

RELATION BETWEEN THE REACTION TIME AND AMPLITUDE CHANGES OF H-REFLEX EVOKED AFTER IMPERATIVE SIGNAL OF MUSCLES OF AGONISTS OF FORTHCOMING VOLUNTARY MOVEMENT

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The interest towards organization of a forthcoming voluntary movement is spreading more and more (Papakostopoulos, Cooper — 1973; Requin, Bonnet, Semjen — 1977; Brunia — 1980; Deecke — 1981; Gerilovski, Kostov, Gidikov — 1981; etc.). In connection with this problem are the investigations of the relation between the reaction time (RT) and amplitude changes (AC) of monosynaptic H- and T-reflexes (Tzekov, Gerilovski — 1974; Kots — 1975), Brunia, Sheirs, Haagh — 1981; Semjen, Bonnet, Requin — 1973; etc.)

In our previous studies (Tzekov, Gerilovski — 1974) we pointed out the presence of an "OPTIMUM" of AC of H-reflex where the RT was shortest. These investigations were carried out in conditions of simple motor task without warning signal. The electrical impulse evoking H-reflex was set simultaneously with the switching on of a light signal requiring as quick as possible motor response (MR). These results are presented on figure 1.

However, the question if there is such a relation in the case when H-reflex is evoked by muscles-future agonists of forthcoming voluntary movement, but after setting a signal requiring a MR; is still unclear.

Materials and methods

The experiments were carried out with 4 practically healthy men, aged between 22 and 25 years. They sat on a chair in a dark room responding with their maximum speed to a light signal from a blitz-lamp. The MR was a plantar flexion of the foot of the right leg. 50 msec after switching on of any light signal was evoked a single H-reflex by m. gastrocnemius lateralis dextri, being the agonist of the forthcoming voluntary movement. For this purpose n. tibialis posterior in fossa poplitea was irritated (method described in previous work: Tzekov, Gerilovski — 1974). The experiments were performed in two days, not following each other. The one-day experimental programme

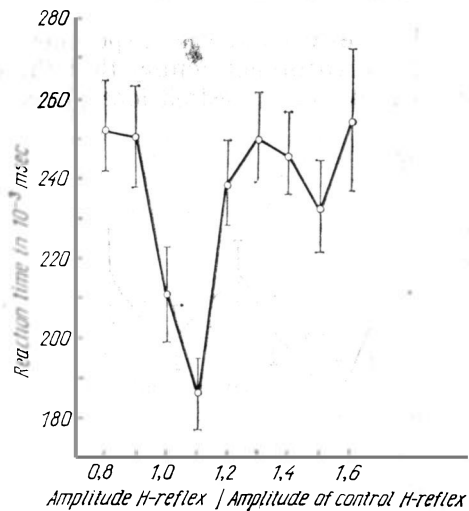


Fig. 1

included 120 light signals (trials) divided in 3 blocks. Before and after each block was evoked 4-times H-reflex by the same muscle without switching on light signals. The mean amplitude was considered as amplitude of a control H-reflex at relaxation for the corresponding block. The amplitudes of single-evoked H-reflexes for each light signal of the block were compared to the amplitude of the control H-reflex. Their decrease or increase was read. The RT were grouped according to the decrease or increase of their corresponding H-reflex. In one group the RT whose amplitudes of H-reflexes were 0.6 towards amplitude of the control H-reflex were cited, in a second one — those with 0.7 and so on. In the seventh group were cited RT whose corresponding H-reflexes were increased amplitudinally 1.2 towards the amplitude of the control H-reflex, i. g. the step of grouping was 0.1

The mean RT of each group was determined and all results were worked after the method of variational analysis.

Results and discussion

Figure 2 shows the experimental results.

It is worth-mentioning that the character of the curve is similar to that of previous our investigations (Tzekov, Gerilovski — 1974). Even not so roughly, OPTIMUM of the amplitude of H-reflexes is also indicated where the RT is shortest. There is a slightly expressed tendency for a second "optimum" which can be seen on figure 1 too. However, there are certain differences. First, of our studies mark this optimum in the region of decreased values of the amplitudes of H-reflexes differing to the previous study where the optimum was located in the region of values of amplitudes of H-reflexes near to those of the control H-reflex. Secondly, we must point that from 815 proper responses the bigger percent of them (58%) were accompanied by a decrease of the amplitude of H-reflexes compared to the control H-reflex. While in the first experiments the relation is contra-

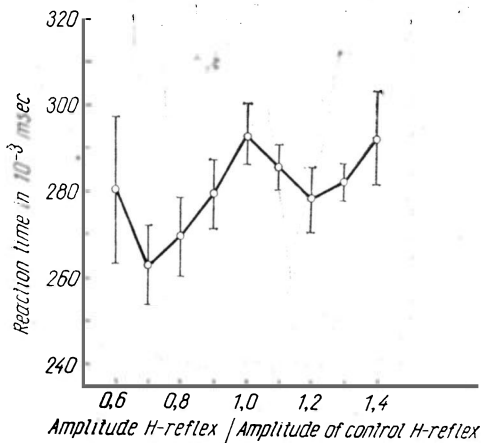


Fig. 2

versary (73% of the proper responses shew larger amplitude of H-reflexes compared to the control ones), in the present one it was as cited above. Kotz (1975) indicates that evocation of H-reflex in the last 100 msec before the beginning of a voluntary movement does not influence considerably the duration of RT. However, the author finds that the latter is with bigger amplitude of monosynaptic H-reflexes compared to those in relaxation. This does not coincide totally with our data.

Our results prove again the fact that the initially set happenings at segment-spinal level are a dynamic process in time during the latent period of MR. However, it is undoubtful that the relation between RT and AC of H-reflex is more or less preserved in our previous and present study. If the H-reflex

is an expressed correlate of alpha-motorneuron irritation, it is very important that the character of this relation is not linear. As Bzalava (1971) reports the relations between the irritator and MR are not linear because between them is set the preliminarily prepared for certain action system.

Of course, we must answer the question what is the character of the relation between RT and AC of H-reflex when it is evoked by muscle-antagonists or muscles which do not take practical participation in the forthcoming voluntary movement even 50 msec after the switched signal requiring a MR. Thus, we can confirm or reject the specific character of this relation. All that will be the object of our future studies.

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ЗАВИСИМОСТЬ МЕЖДУ ВРЕМЕНЕМ РЕАКЦИИ И АМПЛИТУДАМИ ИЗМЕНЕНИЯМИ Н-РЕФЛЕКСА, ВЫЗВАННОГО ПОСЛЕ ИМПЕРАТИВНОГО СИГНАЛА МЫШЦАМИ-АГОНИСТАМИ ПРЕДСТОЯЩЕГО ВОЛЕВОГО ДВИЖЕНИЯ

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РЕЗЮМЕ

Изучена зависимость между временем реакции и амплитудной Н-рефлекса, вызванного 50 миллисекунд после сигнала, требующего двигательного ответа. Н-рефлексы вызываются мышцами-агонистами предстоящего волевого движения. Исследования проводены в условиях простой двигательной реакции без предупредительного сигнала. В них участвуют четыре подопытных лица. Времена реакции группируются в зависимости от изменений амплитуд Н-рефлексов в сопоставлении с амплитудами контрольного Н-рефлекса в покое. Полученные данные сравниваются с результатами исследования той же зависимости при тех же условиях, но на других лицах, когда Н-рефлекс вызывается одновременно с сигналом, требующим двигательного ответа. Устанавливается сходство в характере зависимости между временем реакции и амплитудными изменениями Н-рефлекса этих двух постановок. В обоих случаях отмечена «оптимальная» стоимость амплитуды Н-рефлекса, при которой время реакции короче всего. Наряду с этим отмечаются и различия. На первом месте это перемещение «оптимума» налево, т. е. к более коротким амплитудам Н-рефлексов, при постановке, когда Н-рефлекс вызывается 50 миллисекунд после императивного сигнала. На втором месте установлен большой процент укорачивания амплитуды Н-рефлексов по отношению к контрольному Н-рефлексу, когда Н-рефлекс вызывается 50 миллисекунд после сигнала, требующего двигательного ответа. При эвокировании Н-рефлекса одновременно с императивным сигналом устанавливается значительно больше Н-рефлексов с более длинной амплитудой по сравнению с контрольным Н-рефлексом. Эти различия объясняются динамикой описанной зависимости во время латентного периода двигательной реакции.