), starea de anxietate (A) și glicemia (G). Evaluarea statistică s-a făcut pe baza testului Student.

Rezultate. FC: comparativ cu AD, valorile la C au fost semnificativ mai crescute, imediat pre- și post-stres. A și G: valorile la C au fost semnificativ mai crescute comparativ cu AD, imediat pre- și post-stres.

Concluzii. 1) Influența PS+N/D/Î a fost semnificativ mai intensă asupra C comparativ cu AD, mai intensă asupra FC și A decât asupra G. 2) EF de tip D a crescut și EF de tip Î a scăzut stresul fizic, în timp ce N nu l-a influențat. 3) Comparativ cu C, PAD a scăzut efectul EF de tip D și a crescut efectul EF de tip Î. 4) PAD ar putea fi folosit ca modulator al impactului EF asupra stresului fizic, iar această implicare ar trebui studiată prin cercetări ulterioare.

Cuvinte cheie: expresii faciale, stres fizic, ritm cardiac, anxietate, glicemie, modulare fitoterapică.

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Introduction

According to psychological models as well as common intuition, intense positive and negative situations evoke highly distinct emotional expressions (Wenzler et al., 2016). For example, coherent increases in sympathetic activation accompanied a film containing violent threats, whereas a surgery film yielded greater electrodermal activation, as well as heart rate deceleration (Palomba et al., 2000). In sport, athletes from relatively urban, individualistic cultures expressed their emotions more, whereas athletes from less urban, collectivistic cultures masked their emotions to a greater extent (Matsumoto et al., 2009).

The present work is a continuation of our concerns for assessments in physical stress, as well as for the modulation of physical stress (Jurcău et al., 2011; Jurcău et al., 2013; Jurcău & Jurcău, 2014; Jurcău & Jurcău, 2015).

Hypothesis

Facial expression (FE) can have an important impact on physiological and psychological reactions under conditions of physical exercise. On the other hand, it is known that there are plants that can modulate the impact of stress on the human body.

Objectives

The objective was to highlight how a phytotherapeutic product containing plants with an adaptogenic role can influence the impact of FE, under intense physical stress, on sedentary persons.

Material and methods

Research protocol

a) Period and place of the research

The study and measurements were carried out in July 2018, in the 122 Medical Family Practice in Cluj-Napoca. Participation of all subjects in the study was voluntary.

b) Subjects and groups

Sedentary volunteers (n = 24 males) were divided into two groups: a) no treatment (C = 12) and b) who received a phytotherapeutic product containing plants with an adaptogenic role, PAD (AD = 12). Average age: 24.4 ± 3 (C), 30.1 ± 4 (AD). They underwent the same kind of physical effort.

c) Tests applied

- *Study design*

The chosen FEs were: neutral (N), disappointment (D) and encouragement (E). FEs were displayed on a screen in front of the subject. The FEs were presented in three short films while the subject pedaled, with 30-minute breaks between them. The stress was short-term intense physical exercise performed on the Monark Ergomedic 839E cycle ergometer, in three successive physical sequences (PS), in the order: PS+N → PS+D → PS+E.

PAD administration was 2x1 capsules/day, for 21 days. PAD is called Fitotensin and its composition includes (1): Hypericum perforatum, Verbena officinalis, Angelica archangelica, Ocimum basilicum, Passiflora incarnata, Melissa officinalis, Valeriana officinalis, Lavandula angustifolia.

- *The indicator determination program* was as follows:

Evaluations were performed: 24 h (T1) and 15 minutes before PS+N (T2); 15 minutes after PS+N (T3), PS+D (T4) and PS+E (T5); 24 hours after PS+E (T6).

- *Explorations*

Heart rate (HR) was evaluated on the cycle ergometer; anxiety (A) was assessed with Beck Anxiety Inventory; glycemia (G) was evaluated with a portable glucometer.

d) Statistical evaluation

- The results obtained were analyzed using SPSS 13.0. statistical package.
- For continuous data examination, Student's t test was used.
- The differences were considered significant at a $p< 0.05$.

Results

Mean, standard deviation and p values for C-AD comparison are shown in the tables below.

Heart rate (HR) (Table I). Compared with AD, C values were significantly higher immediately pre-stress: T2 (p = 0.005) and post-stress: T3 (p = 0.0001), T4 (p = 0.002) and T5 (p = 0.005). The most significant difference was at T3. At T6, differences were not significant.

Table I

Modification of HR at T1-T6 moments

Moments	Groups	HR		
		Mean	SD	p
T1	C	69.17	3.1841	ns
	AD	68.92	2.9849	
T2	C	138.08	140.25	0.005
	AD	140.25	1.0103	
T3	C	154.25	2.3139	0,0001
	AD	149.33	2.8963	
T4	C	165.08	3.5463	0.0002
	AD	159.33	2.8963	
T5	C	130.25	1.0104	0.005
	AD	128.08	2.3258	
T6	C	72.58	1.801	ns
	AD	70.16	3.387	

Anxiety (A) (Table II). Values in C were significantly higher compared to AD immediately pre- and post-stress: T2 (p = 0.003), T3 (p = 0.005), T4 (p = 0.01) and T5 (p = 0.004). The most significant difference was at T2. At T6, differences were not significant.

Table II

Modification of A at T1-T6 moments

Moments	Groups	A		
		Mean	SD	p
T1	C	0.93	0.3374	ns
	AD	0.89	0.3094	
T2	C	34.33	5.6025	0.003
	AD	26.08	7.0292	
T3	C	22.91	6.0063	0.005
	AD	15.5	6.6269	
T4	C	28.08	5.8659	0.01
	AD	21.58	6.4737	
T5	C	19.16	5.8142	0.004
	AD	11.33	6.7618	
T6	C	4.66	1.0274	ns
	AD	3.83	1.4624	

Glycemia (G) (Table III). Values in C were significantly higher compared to AD immediately pre- and post-stress: T3

(p = 0.04), T4 (p = 0.01), T5 (p = 0.02) and T6 (p = 0.005). The most significant difference was at T6. At T2, differences were not significant.

Table III
Modification of G at T1-T6 moments

Moments	Groups	G		
		Mean	SD	p
T1	C	75.36	5.2271	ns
	AD	74.66	4.7667	
T2	C	75.16	4.7929	ns
	AD	74.91	4.9909	
T3	C	117	6.0138	0.04
	AD	112.66	4.8705	
T4	C	150.91	5.5295	0.01
	AD	145.66	4.0483	
T5	C	146.25	5.9037	0,02
	AD	141.58	4.0509	
T6	C	113.16	9.8896	0.005
	AD	101.16	10.3346	

Discussion

Analysis of the results of the present study

Action on HR. The relationship between the effect of PAD and facial expressions in AD versus C: PAD reduced the negative effect of D (T4); PAD reduced the N (T3) effect to a greater extent compared to the D effect; PAD potentiated the beneficial effect of E (T5) on HR.

Action on A. The relationship between PAD effect and facial expressions in AD compared to C: PAD reduced the effect of D (T4) and N (T3) on A; PAD summed with E (T5) determined a significant decrease of A.

Action on G. The relationship between PAD effect and facial expressions in AD compared to C: PAD moderately reduced the negative effect of D (T4); PAD reduced the N (T3) effect to a greater extent compared to the D effect; PAD increased the beneficial effect of E (T5) on G.

FE and sport

FE of individuals participating in a contest is important for the performance of those athletes. Less is known about how phytotherapeutic products can influence the impact of FE on physical stress.

Emotion category and facial expression intensity differentially affect performance on explicit and implicit emotion-processing tasks (Herba et al., 2006). Thus, professional sports performance is influenced by emotional expressions and implies that performance can potentially be improved by taking this into account (Cheshin et al., 2016). For example, recognition of facial emotions plays a role in the action prediction in combat sports such as taekwondo (Shih & Lin, 2016).

The results obtained support the literature data regarding the effects of plants in the PAD composition on the studied parameters, some of which are mentioned below.

St John's wort (Hypericum perforatum, HP). HP increased sensitization and binding to various receptors, including glutamate, adenosine and GABA (Butterweck, 2003; Mennini & Gobbi, 2005; Zanoli, 2004). Long-term treatment (6 weeks) with St. John's wort in young and healthy men may affect glucose tolerance by reducing insulin secretion (Stage et al., 2016).

Verbena (Verbena officinalis, VO). The anticonvulsant, anxiolytic and sedative activities of VO have been scientifically proven, which provides support for its utilization in various neurological diseases such as epilepsy, anxiety and insomnia (Khan et al., 2016).

Angelica (Angelica archangelica, AA). AA has been used since historic times in traditional European and Asian medicine, for its anxiolytic effects (Bhat et al., 2011; Sigurdsson et al., 2004). AA has been evaluated for anxiolytic activity and has been found to have significant potential for it (Kumar, Bhat, 2012).

Basil (Ocimum basilicum, OC). OC is a popular herb that has a wide range of uses in traditional medicine as a treatment for anxiety, diabetes, cardiovascular disease and headache (Bora et al., 2011).

Passiflora (Passiflora incarnata, PI). PI showed an anxiolytic effect similar to that of midazolam, and was safe and effective for the conscious sedation of adult patients who underwent three mandibular molar extractions (Dantas et al., 2017). The single administration of passion fruit extract, as well as piceatannol in its composition, reduced the blood glucose levels of mice to which they were administered (Uchida-Maruki et al., 2015).

Melissa (Melissa officinalis, MO). MO officinalis is a potential source for the treatment of a wide range of conditions, especially anxiety and other CNS disorders (Shakeri et al., 2016). The essential oil of MO administered in low concentrations is an effective hypoglycemic agent, probably due to increased absorption of glucose and its metabolism in the liver and adipose tissue and inhibition of gluconeogenesis in the liver (Chung et al., 2010). Also, Melissa officinalis (Cases et al., 2011) and Passiflora (Miroddi et al., 2013) are known for their anti-stress effects.

Valeriana (Valeriana officinalis, VO). In pharmacological studies, valepotriate constituents have demonstrated sedative and spasmolytic effects of VO, and sesquiterpene and valeric acid have been shown to produce sedation (Plushner, 2000; Lefebvre et al., 2004).

Lavender (Lavandula angustifolia, LA) essential oil. The anxiolytic and antidepressant effects of LA may be due to an antagonism on the NMDA receptor and the serotonin transporter inhibitor (López et al., 2017).

Conclusions

1. Influence of PS+N/D/E was significantly more intense on C versus AD, more intense on HR and A than on G.
2. FE type D increased and FE type E reduced physical stress, while N did not influence it.
3. Compared to C, PAD decreased the effect of FE type D and increased the FE type E effect.
4. PAD could be used as a modulator of FE impact on physical stress, and this involvement should be studied through further research.

Conflicts of interest

Nothing to declare.

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