Identifying the predisposing factors, signs and symptoms of overreaching and overtraining in physical education professionals

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Background: It is possible that physical education professionals, especially those who participate in aerobic activities, have predisposing factors, signs and symptoms of overreaching (OVR) and overtraining (OVT) due to a high load and volume of exercise followed by suboptimal recovery time. The present study aimed to identify the predisposing factors, signs and symptoms of OVR and OVT in physical education professionals.

Methods: A questionnaire consisting of 42 questions (10 questions group) about predisposing factors and signs/symptoms was answered by 132 physical education professionals from both sexes (83 men and 49 women) who were allocated into a resistance training group (RG, n = 74), aerobic training group (AG, n = 20) and resistance and aerobic training group (RAG, n = 38). A mean score was calculated ranging from 1 (completely absent) to 5 (severe) for each question group. A low occurrence of predisposing factors and signs and symptoms of OVR and OVT was considered to be a question group score 4 or lower. Profile of Mood State Questionnaire (POMS) was also applied.

Results: A mean score of 2.5 ± 0.7, 2.7 ± 0.7 and 2.7 ± 0.8 was found for all question groups for RG, AG and RAG, respectively. Of the total sample, 40.6% trained at least 5 times/week. The POMS revealed that 67.5% of the RG (n = 50), 80% of the AG (n = 16) and 60.5% of the RAG (n = 23) were classified as having no mood disorders and a standard graphic iceberg was presented. There were no statistical differences (p > 0.05) in the total mood disorders among RG (13.9 ± 24.5), AG (10.3 ± 25.1) and RAG (14.6 ± 27.9) groups.

Conclusion: Despite the volume of training/body working performed by the physical education professionals surveyed being greater than the recommended to achieve improvements on physical fitness, they did not show predisposing factors, signs or symptoms of OVR and OVT.

1   Original Article

3   **Identifying the predisposing factors, signs and symptoms of overreaching and overtraining**

4   **in physical education professionals**

6   *Running head:* Overtraining and physical education professionals

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22   **ABSTRACT**

23   **Background:** It is possible that physical education professionals, especially those who

24   participate in aerobic activities, have predisposing factors, signs and symptoms of overreaching

25   (OVR) and overtraining (OVT) due to a high load and volume of exercise followed by

26   suboptimal recovery time. The present study aimed to identify the predisposing factors, signs and

27   symptoms of OVR and OVT in physical education professionals.

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29   factors and signs/symptoms was answered by 132 physical education professionals from both

30   sexes (83 men and 49 women) who were allocated into a resistance training group (RG, n = 74),

31   aerobic training group (AG, n = 20) and resistance and aerobic training group (RAG, n = 38). A

32   mean score was calculated ranging from 1 (completely absent) to 5 (severe) for each question

33   group. A low occurrence of predisposing factors and signs and symptoms of OVR and OVT was

34   considered to be a question group score 4 or lower. *Profile of Mood State Questionnaire* (POMS)

35   was also applied.

36   **Results:** A mean score of 2.5 ± 0.7, 2.7 ± 0.7 and 2.7 ± 0.8 was found for all question groups for

37   RG, AG and RAG, respectively. Of the total sample, 40.6% trained at least 5 times/week. The

38   POMS revealed that 67.5% of the RG (n = 50), 80% of the AG (n = 16) and 60.5% of the RAG

39   (n = 23) were classified as having no mood disorders and a standard graphic iceberg was

40   presented. There were no statistical differences (p > 0.05) in the total mood disorders among RG

41   (13.9 ± 24.5), AG (10.3 ± 25.1) and RAG (14.6 ± 27.9) groups.

42   **Conclusion:** Despite the volume of training/body working performed by the physical education

43   professionals surveyed being greater than the recommended to achieve improvements on

44   physical fitness, they did not show predisposing factors, signs or symptoms of OVR and OVT.

INTRODUCTION

Overtraining syndrome (OVT) is characterized by multiple signs and symptoms. It involves the accumulation of stress, leading to a decrease in physical/mental/working performance during the sports season (Budgett, 1990). OVT is commonly attributed to an imbalance between training/working stimulus [generally, aerobic training (Elliott, Wagner & Chiu, 2007)] and rest periods, therefore, the individual is subjected to high intensity and/or high volumes without an appropriate recovery time (Lemyre, Roberts & Stray-Gundersen, 2007; Jones & Tenenbaum, 2009; Meeusen et al., 2013). Psychological and/or social stressors can also contribute to this syndrome (Kreher & Schwartz, 2012). Apart from a decrease in performance, OVT syndrome is usually accompanied by physiological, immunological, biochemical and psychological alterations (Fry, Morton & Keast, 1991; Lehmann, Foster & Keul, 1993; Kuipers, 1998; Carfagno & Hendrix, 2014). For example, the following alterations are common in OVT: parasympathetic (fatigue, depression, bradycardia and loss of motivation), sympathetic (insomnia, irritability, tachycardia, agitation, hypertension and restlessness) and others (anorexia, weight loss, lack of concentration, anxiety, heavy/stiff muscle, and awakening unrefreshed) (Carfagno & Hendrix, 2014).

During some periods of the sports season, such as a shock microcycle, coaches can plan an intentional increase in volume/intensity of training load in order to potentiate physiological adaptations that would result in a chronic increase of performance (Issurin, 2010). Frequently, this training manipulation leads the athlete to develop transitory signs and symptoms similar to OVT syndrome known as overreaching (OVR) (Fry, Morton & Keast, 1991; Lehmann, Foster & Keul, 1993; Kuipers, 1998). However, OVR recovery can occur a few days after refraining from training or decreasing exercise volume/intensity. Conversely, OVT can last for weeks or months and might even lead to the interruption of an athlete's carrer (Ackel-D'Elia et al., 2010).

At least in Brazil, many physical education professionals work in gyms and exercise facilities and centers (da Silva, Santos & Araújo, 2016). According to Brazilian legislation (Brazil, 1998), the physical education professionals are responsible for exercise prescription in these workplaces. It is reasonable to assume that these professionals present a high level of physical exertion, constituted by physical exercise performed in working environment (e.g.: during group-based activities) added to their own training routine. In addition, these professionals may be exposed to other external factors to the training, such as family, economic,

76   social and emotional problems, which may further predispose to symptoms of OVR and/or OVT

77   syndrome (Hjälm et al., 2007; Fletcher & Scott, 2010; Mazerolle et al., 2011).

78   Thus, it is possible that this specific population has predisposing factors, signs and

79   symptoms of OVR and OVT due to a high load and volume of exercise followed by suboptimal

80   recovery time. Therefore, this study aimed to identify the predisposing factors, signs and

81   symptoms of OVR and OVT in physical education professionals. We hypothesized that physical

82   education professionals who work in gyms/exercise facilities have a high load and volume of

83   exercise accompanied by inappropriate recovery. This might be especially true for professionals

84   who participate in aerobic activities, which could potentiate OVT syndrome. Thus, these

85   professionals could present predisposing factors, signs and symptoms of OVR and OVT.

86

87   **MATERIALS AND METHODS**

88   **Sample**

89   A power analysis based on a medium effect size ($d = 0.30$) for the interaction between

90   groups > of 0.05 indicated that a sample size of 126 participants provides a statistical power of

91   0.85 (Faul et al., 2009). Based on this, the present study involved a total of 132 volunteers (83

92   men and 49 women). The professionals were recruited from 13 gyms located in Goiânia (Brazil)

93   and enrolled in the study based on the following criteria: i) performing at least one daily exercise

94   session not shorter than 60 min, with a minimum frequency of 4 days/week (total of 4

95   hours/week); ii) aged between 18 and 35 years; and iii) all kinds of physical exercise were

96   acceptable (Ackel-D'Elia et al., 2010). The selected volunteers were classified into three groups:

97   resistance training group (RG) (n = 74; 50 men and 24 women), composed of physical education

98   professionals who work and practice only in resistance training (this group served as control);

99   aerobic training group (AG) (n = 20; 10 men and 10 women), composed of physical education

100   professionals who work and practice only in aerobic training (running, fitness classes and

101   others.); and resistance and aerobic training group (RAG) (n = 38; 23 men and 15 women),

102   composed of physical education professionals who work and practice both resistance and aerobic

103   training (Table 1).

104

105 **Experimental design and variables analyzed**

106   A cross-sectional study was conducted with the application of two questionnaires.
107 The first questionnaire, adapted from Ackel-D'Elia et al. (2010), aims to identify
108 predisposing factors, signs and symptoms of OVR and OVT, and the other questionnaire,
109 the *Profile of Mood State* Questionnaire (POMS), aims to identify mood disorders in the
110 volunteers (McNair, Lorr & Droppleman, 1971).

111   Briefly, the first questionnaire aims to identify predisposing factors, signs and
112 symptoms of OVR and OVT. It consists of 42 questions related to the work activity and/or
113 study, obligations and external problems to training, type of physical activity practiced,
114 motivation for class/training, patterns of rest and recovery, nutritional factors, presence of
115 chronic diseases, medication use, monotony, fatigue and motivation, self-evaluation of
116 training/class, performance and recovery, sleep quality, injury incidence, appetite changes,
117 weight loss, frequency of upper respiratory tract infections and excessive sweating, volume
118 of training/class and time of physical activity practiced. The questions were classified into
119 10 groups of questions related to either predisposing factors (question groups 1 to 6) or
120 signs and symptoms (question groups 7 to 10).

121   The scores of the question groups were calculated as performed by Ackel-D'Elia et
122 al. (2010):

123   *Each volunteer was asked to make a self-assessment for each question using a five-*
124   *point scale. The scale ranged from 1 (absence) to 5 (severe). Mean score (MS) for*
125   *each question was calculated according to the expression: $MS = \sum (f \times S)_n$, where f*
126   *stands for the ratio between the frequency of the response for the number of*
127   *alternatives and the total frequency (%) obtained for each alternative within a*
128   *question, S stands for the score attributed to each alternative within a question, and*
129   *n stands for the number of alternatives for each question. The final MS for a*
130   *specific question group was calculated as the mean of each individual MS obtained*
131   *for the selected questions fitted to a specific question group. [...] The individual MS*
132   *for the three features was computed using the same formula as described above,*
133   *and the final group MS was calculated as the mean of the three individual mean*
134   *scores.*

135

136   The volunteer was considered with OVR/OVT when scoring higher than 4 in at least 6 of
137   the 10 question groups and presented an altered mood state profile. Table 2 shows the group of
138   questions used in the identification of predisposing factors, signs and symptoms of OVR and
139   OVT. This questionnaire was designed based on a broad literature review about OVT and OVR
140   and its design and validation was based on the guidelines outlined by Juniper, Guyatt & Jaeschke
141   (1995).

142   The self-evaluation of training, performance and recovery were evaluated by means of
143   questions 9 (*How do you assess your exercise session?*), 10 (*How do you evaluate your physical
144   performance?*), and 11 (*How do you evaluate your physical recovery after training sessions?*),
145   respectively. For this, we used a modified Borg scale. For question 9, the possible answers were
146   'very, very light', 'very light', 'slightly light', 'a little heavy', 'heavy', 'too heavy', and 'very,
147   very heavy'. For question 10, the possible answers were 'very, very bad', 'very bad', 'poor',
148   'average', 'good', 'very good', and 'very, very good'. For question 11, the possible answers were
149   'very, very poor', 'poor', 'reasonable', 'good', 'very good', and very, very good'. This strategy
150   was previously by other studies to assess breathlessness (for review, see Bausewein et al., 2007).

151   For the purposes of this study, high-intensity exercise was when the participant answered
152   'heavy'; 'too heavy', or 'very, very heavy' in question 9. Participants were considered to have a
153   decrease in performance if: 1) they were located at the far right of the frequency distribution in at
154   least two of questions 9, 10, and 11; or 2) answered 'heavy', 'too heavy', or 'very, very hard' to
155   question 9; or 3) who answered 'bad', 'very bad', or 'very, very bad' to question 10 and 'poor',
156   'very poor', and 'very, very poor' to question 11.

157   The second questionnaire used, POMS, aimed to identify mood disorders in the
158   volunteers. The POMS consists of 65 adjectives that are related to mood, using a scale from 0 to
159   4, where '0 – no way', 1 – a little, '2 – moderately', '3 – enough', and '4 – very much'. This
160   instrument evaluates six categories: tension-anxiety, depression-dejection, anger-hostility,
161   vigour-activity, fatigue-inertia, and mental confusion-bewilderment (McNair, Lorr &
162   Droppleman, 1971; Spreen & Strauss, 1998).

163   The scores of the POMS were calculated by adding the negative factors (tension,
164   depression, anger, fatigue, and confusion) and subtracting the positive (vigour). Additionally, it
165   was analyzed whether the volunteer has or not a positive iceberg profile. A positive iceberg
166   profile indicates that the volunteer does not have mood disorders and is characterized by a low

167 tension, depression, anger, fatigue and confusion score and a high vigour score. When the scores

168 related to stress, depression, anger, fatigue and confusion are high and the vigour score is low the

169 result is a so-called inverted (negative) iceberg profile, featuring a state of altered mood

170 (McNair, Lorr & Droppleman, 1971; Morgan et al., 1987). The POMS questionnaire is widely

171 utilized because of its feasibility, reliability, and validity common use in psychometric studies

172 (Morgan et al., 1988; McNair, Lorr & Droppleman, 1971). The internal consistency reliability

173 for POMS scales is 0.84 or greater (Spielberger, 1972).

174

175 **Ethical aspects**

176   All participants were informed of the potential risks and benefits of the study and signed

177 an informed consent form. All experimental procedures were approved (nº 2.259.846) by the

178 University Human Research Ethics Committee and conformed to the principles outlined in the

179 Declaration of Helsinki.

180

181 **Statistical analysis**

182   Data were entered into an Excel spreadsheet (Microsoft Office 2016, USA) and imported

183 into Statistical Package for the Social Science (SPSS) version 23.0 (IBM Corp., Armonk, USA)

184 for statistical analysis. Data were presented as mean ± standard deviation and absolute and

185 relative frequencies. To test the normality of the sample, we used the Kolmogorov–Smirnov test.

186 As no data about domains of the POMS profile followed a normal distribution, the comparison

187 between groups (RG vs. AG vs. RAG) was done using the Kruskal–Wallis test followed by

188 Dunn's post-test. Fisher's exact test was applied to evaluate the association between the presence

189 of OVT and group. A significance level of 5% was set for all statistical procedures.

190

191 **RESULTS**

192   The results showed that none of the question groups for any of the analyzed groups

193 presented scores above four (Table 3).

194   As mentioned in the methods, a decreased performance was considered in those

195 volunteers who were located at the extreme right in at least two of the following three self-

196 evaluated aspects: training (Figure 1A); performance (Figure 1B); and recovery (Figure 1C). In

197 this context, only 2.7%, 15% and 18.4% of the RG (n = 2), AG (n = 3), and RAG (n = 7),

198 respectively, were considered to have decreased performance. The exact Fisher's test showed
199 that distribution frequency was significantly different between groups (p=0.009).
200   Regarding the assessment of mood state by POMS, 67.5%, 80.0% and 60.5% of the RG
201 (n = 50), AG (n = 16), and RAG (n = 23), respectively, were classified as absent of mood
202 disorders (*Standard Graphic Iceberg* – Figure 2). There were no statistical differences (p = 0.82)
203 in the total mood disorder among RG (13.9 ± 24.5), AG (10.3 ± 25.1) and RAG (14.6 ± 27.9)
204 groups.
205

206 **DISCUSSION**
207   The primary aim of this study was to evaluate the risk of OVR and OVT (related to
208 physical/mental work stress) in physical education professionals. The results showed that the
209 sample did not present predisposing factors, signs and symptoms of OVR and OVT. In addition,
210 we observed a low presence of performance impairment. However, it is noteworthy that
211 workplaces – especially for professionals whose bodies are a working tool – can place workers at
212 a higher risk of injuries, disabilities, morbidities, and mortality (Knoblauch & Cassaro, 2017).
213   Our results are in line with Ackel-D'Elia et al. (2010), who assessed the prevalence of
214 predisposing factors, signs and symptoms of OVR and OVT in 413 members of 17 gyms in São
215 Paulo (Brazil). The authors found a low prevalence of signs and symptoms of OVR and OVT,
216 including among individuals classified as belong to a higher risk subgroup.
217   The findings of the present study do not support the initial hypothesis, that the high
218 weekly volume of exercise (that includes own training session and exercise performed
219 professionally), would put physical education professionals at a high risk of developing OVR
220 and/or OVT syndrome. In fact, when we compare the weekly amount of exercise performed by
221 volunteers evaluated (5.1 ± 0.9 hours) with that recommended by scientific societies, such as the
222 American College of Sports Medicine (ACSM) (Garber et al., 2011), we found that the weekly
223 volume of exercise is greater than recommended for the maintenance and development of
224 cardiorespiratory and neuromuscular fitness (Garber et al., 2011). The ACSM recommends that
225 individuals should engage in a moderate-intensity program for at least 30 minutes a day for five
226 or more days a week, totalizing a minimum of 150 minutes (2.5 hours) per week or perform an
227 intense training for at least 20 minutes a day for three or more days a week, totalizing a minimum
228 of 75 minutes (1.25 hours) per week (Garber et al., 2011).

229   Considering the weekly volume recommended by the ACSM for moderate exercise (150
230   minutes) (Garber et al., 2011), the assessed volunteers trained more than twice the recommended
231   time/volume (~400 minutes). However, when the weekly training volume of the sample is
232   compared with that of high-level athletes, 25–38 hours/week (Woods et al., 2017), it might be
233   considered low. In this regard, the findings of the present study appear consistent; that is, they
234   show an absence of predisposing factors, signs and symptoms of OVR and OVT in physical
235   education professionals. Even if we evaluate only the AG, the average weekly exercise of the
236   participants in this group is around 13 hours/week, also very distant from that found for
237   professional athletes.

238   Another variable related to the development of OVR and OVT is training intensity
239   (Purvis, Gonsalves & Deuster, 2010). In the present study, with regard to training intensity
240   (question 14), 80 (60.6%) of the 132 subjects reported that their training intensity was at least as
241   a little heavy. Many authors advocate that high-intensity exercise is necessary to evoke
242   physiological adaptations, and consequently to improve physical performance (Rogero, Mendes
243   & Tirapegui, 2005; Bosquet et al., 2007). However, coaches should be aware of training load and
244   fatigue-related parameters in order to avoid OVR symptoms. In this context, it is clear that
245   training stimulus must be accompanied by adequate periods of recovery and a proper nutrition
246   and hydration (Rogero, Mendes & Tirapegui, 2005; Bosquet et al., 2007).

247   Regarding recovery (question 16), 120 (90.9%) reported a 'reasonable', 'good', 'very
248   good' or 'very, very good' recovery. Therefore, even though the training intensity was 'a little
249   heavy' for more than half of the volunteers, they reported an adequate recovery. As a result of a
250   fairly heavy training and a considerable recovery, 91.6% (n = 121) of the volunteers achieved at
251   least regular performance.

252   Sleep disorders, occupational hazards, injuries and illnesses could impact professional
253   and worker overall health (Kalliny & McKenzie, 2017). Sportsmen and women with OVR and
254   OVT usually reported sleep disorders (Winsley & Matos, 2010). In this regard, the participants
255   of the present study can be considered as having no sleep disorders, with the score of three
256   groups showing an average below 3.0. A similar pattern was found for groups of questions that
257   assessed external obligations to training, nutritional factors, hydration pattern, changes in
258   appetite, weight loss, respiratory tract infections, excessive sweating, monotony, fatigue and
259   motivation in relation to training. Particularly, in relation to nutritional factors, it has been

260   suggested that, to ensure a more efficient replacement of energy stocks, especially muscle

261   glycogen, the post-workout meal should be eaten in the first hours of post-exercise recovery

262   (Beelen et al., 2010). Of the 132 volunteers evaluated, 90.9% (n = 120) ate within two hours after

263   the training session.

264   Regarding monotony, we found that RG, AG and RAG showed low tiredness and

265   monotony in relation to training (scores lower than 3.0). This suggests that monotony was not

266   singled out as a factor that interferes in the training sessions for the volunteers. This data

267   combined with the results of training intensity, recovery and performance suggest that the

268   training carried out by volunteers was adequate. Considering that the volunteers are physical

269   education professionals, it is reasonable to assume that they had current and scientifically

270   relevant information about exercise prescription and training planning.

271   Finally, regarding mood, 64.4% (n = 89) volunteers had an absence of signs and

272   symptoms of mood disorders (positive iceberg), while 32.6% (n = 43) had an outside graphic

273   pattern or inverted/negative iceberg. Despite the relatively high number of individuals with

274   altered mood state, it seems prudent to not associate this fact to the characteristics of the training,

275   but possibly to psychosocial stressors related to work/modern life, since the RG, AG and RAG

276   had an average score close to 4.0 in the group of questions related to the work activity and/or

277   study (one of the highest scores among those evaluated).

278

279   **Study limitations**

280   Firstly, the volunteers did not undergo biochemical (creatine kinase, testosterone, and

281   cortisol) and physiological (heart rate variability and oxygen uptake) analysis. Such analysis

282   could provide valuable information about the physiological status of volunteers, since several

283   studies have demonstrated that these biochemical and physiological measures are changed in

284   sportsmen and women with OVT (Halson et al., 2003; Silva, Santhiago & Gobatto, 2006;

285   Cadegiani & Kater, 2017a,b). Secondly, the volunteers were not submitted to objective tests to

286   evaluate their performance, such as a cardiorespiratory exercise test. Thirdly, the present study

287   cannot differentiate the states of OVR and OVT. Fourthly, as for all studies employing

288   questionnaires, the present results rely on the honesty and level of recall of respondents.

289   Nevertheless, we believe that these limitations do not prevent the study's conclusions from being

290   drawn.

291

292 **CONCLUSION**

293   Despite the relatively high-volume work/training performed by the physical education

294 professionals surveyed, we can conclude that they did not have predisposing factors, signs and

295 symptoms of OVR and OVT. Additionally, no differences between RG, AG and RAG were

296 identified.

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305

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400 **TABLE LEGENDS**
401 **Table 1.** Characteristics of the professional groups.
402 **Table 2.** Groups of questions used to assess the OVR and OVT predisposing factors, signs and
403 symptoms.
404 **Table 3.** Predisposing factors, signs, and symptoms of OVR and OVT between professional
405 groups.
406

407 **FIGURE LEGENDS**
408 **Figure 1.** Self-evaluation of the training (A), performance (B), and recovery (C) of the
409 professionals according to the groups. RG: resistance training group; AG: aerobic training group;
410 RAG: resistance and aerobic training group.
411 **Figure 2.** Graphic POMS profile of resistance training group (RG), aerobic training group (AG),
412 and resistance and aerobic training group (RAG).

Characteristics of the professional groups.

[a]Statistically significant difference from AG (p<0.05, *Kruskal–Wallis* test followed by test of Dunn). Values are presented as mean ± standard deviation. RG: resistance group. AG: aerobic group. RAG: resistance and aerobic group.

Table 1. Characteristics of the professional groups

	RG (n=74)	AG (n=20)	RAG (n=38)	Total (n=132)
Age (years)	27.0±6.0	27.2±6.2	27.3±6.1	27.1±6.0
Body mass (kg)	73.3±13.7	74.2±14.1	73.8±14.1	73.6±13.8
Height (cm)	171.5±8.9	171.1±9.2	171.4±9.1	171.4±9.1
Body mass index (m/kg^2)	24.5±3.9	24.9±3.9	24.7±3.9	24.6±3.7
Training session duration (hours)	1.0±0.0[a]	2.3±2.0	1.3±0.9[a]	1.3±1
Weekly training frequency (days)	5.0±0.9[a]	5.6±0.9	5.0±1	5.1±0.9
Training experience (months)	57.7±71.8	70.5±68.7	36.4±4.3	53.5±65.0
Hazards of physical training	28.4%	60%	42.1%	37.1%
Lasting more than 15 days	12.2%	25%	23.7%	16.7%

[a]Statistically significant difference from AG (p<0.05, *Kruskal–Wallis* test followed by test of Dunn). Values are presented as mean ± standard deviation. RG: resistance group. AG: aerobic group. RAG: resistance and aerobic group.

Groups of questions used to assess the OVR and OVT predisposing factors, signs and symptoms.

Note: Questions 9, 10 and 11 refer to self-evaluation of training, performance and recovery and have not been computed.

Table 2. Groups of questions used to assess the OVR and OVT predisposing factors, signs and symptoms.

Question Group		Questions
Predisposing factors		
Group 1	Work activity and/or study	1-5
Group 2	Non-training related problems	30 and 31
Group 3	Training motivation	18-20
Group 4	Recovery pattern	12-15
Group 5	Nutritional pattern	21-25
Group 6	Hydration pattern	26-29
Signs and symptoms		
Group 7	Sleep patterns	33-37
Group 8	Previous injuries	32
Group 9	Appetite pattern changes, weight loss, superior respiratory tract infections, and excessive sweating	38-42
Group 10	Training monotony, motivation and tiredness	6-8, 16 and 17

Note: Questions 9, 10 and 11 refer to self-evaluation of training, performance and recovery and have not been computed.

Predisposing factors, signs, and symptoms of OVR and OVT between professional groups.

SD: standard deviation. SRTI: superior respiratory tract infection. RG: resistance group. AG: aerobic group. RAG: resistance and aerobic group.

Table 3. Predisposing factors, signs, and symptoms of OVR and OVT between professional groups.

Question group (1 to 10)		n° of questions	RG	AG	RAG	Total average
Predisposing factors						
1	Work activity and/or study	5	3.4	3.5	3.6	3.5
2	Non-training-related problems	2	2.3	2.1	2.8	2.4
3	Training motivation	3	3.5	3.4	3.8	3.6
4	Recovery pattern	4	3.5	3.2	3.0	3.3
5	Nutritional pattern	5	2.0	1.9	1.9	2.0
6	Hydration pattern	4	2.1	2.2	2.1	1.8
Signs and symptoms						
7	Sleep pattern	5	2.2	2.4	2.3	2.2
8	Previous injuries	1	2.4	3.8	3.6	2.9
9	Appetite pattern changes, weight loss, SRTI and excessive sweating	5	1.5	1.7	1.6	1.5
10	Training monotony, motivation and tiredness	5	2.4	2.7	2.6	2.5
Mean±SD			2.5±0.7	2.7±0.7	2.7±0.8	2.6±0.7

SD: standard deviation. SRTI: superior respiratory tract infection. RG: resistance group. AG: aerobic group. RAG: resistance and aerobic group.

Figure 1

Self-evaluation of the training (A), performance (B), and recovery (C) of the professionals according to the groups. RG: resistance training group; AG: aerobic training group; RAG: resistance and aerobic training group.
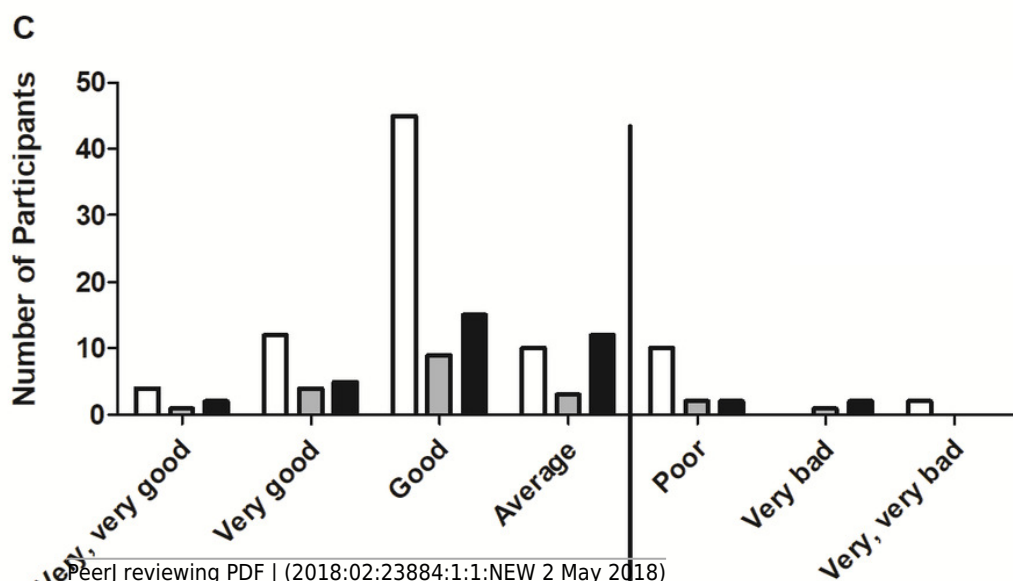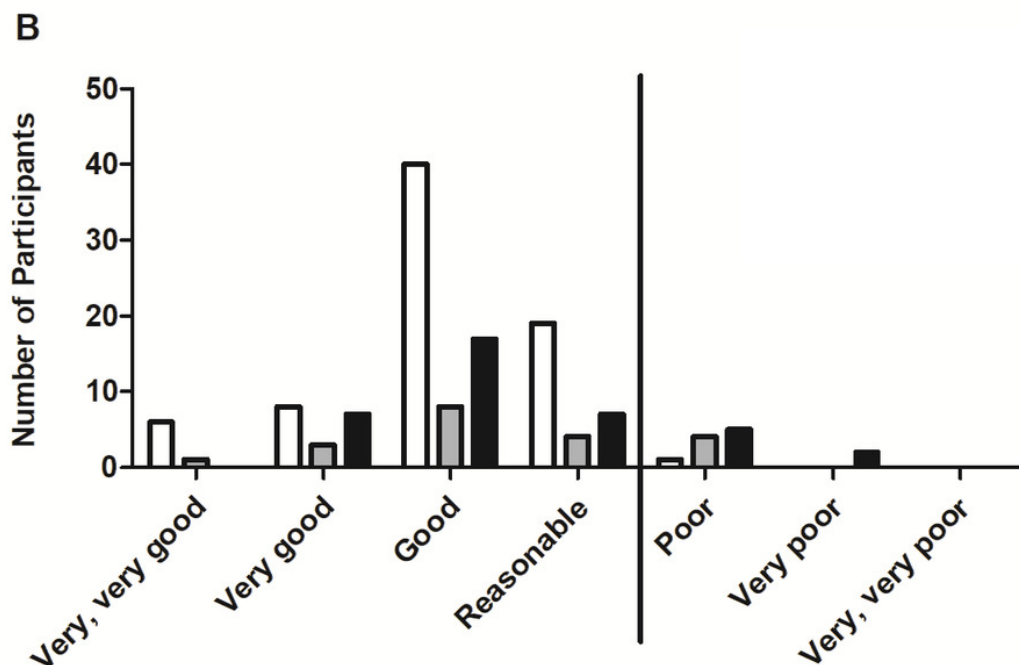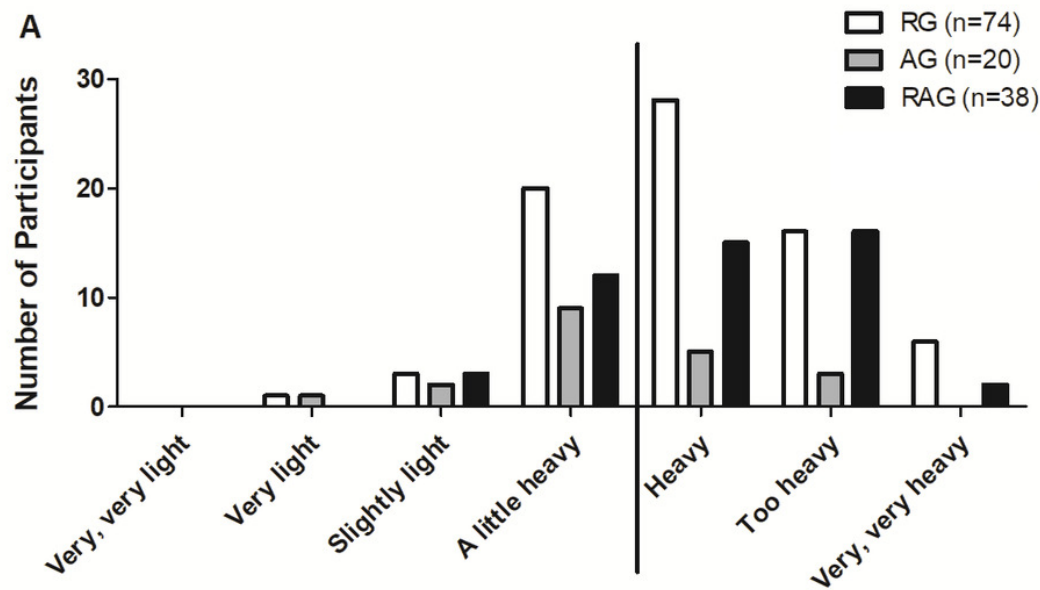
Figure 2

Graphic POMS profile of resistance training group (RG), aerobic training group (AG), and resistance and aerobic training group (RAG).