21 - SIMPLE VISUAL REACTION TIME BEFORE AND AFTER A RESISTANCE TRAINING SESSION

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Introduction

The reaction time represents the time needed to sense and evaluate a sonorous or visual stimulus and respond to it (ZAJDEL, NOWAK, 2007). Integrated to other motor capacities, it forms a complex system which allows the execution of a variety of body movements. It indicates the speed and effectiveness of making a decision, and its study has been an important feature to comprehend the motor behavior in humans. It is defined as the time interval (which is represented in milliseconds) between the introduction of a stimulus and the beginning of the movement, thus providing explanation regarding the internal processes that are involved with the voluntary body movements in many situations of our daily life, as in sport activities in general and/or in the learning of more complex motor abilities (MANNING, HAMMOND, 1990; VIDAL, BONNET, MACAR, 1991).

The reaction time is widely studied in the motor behavior field, and it's used to measure the time it takes to process the information. During this short period of time, a series of mental processes happen, depending on the characteristics of the subject and the task; also the performance of the movements seem to be highly related to the quality and speed of these processes (ETNYRE, KINUGASA, 2002). The reaction time can be simple, when a stimulus is presented and there is only one possible response; there is also the choice reaction time, when there are two response options for each stimulus; and the discrimination type, when there are more than one stimulus, but only one response (MAGILL, 2000). The stimulus can be visual or sonorous and according to Vernon and Merkel apud Zajdel, Nowak (2007), in general, the simple reaction time, with sonorous stimulus, is normally 150 ms and with visual stimulus it varies from 220 to 250 ms.

Previous researches have related the reaction time with sincronization/coordination matters in tasks with different situations of performance and different levels of complexity (LYNN, CHAN, EYSENCK, 1991; MAGILL, 1989; VAGHETTI, 2003; INUI, YAMANISHI, TADA, 1995), in different types of stimulus (VAGUIMO DE LIMA, TORTOZA); relating it to neurological affections (SAFRIT, 1981); intelligence (ETCHEPARE, 2004; JOHNSON, NELSON, 1986) and to the performance in complex sport motor activities (THOMAS e NELSON, 2002).

Despite the great number of studies, there's still a lack of researches which aim to relate the reaction time with the fatigue caused by the physical exercise, since it's known that the integrity of the nervous system is essential to an effective motor control (BULLOCK-SAXTON, 1995) and the muscular fatigue can decrease the neural transmission speed (MERCER ET AL, 1998). So far, it hasn't been seen a consensus in the literature regarding the interference of the physical exercise and the fatigue with the reaction time.

Kamen et al (1981) have shown in their study that weightlifters and runners have a better reaction time when in isometric fatigue if compared to non athletes. Silva et al (2006) have found and increase in the reaction time of the peroneal muscles after fatigue induced by local active resisted exercises.

Delignières, Brisswalter, Legros (1994) in studies with athletes and sports practitioners non-athletes during progressive test in cycle ergometer, have identified that the reaction time shows improvement with the fatigue process in the athletes group, which could not be seen in the other group.

Considering the limitations on the literature review in this study, it seems to exist, at first, lack of studies which investigate the reaction time immediately after the resistance training (RT). Thus, the aim of this study is to verify if there is a significance difference between the simple visual reaction time (SVRT), checking it before and immediately after a resistance training session.

Methods and Instruments

To asses the simple reaction time we used a mouse and the software TTR version 1.3, which can measure the simple reaction time and the choice reaction time. This instrument has shown a good reproducibility coefficient and a high resolution (about 900 nano seconds) (PEREIRA, DIAS and CORAZZA, 2007).

The TTR basically operates the following way: in the software interface there is a ring which becomes red every time it is pressed. The individual must keep pressing the mouse button until the ring red color changes into green, releasing it as soon as possible at this moment (Picture 1). The program measures the time between the emergence of the green color and the withdrawal of the finger from the mouse button. O time needed for the color to change is aleatory, hence assuring that there won't be conditioning during the test and a possible learning effect.



Picture 1. TTR screen.

The test to assess the simple reaction time consists of repeating 20 times the procedure quoted before and afford at the of it the mean and standard deviation in milliseconds (ms) of the 10 middle attempts. This way, the first 5 attempts are excluded, considering that in those the individual can still be trying to be secure in executing the task. If the individual releases the

button before the color changes, this measure is automatically excluded and the software repeats it again.

This is and experimental study with a pre-experimental design 3 (comparison is the static group), where the group, which is the experience, receives the treatment (in this case the execution of at least five resistance exercises with their upper limbs), is compared to the control group which has remained at rest with no exercise training (CAMPBELL and STANLEY apud VAN DALEN, MEYER, 1974). Regarding the protocol, each subject has executed 10 preliminary attempts (half of the test) to become familiar with the test. After this familiarization with the instrument the subjects from the experimental group executed the test before the beginning of the exercise session and immediately after the end of the resistance exercises. The control group has followed the same procedures as the experimental group, however, instead of executing the resistance exercises, they have remained in average, six minutes resting.

The participants were 37 individuals (23 male e 14 female), who were participating in the project of physical fitness for the community-dwelling of the Centro de Ciências da Saúde e do Esporte - CEFID/UDESC, the mean age was 26,3±9,9 years old, they were all familiarized with the use of the mouse and the computer, with at least one moth experience in weighting lifts and without eye problems. The software SPSS 14.0 was used for the data analyzes. The descriptive statistic was used with a measure of central tendency and variability and the Wilcoxon test was used for the non parametrical data, by using a significance level of P less than 0,05.

Results and Discussion

The data from the sample SVRT did not show a normal distribution according to the Shapiro-Wilk test. The median and the standard deviation of the SVRT in the experimental group , before and after the RT session (6 ± 1 exercises), were respectively 242,9 ± 50,4 ms and 223,5 ± 52,7 ms. In the control group it was 219 ± 59,5 ms and after the resting time (mean of 6 minutes) it was 223,1 ± 65,3 ms. Both groups have presented mean numbers for the SVRT within the expected, since according to Vernon e Merkel quoted by ZAJDEL and NOWAK (2007), the SVRT varies normally between 220 e 250 ms.

The Wilcoxon test has shown a significant difference (p=0,04) between the SVRT values before and after the RT session (experimental group) and didn't show significant difference (p=0,638) for the SVRT values in the control group..

It has been reported that the SVRT decreases during physical exercise (YAGI ET AL, 2003), probably because of predominant mediation from specific influences in the information processing (ARCELIN, DELIGNIÈRES, BRISSWALTER, 1998).

Our findings disagree with the results found by Silva et al (2006) who have identified and increase in the reaction time of the peroneal muscles after fatigue induced by active resistance local exercises, despite they have used a different method (electromyography) from the one we have used (SVRT).

Also, our findings differ from the ones from Lima et al (2004) which have investigated the interference of the high levels of lactate in the SVRT in Judo players didn't find difference in the SVRT in the athletes before and after the fights, but concluded that, despite the levels of blood lactate do not interfere in the SVRT, it seems that the fatigue generated by the fights can decrease the effectiveness in the task of SVRT.

It seems that the physical fitness has a positive role in the SVRT, in such a way that athletes or trained individuals have a better performance in SVRT tests during the exercise compared to non-athletes with lower physical capacity. Arcelin, Deligniéres, Brisswalter (1997) have compared the SVRT in runners and students without regular physical activity by using a progressive test in cycle ergometer and they have found that the runner group presented a stabilization of the SVRT answers as the intensity progressed, on the contrary, the other group presented a reduction. However, it's important to emphasize that after the exercise it wasn't found any effect of the work load or physical fitness between the groups

It also seems to be true that besides the physical fitness, the characteristic of the athlete position in the sport modality may be crucial to the performance in time reaction tests. Delignières, Brisswalter, Legros (1994) have found that the choice reaction time in athletes expert in marking improved with the increase in the exercise intensity, opposite to what has happened with athletes in the same modality, but without expertise in marking. Souza et al 2006 found differences in the simple reaction time in volleyball athletes in different situations, which were the defense and the blockage.

Conclusion

The results have shown that there has been a significant improvement in the capacity to respond to a visual stimulus immediately after the resistance training. The control group, where the participants have remained a mean of 6 minutes resting, did not have significant difference. Therefore, this result seems to show that, in this population, the session with RT has contributed to the improvement in the SVRT.

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SIMPLE VISUAL REACTION TIME BEFORE AND AFTER A RESISTANCE TRAINING SESSION

ABSTRACT

The reaction time represents the time needed to sense, evaluate a stimulus (sonorous or visual) and respond to it. It indicates the decision making speed and effectiveness. Although it is represented by a small time interval (milliseconds), on it many complex neuromuscular processes important to the movement control occur. The aim of this study was to verify is there is a significant difference in the simple visual reaction time (SVRT) before and immediately after a resistance training (RT) session. To evaluate the SVRT we used the software TTR. The sample was 37 individuals (23 male and 14 female), with a mean age of 26,3±9,9 years old. In the experimental group the test was executed before the beginning of the RT session and immediately after the execution of at least 5 resistance exercises of upper limbs. In the group that didn't execute the RT (control group) the test was executed before and after six minutes of rest. The data analyzes was made with the statistic software SPSS 14.0. The descriptive statistic was used with a measure of central tendency and variability and the Wilcoxon test was used for the non parametrical data, by using a significance level of 5%. The median and the standard deviation of the SVRT in the experimental group , before and after the RT session (6 ± 1 exercises), were respectively 242,9 ± 50,4 ms and 223,5 ± 52,7 ms. In the control group it was 219 ± 59,5 ms and after the resting time (mean of 6 minutes) it was 223,1 ± 65,3 ms. The Wilcoxon test has shown a significant difference (p=0,04) between the SVRT values before and after the RT session (experimental group) and didn't show significant difference (p=0,638) for the SVRT values in the control group.

KEY-WORDS: Reaction Time, Resistance Training, Motor Abilities

TEMPS DE RÉACTION VISUELLE SIMPLE AVANT ET APRÈS UNE SESSION D'ENTRAÎNEMENT RÉSISTÉE

RÉSUMÉ

Le temps de réaction représente le temps nécessaire pour percevoir, évaluer une stimulation (sonore ou visuel) et répondre. Il indique la vitesse et l'efficacité de la prise de décision. Bien qu'il soit représenté par petit intervalle de temps (millisecondes) dans lui se produisent de complexes processus neuromusculares importants pour le contrôle des mouvements. L'objectif de ce travail a été vérifier s'existe différence significative dans le temps de réaction visuelle simple (TRVS) avant et immédiatement après une session d'entraînement résistée (ER). Pour mesurer TRVS est utilisé un logiciel TTR. Ont fait partie de cette étude 37 personnes (23 hommes et 14 femmes), avec moyenne d'âge de 26,3±9,9 années. Dans le groupe expérimental a été appliqué l'essai avant le début de la session de ER et immédiatement après l'exécution de, au minimum, cinq exercices de membres supérieurs. Dans le groupe qui n'a pas réalisé la session de TR (groupe contrôle) a été appliqué l'essai avant et après six minutes de repos. Pour analyse des données est utilisé le logiciel statistique SPSS 14.0. Il a été utilisé la statistique descriptive avec mesure de la tendance centrale, la variabilité et l'essai de Wilcoxon, en adoptant niveau d'importance de 5%. Le moyenne et détour étalon de TRVS pour le groupe expérimental, avant et après la session de ER (6 ± 1 exercices), ont été respectivement 242.9 ± 50.4 ms et 223.5 ± 52.7 ms. Pour le groupe qui ne réalise pas les exercices ce a été de 219 ± 59.5 ms et après le repos 223.1 ± 65.3 ms. L'essai de Wilcoxon a indiqué différence significative (p=0,04) entre les valeurs de TRVS avant et après la session de ER et il n'a pas indiqué différence significative (p=0,638) entre les valeurs de TRVS avant et après repos. Ce résultat semble démontrer que, dans cet échantillon, la session de ER a contribué à l'amélioration de TRVS.

MOTS-CLEF: Temps de Réaction, Entraînement Résistée, Habiletés Motrices

TIEMPO DE REACCIÓN VISUAL SIMPLE AYER Y DESPUÉS DE UNA SESIÓN DE ENTRENAMIENTO RESISTIDO

RESUMEN

El tiempo de reacción representa el tiempo necessario para percebir, evaluar y responder a un estímulo (sonoro o visual). Es la representacion de la velocidad y eficiencia de la tomada de decisión. Aunque sea representado por un pequeño intervalo de tiempo (milissegundos) en él ocurrin complejos procesos neuromusculares importantes para el control de los

movimientos. El objetivo de este trabajo fue verificar se existe diferencia significativa en el tiempo de reacción visual simple (TRVS) ayer e imediatamente después de una sesión de entrenamiento resistido (ER). Para medir el TRVS fue utilizado el *software* TTR. Hicieran parte de lo estudio 37 personas (23 hombres y 14 mujeres), con edad media de 26,3±9,9 años. En el grupo experimental fue aplicado el test ayer y después la ejecución de lo minimo cinco ejercicios de miembros superiores. En el grupo que no hice la sesión de ER (grupo control) fue aplicado el test ayer y despues seis minutos reposo. Para análisis de información estadística fue utilizado el software SPSS 14.0. Fue utilizada la estatística descriptiva con medida da la tendência central, variabilidad y el test de Wilcoxon (α=0,05). La mediana y desviación típica de lo TRVS para el grupo experimental, ayer y después la sesión de ER (6 ± 1 ejercicios), fueram respectivamente 242,9 ± 50,4 ms e 223,5 ± 52,7 ms. Para el grupo que no hice los ejercicios fue 219 ± 59,5 ms y depues lo reposo 223,1 ± 65,3 ms. El test de Wilcoxon apuntou diferencia significativa (p=0,04) entre los valores de TRVS ayer y después de la sesión de ER y no apuntou diferencia significativa (p=0,638) entre los valores de TRVS ayer y después lo reposo. Lo resultado parece demonstrar que, en esta muestra, la sesión de ER contribuyó para la mejora de lo TRVS.

PALABRAS-LLAVE: Tiempo de Reacción, Entrenamiento Resistido, Habilidades Motoras

TEMPO DE REAÇÃO VISUAL SIMPLES ANTES E APÓS UMA SESSÃO DE TREINAMENTO RESISTIDO

RESUMO

O tempo de reação representa o tempo necessário para perceber, avaliar um estímulo (sonoro ou visual) e responder a esse. Ele indica a velocidade e a eficácia da tomada de decisão. Embora seja representado por um pequeno intervalo de tempo (milissegundos) nele ocorrem complexos processos neuromusculares importantes para o controle dos movimentos. O objetivo deste trabalho foi verificar se existe diferença significativa no tempo de reação visual simples (TRVS) antes e imediatamente após uma sessão de treinamento resistido (TR). Para medir o TRVS foi utilizado um *software* TTR. Fizeram parte deste estudo 37 indivíduos (23 homens e 14 mulheres), com média de idade de 26,3±9,9 anos. No grupo experimental foi aplicado o teste antes do início da sessão de TR e imediatamente após a execução de, no mínimo, cinco exercícios de membros superiores. No grupo que não realizou a sessão de TR (grupo controle) foi aplicado o teste antes e após seis minutos de repouso. Para análise dos dados foi utilizado o software estatístico SPSS 14.0. Foi utilizada a estatística descritiva com medida da tendência central, variabilidade e o teste de Wilcoxon, adotando nível de significância de 5%. A mediana e o desvio padrão do TRVS para o grupo experimental, antes e após a sessão de TR (6 ± 1 exercícios), foram respectivamente 242,9 ± 50,4 ms e 223,5 ± 52,7 ms. Para o grupo que não realizou os exercícios foi de 219 ± 59,5 ms e após o repouso 223,1 ± 65,3 ms. O teste de Wilcoxon apontou diferença significativa (p=0,04) entre os valores de TRVS antes e após a sessão de TR e não apontou diferença significativa (p=0,638) entre os valores de TRVS antes e após repouso. Este resultado parece demonstrar que, nesta amostra, a sessão de TR contribuiu para a melhora do TRVS.

PALAVRAS-CHAVE: Tempo de Reação, Treinamento Resistido, Habilidades Motoras.