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Original Article

EFFECT OF MASSAGE AND PSEUDO MASSAGE ON ACUTE PERFORMANCE AND SELF-PERCEIVED RECOVERY: A STUDY PLACEBO-CONTROLLED

EFEITO DA MASSAGEM E PSEUDOMASSAGEM NO DESEMPENHO AGUDO E RECUPERAÇÃO AUTOPERCEBIDA: UM ESTUDO CONTROLADO POR PLACEBO

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RESUMO

O objetivo deste estudo foi verificar o efeito da massagem ou pseudomassagem no desempenho do salto vertical. Quinze participantes foram submetidos aleatoriamente a três condições experimentais: massagem, pseudomassagem e repouso. A condição de massagem exigiu três saltos verticais unipodais seguidos de dois minutos de massagem manual nos músculos flexores plantares e, antes de executar outros três saltos, foi aplicada a Escala de Recuperação de Qualidade Total (TQR). As duas condições a seguir foram estruturadas com os mesmos procedimentos, no entanto, os participantes foram submetidos à pseudomassagem (simples-cego) ou a dois minutos de descanso. Os resultados não mostraram diferenças estatísticas na altura do salto entre as análises pré e pós, nem entre as condições experimentais (massagem 18,7 ± 4,1 vs. 18,2 ± 4,1; pseudomassagem 19,1 ± 4,0 vs. 18,3 ± 3,8; descanso 19,0 ± 4,0 vs. 18,7 ± 3,9 cm). Também não houve diferenças estatísticas no TQR entre as condições experimentais (massagem 16,2 ± 4,3; pseudomassagem 16,4 ± 3,9; descanso 15,9 ± 2,6 ua). Tanto a massagem quanto a pseudomassagem não afetaram o desempenho no salto vertical e na TQR.
Palavras-chave: Salto vertical. Terapia Manual. Exercício de aquecimento. Massagem.

ABSTRACT

The aim of this study was to verify the effect of massage or pseudo massage on vertical jump performance. Fifteen participants were randomly subjected to three experimental conditions: massage, pseudo massage and rest. The massage condition required three unipodal vertical jumps followed by two minutes of manual massage on plantar flexor muscles and, before performing another three jumps, the Total Quality Recover Scale (TQR) was applied. The two following conditions were structured with the same procedures, although participants were submitted either at pseudo massage (single-blinded) or two minutes of rest. Results showed no statistical differences on jump height between pre and post analysis nor between experimental conditions (massage 18.7 ± 4.1 vs 18.2 ± 4.1; pseudo massage 19.1 ± 4.0 vs 8.3 ± 3.8; rest 19.0 ± 4.0 vs 18.7 ± 3.9 cm). There were also no statistical differences in the TQR results between experimental conditions (massage 16.2 ± 4.3; pseudo massage 16.4 ± 3.9; rest 15.9 ± 2.6 ua). Both massage and pseudo massage did not affect performance on vertical jump and TQR.
Keywords: Vertical jump. Manual therapy. Warm-up exercise. Massage.

Introduction

Massage is an ancient technique largely used to prepare and recover the human body from physical and sportive activities[1–3] and it could be described as a mechanical manipulation of body tissue through the use of hands (petrissage, effleurage friction, tapping) or objects (stones, rolls, tennis balls, vibrators) aiming to promote health, wellness and to enhance performance. Literature shows that massage increases mobility[4], blood flow[5] and wellbeing[6], reduces muscle tension[7] and neuromuscular excitability[7] as well as realigning conjunctive tissue and muscle fibers[2]. Other studies, however, demonstrated reduction[4,8], maintenance[9] and improvement[10] on physical performance. Despite such evidences and its traditional application, scientific data presents scarce information regarding the influence of massage on acute physical performance[1–3]. There are several possible answers to such controversy[11], as i) the link between massage and excruciating exercises ahead of

performance tests; ii) the difference in intensity and length of time used to apply massage; and iii) the lack of a placebo condition when comparing different conditions to date.

Based on previously acquired measures, Arabaci[8] asked 24 subjects, non-athletes, to warm-up prior to massage for about 15 min, divided in 4 min of jogging, 3 min of movements with change of direction at moderate intensity, 2 min of 30 m running at moderate intensity, 2 min of running 5 and 20 m at maximal intensity and 2 min of free activities. After completing the warm-up routine, subjects performed reaction time tests of 10, 20 and 30 m sprints and vertical jumps, then remained at rest for 15 min (rest condition) or received 15 min of massage to the lower limbs by a massage therapist (massage condition). These two conditions were applied randomly and in different days. Results showed reduction of 30 m sprint performance in both massage and rest conditions, highlighting that either warm-up or extenuated activities could disguise the influence of massage on performance. Furthermore, the authors argue that the use of two massage therapists demonstrated a serious limitation in controlling the massage intensity[12]. In another study regarding the warm-up effects, Wiktorsson-Möller et al.[4] analyzed 8 individuals who underwent three experimental sessions: i) warm-up condition – for 15 min at moderate intensity in a cycloergometer; ii) massage condition – by only one massage therapist performing the amassment technique during 6 to 15 min, where the variation in length of time was justified by the authors due to the level of tension verified by the therapist; and iii) warm-up and massage condition. Results showed a reduction in power production by the knee flexion/extension, verified through an isokinetic dynamometer, during massage condition with no difference reported during the warm-up and massage condition. Therefore, these findings also indicate that results in performance tests could be influenced by combined previous activities (i.e. warm-up) associated with massage. Thus, studies designed without prior physical effort could assess the exclusive effect of massage on the performance of a given physical test.

In disagreement with the two studies described above, a recent research[10] verified the effect of massage in exercise performance where twenty women performed four experimental sessions of deep squats without any activities prior to the performance test, followed by a randomly chosen foam roll self-massage of 30, 60, 90 and 120 seconds respectively. The roll was placed under the outer thigh and participants had to slide over it while laying on their sides. The completion of the task was to perform another deep squat. Despite results appearing to be true and accurate, with improvement on range of movement in 90 and 120 seconds sessions, performance was measured by mobility and not maximum effort or explosiveness of movement[4,8].

One of the biggest challenges in studies with massage employment is the lack of a suitable control group[13,14]. There is evidence that the application of a massage technique would not be solely responsible for the effects found, but that communication and the therapist's attention also affect performance[11,15]. Therefore, the outcome of massage on the Hawthorne Effect cannot be dismissed[16] because of therapist’s touch, communication and attention. A recent study compared traditional massage (i.e. deep slide, deep friction) and pseudo massage (absent manual technique) on depression symptoms. The same study found changes on the applied psychometric measures in both traditional and pseudo massage[15]. Thus, creating new experimental protocols that allow to compare the effects of pseudo massage considering possible placebo effects on physical performance, could contribute to the State of the Art.

Unipodal jumps are important explosive movements for many physical and sports activities[4,8], being essential skills required in volleyball spike, basketball layup, running and hop exercises in general[17]. Therefore, the performance of unipodal jumps is dependent on the stretch-shortening cycle[8], which rely on mechanical tissue features (muscle-tendon stiffness) that can be affected by deeper massage[10]. For example, if a deep massage is applied on the

gastrocnemius[18], its unique effect could diminish the performance on the unipodal jump performance. On the other side, several psychometric variables are positively affected through massage [1,6,9].or pseudo massage[15], raising the question as to how they could interfere on recovery perception[19] after unipodal jumps. Furthermore, should unipodal jumps not be considered excruciating, "very, very good recovery" answers could be triggered through the possible placebo effect caused by massage or pseudo massage, while in control condition (without its appliance) the answer could be "good recovery"[19].

Therefore, the aim of this study was to verify the effect of massage and pseudo massage on height of unipodal vertical jump performance without previous warm-up, and verify whether pseudo massage changes perceived recovery. We hypothesize that massage will reduce performance of consecutive unipodal vertical jumps, given the muscle-tendon stiffness process, and there no will be difference between massage and pseudo massage in perceived recovery, due to its placebo effect.

Methods

Participants

Fifteen physically active men (27.8 ± 5.2 yrs., 80.1 ± 15.0 kg and 1.78 ± 0.08 cm), familiar with jumping and not familiar with massage techniques, took part in the study. All participants had no recent history of bone, muscle or joint injuries which could affect performance and were informed about risks and benefits, having signed the consent form prior to the tests. The study was approved by the Research Ethics Approval Committee of University Nove de Julho (opinion 5784).

Procedures

All participants answered a brief questionnaire about foot dominance (16), then had their anthropometric measures taken and underwent a familiarization protocol of twenty unipodal vertical jumps which were executed 48 hours before the experimental tests. Additionally, as the participants had no previous experience with Total Quality Recovery scale (TQR), they learned and experienced how to anchor and classify TQR to start another jump during the familiarization session. Participants reported to the laboratory on three occasions, each separated by a week (Figure 1). Sessions were designed with three maximal unipodal vertical jumps with fifteen seconds in between. After the third jump one of the three experimental massage conditions was randomly given to the participant. At that moment, the participant was instructed to remain in decubitus position on a stretcher for two minutes. The massage and pseudo massage conditions were blinded to all participants. After receiving the massage protocol, the participant was asked to rate the recovery status based on the TQR and then performed another three jumps.

Test	Experimental Conditions*	Retest
Three unipodal vertical maximum jumps	MASSAGE CONDITION □ Deep slides (30s) □ Deep friction (30s) □ Vertical friction (30s) □ Kneading (30s)	Perceived recovery scale Three unipodal vertical maximum jumps
	PLACEBO CONDITION □ Pseudo-massage (120s)	
	REST CONDITION □ No intervention (120s)	

Figure 1. Sequence of experimental procedures and description of experimental sessions
Note: * Experimental conditions were randomly performed in different days
Source: Authors

Experimental conditions

After performing the three initial vertical jumps, the participant was instructed to lay down in a stretcher for 120 seconds and then received one of the three experimental interventions (Massage Condition, Placebo Condition, Rest Condition). The massage was performed by a professional therapist who was required to keep a constant rhythm and force appliance during 30 seconds each. As only one massage therapist was chosen to secure a single technique, a maximum number of five individuals per day was established.

For the massage condition, a lotion was applied in the calf area of the dominant leg, in which the therapist worked through several techniques, such as deep sliding, deep friction, vertical friction and kneading at the triceps surae level. As for the placebo condition, a single blinded procedure was performed in which the same balm was applied, although the massage offered no pressure in the targeted muscle area. In the control condition, subjects remained at rest for the same length of time without receiving any massage. The order of these conditions was random and there was an interval of one week between them.

Testing procedures

The unipodal maximum vertical jump was performed in a jump mat (Hidrofit®, Brazil) and measured performance through three attempts in both pre and post experimental conditions. The unipodal countermovement was based on the dominant leg, where its knee was kept in full extension during the flying phase and with hands placed on the shoulders. An interval of fifteen seconds between the three jumps pre- and the three jumps post-experimental condition was applied. Those jumps landed outside the mat or performed outside the required parameters were excluded. The average height achieved over the six jumps was used to statistical analysis.

Immediately before performing the last three vertical jumps, participants pointed to the TQR, which consist of a combination of numerical scale and phrases that represent various levels of recovery (Figure 2). The scale ranges from 6 (very, very bad recovery) to 20 (very, very good recovery). The value indicated in each of the three experimental conditions was used for statistical analysis.

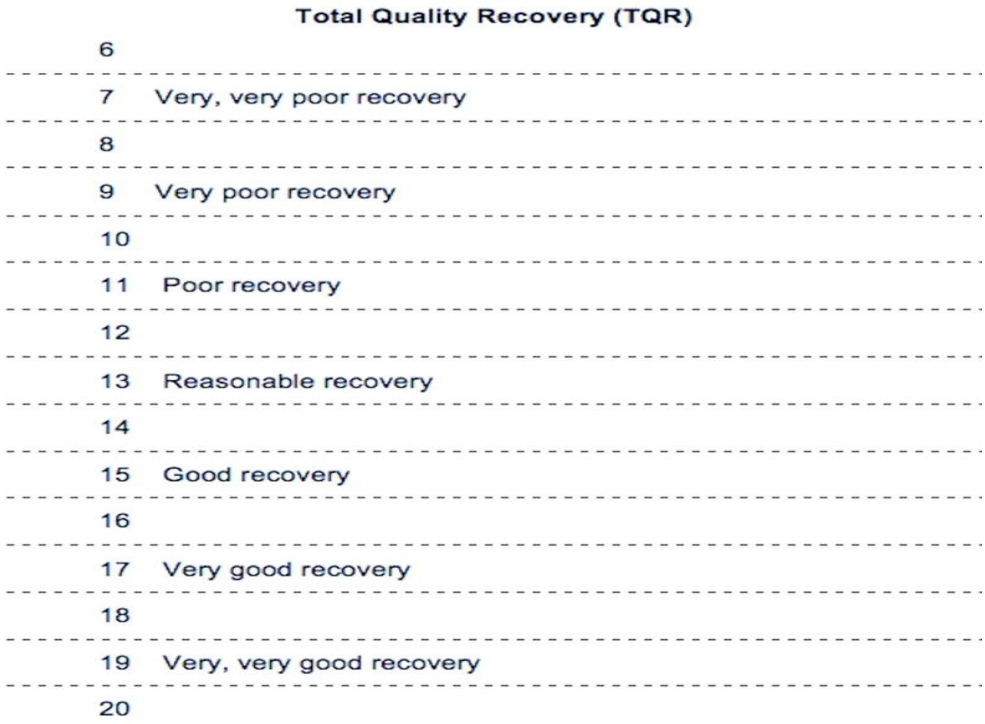

Figure 2. Total Quality Recovery Scale -TQR
Source: Adapted from Kenttä and Hassmén[19]

Statistical analysis

The normality and homogeneity were verified through the Shapiro-Wilk and Levene tests respectively. Since data presented a normal distribution, parametric statistics were applied. The ANOVA repeated measures test was employed to compare maximum height in vertical jumps, with the three experimental conditions (massage, pseudo massage and rest) as well as with both pre (jumps 1, 2 and 3) and post (jumps 4, 5 and 6) moments. To compare perceived recovery with each experimental condition, the same test was used. The Tukey Multiple Comparison test was used when necessary. Significance was set at 5%.

Results

There were no statistical differences on vertical jump maximum height between moments (Table 1).

Table 1. Mean and standard deviation of maximum height on vertical jumps in pre and post experimental conditions

Conditions	Pre				Post			
	J1	J2	J3	Mean	J1	J2	J3	Mean
Massage (cm)	18.7±3.7	18.2±3.4	18.4±3.7	18.4±3.7	18.7±4.1	18.0±4.1	18.0±4.1	18.2±4.1
Placebo (cm)	18.8±4.3	18.8±4.3	19.6±4.0	19.1±4.0	18.9±4.4	18.8±4.0	19.3±4.2	18.3±3.8
Rest (cm)	19.0±4.2	19.0±4.1	18.9±4.0	19.0±4.0	18.6±3.9	18.6±4.2	19.1±4.0	18.7±3.9

Note: J = Jump
Source: Authors

No statistical differences were found to perceived recovery between experimental conditions (Table 2). Despite not showing significant differences, both placebo and massage condition presented 3,1% and 1,9% greater recovery rates than rest condition, respectively.

Table 2. Mean and standard deviation of Total Quality Recovery (TQR) scale to experimental conditions

Conditions	TQR
Massage (u.a.)	16.2 ± 4.3
Placebo (u.a.)	16.4 ± 3.9
Rest (u.a.)	15.9 ± 2.6

Source: Authors

Discussion

The main finding of the present study was the ineffectiveness of both massage and pseudo massage in altering physical performance and perceived recovery. Furthermore, to the authors knowledge, this is the first time the pseudo massage was used as a placebo effect to assessed physical performance.

Regarding the psychometric effects as a result of whether the massage was performed, several studies showed acute improvements on perceived recovery[2,3,9]. Nevertheless, such results could be related to the Hawthorne Effect[16]. Although the literature traditionally relates the importance of the resting condition to diminish such psychological influence[14,20], our subjects were unaware of the treatment they received by the time of the experiment. The lack of a placebo condition limits the real effect of massage techniques over these psychological variables. Thus, in order to test this hypothesis, the present study created both a placebo condition and a rest condition. In the light of these facts, Hohl et al.[15] also created a massage placebo condition to study the symptoms of depression. Participants presented positive psychometric changes after receiving a sham massage, where instead of hand pressure, quartz stones were placed in several body areas. Similarly, our study is concerned with the placebo effects between massage and pseudo massage, though the difference being that both conditions used manual touch. The experimental design of our study provides practical implications for prescription of massage in future studies. However, results showed no differences in perceived recovery between the experimental conditions, thus making the establishment of the Hawthorne Effect not possible since the combination of the number of consecutive jumps with experimental interventions were not enough to reduce performance.

A recent systematic review[2] demonstrated a scarce amount of studies identifying moderate significant effect size on vertical jump followed by massage. The present study which also demonstrated no effect of massage on performance, as in many other studies[9,20–22]. Hemmings et al.[9] showed that twenty minutes of massage did not alter punching performance. Goodwin et al.[21], in a study with 30-metre sprint performance, found no effect on its performance with a 15-minute massage condition. Harmer et al.[22] identified no difference on running rate in sprinters after 30 minutes of massage, while McKechine et al.[20] also demonstrated that three minutes of massage had no effect on drop jump performance. Although each sport or discipline has its own neurophysiological demands, the findings on the present study is in alignment with the fact that massage seems to have no acute effect on performance.

Nevertheless, there are studies showing decrease in performance of explosive movements[4,23] such as vertical jump[8]. Hunter et al.[23] and Wiktorsson-Moller et al.[4] found reduction in power output after massage for 30 and 6 minutes respectively. Arabaci[8] also found loss of performance on the vertical jump after a 15-minute massage. According to the authors, there would be muscle relaxation provided by the massage which could affect stiffness[24] and muscle lengthening[25], thus resulting in deleterious acute effects to the performance of explosive movements similar to the exercises with static flexibility[8,10]. On

the other hand, it seems that massage can sensibly increase mobility[4,6,10,26] and resulting in improved physical performance.

The present study used a 2-minute bout of massage, and it seems that at first not only length of application but also the area on the body could influence its outcomes, yet results are inconsistent through the literature. Regarding the length of time, there are studies with 2[10], 3[20], 5[27], 6[28], 10[29], 15[30], 20[9], 30[31] and even 60 minutes[32]. Regardless of that, results show maintenance, decrease and increase in physical performance. As for the area on the body where massage is applied, results also are conflicting. Studies made in different areas of the body[32] and those where the depth of the massage is not specified[1–3] also make it difficult to draw comparisons with the one presented here. Furthermore, there are experiments that used a time longer than 120s[9,27–30] , and in the vast majority of them massage is applied in different parts of the body. But if the massage time is divided by these different body parts, we find values close to 120s in each.

Manual massage presents some limitations in what refers to controlling intensity and quality of its use. However, the present study showed ways to minimize such limitations through: a) the length of the massage being of two minutes; and b) the number of participants being limited of five per day, with the employment of only one professional massage therapist, told to control handling frequency and constant force application in all participants. Despite all these aspects, the results found can only be compared to studies with a similar design. Also, the Hawthorne Effect could not be established since the 2-minute break between jumps during the pre-condition seemed to promote a state of "well recovered" to the participants. Hence, it is suggested that novel studies are designed with extenuating tests using massage and pseudo massage as recovery tools[11].

Despite its positive aspects (strong experimental design, intra-subject control, single blinded and sample size), the present study presents some limitations. If the chosen test to evaluate performance contains many compensatory factors or has a metabolic requirement which cannot be recovered by the time of the retest, then the real effect of the massage could not be identified. Amongst these compensatory factors are postural changes[10] and movement patterns [9] that could sustain performance. The unipodal vertical jump was chosen to this study for being a skill of simple, explosive manner which is found in many sportive activities. In addition, the proximity of the height reached between the jumps indicates that familiarization was sufficient. Nevertheless, dozens of muscles contribute for it to be achieved, particularly in the posterior area of the thigh[18], therefore the massage effect on them could reduce stiffness thus providing better torque to the knee extension with a consequent increase in power output. However, the sural triceps is an important muscle in the unipodal jump and if the massage were able to cause significant changes in the tendon muscle unit, the performance between the jumps would have changes. Although the literature reveals that 15 seconds would be an insufficient time for recovery [33–35], in our study it was enough to reestablish performance between three consecutive jumps in the pre and post experimental condition. Future studies could reduce the recovery interval or increase the number of jumps to trigger fatigue, without the need for warm-up or previous strenuous activities.

Conclusion

The main findings of this study are that acute performance on unipodal maximum vertical jump is not altered after massage in the posterior thigh of the dominant leg. Furthermore, both massage and pseudo-massage did not change the recovery subjective perception after performing three unipodal vertical jumps. Despite being referred as a helping tool to physical activity, this study reveals lack of efficiency on the technique employed.

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