Muscular Balance, Posture and Training

The theory of muscular balance is one of the most widely discussed topics in sport science over the past years. A significant discrepancy becomes evident between the accuracy of many statements on the theory of muscular balance that have been published and the small number of empirical studies in this field. Furthermore it can be stated that in most of the empirical studies posture was examined by means of visual assessment or via the muscular function test according to JANDA. Neither of these methods comes up to the high standard demanded by empirical methods concerning validity, reliability and objectivity. In field of „muscular balance, posture and training (exercise)“ only a small number of empirical studies have been launched so far. Consequently there is a high demand for empirically reliable data on this topic.

In this study the muscular function (i.e. maximal isometric force (MVC) of the back extensors, the abdominal muscles, the hip flexors and the hip extensors; the range of motion (ROM), the stretch force and the passive tension of the hip flexors and the hamstring muscles) and the posture were metrically obtained in 53 pupils, who volunteered as subjects. In order to obtain exact data on the subject´s posture, photos were taken and evaluated. Furthermore 40 of the volunteers participated in a 10 week training experiment. They were divided in two groups of 20 according to their pelvic inclination whereas the other 13 pupils constituted the control group. Subjects with a pelvic inclination higher than average took part in a training program designed to straighten the pelvis via the strengthening of the abdominal muscles and the hip extensors and a stretching of the back extensors and the hip flexors. Pupils with a pelvic inclination lower than average took part in a training program designed to achieve the opposite effect (anterior tilt of the pelvis) by means of a strengthening of the hip flexors and the back extensors and a stretching of the hamstring muscles.

While the examination of plausibility and stringency of argumentation showed that the theory of muscular balance lacks a empirical basis, the empirical part disclosed a number of correlations between the variables of muscular function, between pelvic inclination, lordosis and kyphosis, and between muscular function and posture. The correlations between pelvic inclination and the inclination of the lumbo-sacrale section of the spine and between pelvic inclination and the lordosis are in line with the current theory of the muscular balance: The more the pelvis is straightened the less the lordosis is marked. Subjects with a more inclined pelvis show on average

more distinct lordosis and kyphosis. Subjects with - compared to the hip flexors - strongly developed abdominal muscles show a smaller inclination of the sacrum i.e. a more straightened lumbo-sacrale section of the spine. If subjects have strongly developed hip flexors in relation to their weight, they show a more inclined pelvis if they stand in a kind of resting posture. The central aim of the training programme was to influence the pelvic inclination. The results elucidated that the pelvic inclination was lowered significantly (2,16° [$p<0,01$]) in the group who performed a program to straighten the pelvis. This is in line with the hypothesis.

Many questions for further investigation remain open. Before thinking about possibilities to influence posture by means of training for example, it has to be clarified which kind of posture can be defined as being healthy. The accepted methods to legitimate a norm or standard posture i.e. calculating a mean value or evaluating according to theoretical - technical aspects can only be seen as a kind of guideline. A legitimation of standard values for factors which constitute posture is only possible, if a direct connection between the deviation of a defined standard value and backache can be shown. Before these questions have not been answered satisfactorily it can only be stated that an extremely inclined pelvis bears a latent risk for the health. The results of this study suggest that a muscular training brings about a straightening of the pelvic inclination.