



# IMPROVEMENT OF THE PHYSICAL ABILITY AND HEMODIALYSIS EFFICIENCY DUE TO TRANSCUTANEOUS ELECTRICAL MUSCLE STIMULATION OF LOWER EXTREMITIES



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## OBJECTIVES

Transcutaneous Electrical Muscle Stimulation (TEMS) is widely used in cardiology, pulmonology and neurological rehabilitation practice in order to improve the physical performance and adaptation in patients who unable to carry out the necessary intensity of rehabilitation exercises. Large cohort of hemodialysis patients are also unable to carry out even minimal exercise because of the underlying disease severity and comorbid conditions. TEMS can be among a few possible rehabilitative interventions for these patients. In hemodialysis practice TEMS has been previously used to prevent intradialytic hypotension, as well as to enhance dialysis efficiency. The aim of this study was to evaluate the TEMS capability in improvement of the hemodialysis efficiency and physical ability.

## METHODS

24 hemodialysis patients were randomized to TEMS treatment group or control group (CG). The TEMS group underwent the procedures of muscle stimulation of the lower extremities during hemodialysis sessions for 4 weeks, 3 times per week and 3 TEMS treatments each session for 30 minutes each procedure, while the CG remained on previous dialysis regimen. The blood tests before and after hemodialysis and six-minute walk test (6MWT) were performed at the start of the protocol. The Borg scale was used for assessment of breathlessness and fatigue before and after the test. We repeated this evaluation procedure after completion of the TEMS protocol.

## RESULTS

The TEMS procedures were well tolerated and the level of compliance was high. No changes in  $spKt/V$  or URR were observed, but there were statistically significant shifts in the levels of serum creatinine and urea: creatinine increased by  $0,03 \pm 0,05$  mmol/l in the CG and decreased by  $0,05 \pm 0,06$  mmol/l in the TEMS ( $p=0.001$  for size effect); urea increased by  $1,22 \pm 6,2$  mmol/l in the CG and decreased by  $3,1 \pm 2,6$  mmol/l in TEMS group ( $p=0.042$  for size effect). While there were no changes in phosphate level in the whole groups, the individual changes in phosphate level were directly linked to baseline phosphate in treatment group ( $R^2=0,52$ ;  $p<0,05$ ; Fig. 1) but not in control group. It means that patients with elevated phosphate level showed significant reduction of phosphate while patient with near-normal level - did not.

The distance walked in the 6MWT in the TEMS group increased from  $431 \pm 113$  to  $455 \pm 99$  m (at  $23,9 \pm 26,2$  m) and decreased from  $445 \pm 114$  to  $441 \pm 101$  m (at  $-3,8 \pm 31,8$  m) in the CG ( $p=0.03$  for size effect; Fig. 2). There was a reduction of the disadaptative symptoms after 6MWT in TEMS group: dyspnea decreased from  $3,7 \pm 1,1$  to  $2,9 \pm 1,4$  points ( $p=0.01$ ) and fatigue decreased from  $4,3 \pm 2$  to  $2,5 \pm 1,6$  points ( $p=0.001$ ) according to the Borg scale; in the CG there were no significant changes in these parameters.

Fig. 1. The individual trends in serum phosphate to baseline phosphate, mmol/l

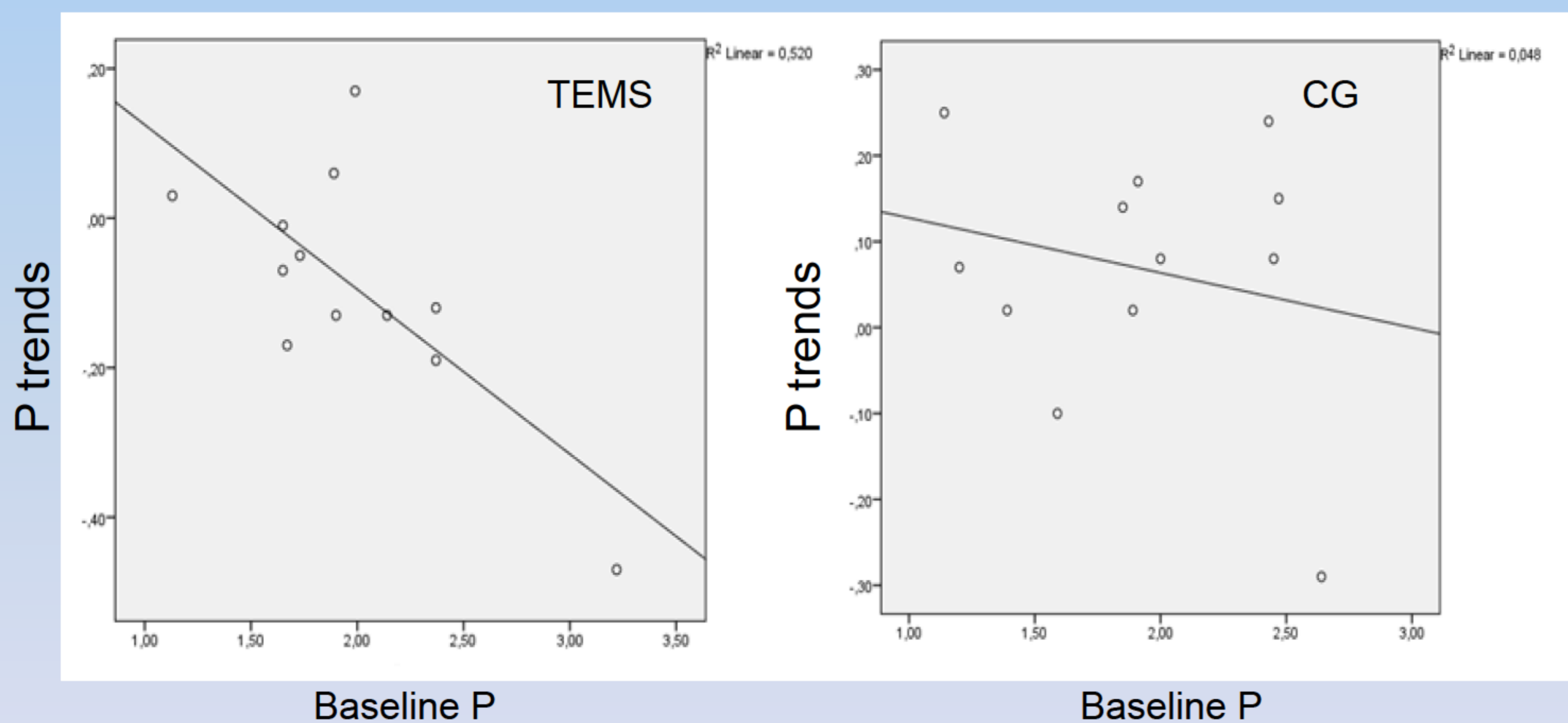
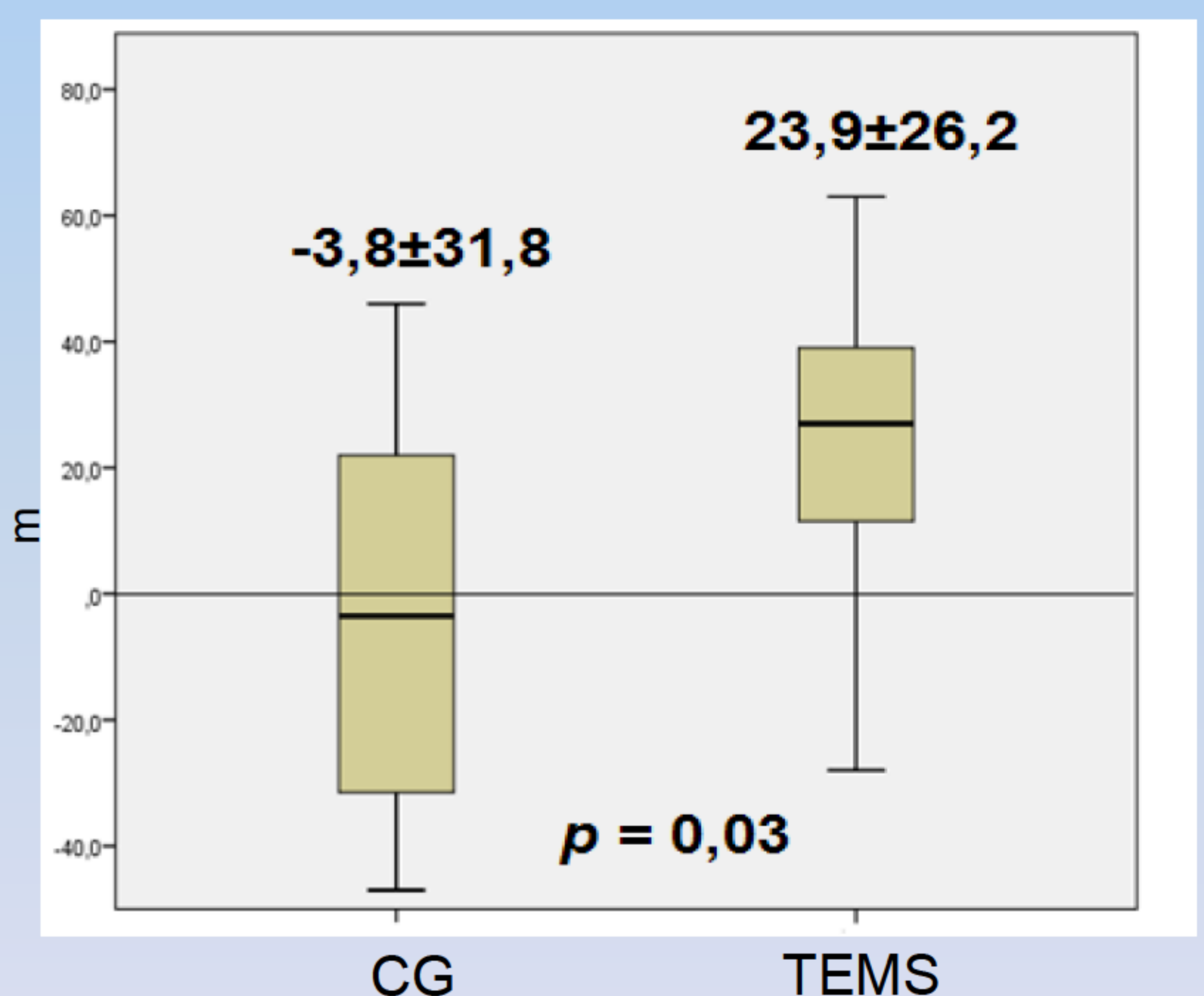


Fig. 2. The distance walked in the 6MWT dynamic, m



## CONCLUSIONS

The decreasing of predialysis serum creatinine, urea and phosphate levels after a month of using TEMS can serve as an indicator of improving the efficiency of dialysis therapy at the long term and also as a marker of the enhancing metabolic processes. Intradialytic TEMS can improve functional capacity and physical ability of the hemodialysis patients and it can be a possible alternative of the physical exercise program for patients who cannot tolerate the exercises in the extent necessary.

## REFERENCES:

Farese S et al. Am J KidneyDis 2008; 52:745–752.

