Summary

Effectiveness of an intervention programme on arm, shoulder and neck symptoms in computer workers

General introduction

Work-related arm, shoulder and neck symptoms have been known for centuries and are still highly prevalent, especially among computer workers. The costs of these symptoms, both from a health and economic perspective, are high. In an attempt to reduce these costs organizations are implementing various interventions aimed at the prevention of arm, shoulder and neck symptoms. One frequently used intervention that has recently been developed by a large occupational health service in the Netherlands, is the RSI QuickScan intervention programme for computer workers. Instead of using generic strategies, which is common among occupational health services in the Netherlands, this method establishes a risk profile of the target population by using results from the internet-based RSI QuickScan questionnaire. Subsequently, the programme advises interventions following a decision tree based on that risk profile, which may be more effective. This intervention programme is quite unique, as it addresses a broad spectrum of potential risk factors in computer work. The effectiveness of such an intervention programme has not been established yet. Therefore, the objective of this thesis was to assess the reliability, consistency and validity of the RSI QuickScan questionnaire and to assess the (cost-) effectiveness of the RSI QuickScan intervention programme on the prevalence of arm, shoulder and neck symptoms, exposure to risk factors, and sick leave in a population of computer workers.

Internal consistency, test-retest reliability and concurrent validity of the questions on risk factors

Questionnaires are widely used in risk assessments because they provide an efficient method to gather data on large populations, in a short period of time and at low cost. However, a disadvantage of questionnaires is that the collected data may be of limited quality. Therefore, it is important to study whether the RSI QuickScan questionnaire possesses the requisite clinimetric properties to validly assess risk factors. In *chapter 2,* the internal consistency, test-retest reliability and concurrent validity of the RSI QuickScan questionnaire were determined. To study the internal consistency of the RSI QuickScan questionnaire, a population of 86 computer workers was asked to fill out the questionnaire. The internal consistency was calculated using item analysis. The test-retest reliability (N = 86) and concurrent validity (N = 73) were analyzed by calculating the percentage of agreement, Cohen's Kappa, and the Ppositive and Pnegative. The concurrent validity was also tested by comparing the results from the new questionnaire with those from the original questionnaires on which it was based, on-site expert observations, and direct measurements. The results indicate that the RSI QuickScan questionnaire is a measurement tool with acceptable internal consistency, reliability and concurrent validity.

Concurrent validity of the questions on arm, shoulder and neck symptoms

The RSI QuickScan questionnaire also contains questions on arm, shoulder and neck symptoms, which have not previously been validated. To ascertain the clinimetric quality of these questions, in *chapter 3*, the concurrent validity of questions on musculoskeletal symptoms of the RSI QuickScan questionnaire was studied in a study population of 106 computer workers. The agreement between the answers on questions regarding the presence of arm, shoulder and neck symptoms given by workers and physical examinations of the same workers by occupational physicians was determined. In addition, the inter-observer reliability of the physical examinations was explored. The agreement between the symptom questions of the RSI QuickScan questionnaire and physical examinations by occupational physicians can be considered as poor to moderate. However, also the agreement between the occupational physicians themselves can, with a few exceptions, be considered as moderate. The results are comparable to what is generally reported in literature. Good values of the proportion of negative agreement were observed in both the concurrent validity study as well as the inter-observer reliability study. Therefore, it can be concluded that the RSI QuickScan questionnaire is a moderately valid instrument to rapidly collect data on the presence of arm, shoulder and neck symptoms, and a valid instrument to collect data on the absence of these symptoms, in populations of computer workers.

Predictive validity of the questionnaire

The RSI QuickScan intervention programme is based on the assumption that workers with a high score on risk factors and symptoms in the RSI QuickScan questionnaire have a higher risk of having arm, shoulder and neck symptoms in the future. The RSI Quick-Scan questionnaire has been used as a screening tool for several years, but the predictive validity of the scales in the questionnaire has not previously been determined. Therefore, in *chapter 4*, the predictive validity of the RSI QuickScan questionnaire for the future prevalence of arm, shoulder and neck symptoms among computer workers was determined. For this prospective cohort study, with a follow-up of 24 months, 3383 workers who regularly worked with a computer were approached. Generalized Estimating Equations (GEE) with 6, 12, 18 and 24 months time lags were used to determine whether high exposure to risk factors and previous symptoms were related to symptoms at follow-up. The results showed that high scores on 9 out of 13 scales, including previous symptoms, were significantly related to arm, shoulder and neck symptoms at follow-up. These results provide support for the predictive validity of the RSI QuickScan questionnaire.

Effectiveness of the intervention programme

In *chapter 5*, the effectiveness of the RSI QuickScan intervention programme on exposure to risk factors, the prevalence of symptoms and sick leave in computer workers was studied in a randomised controlled trial. In total, 1673 workers from 7 Dutch organisations in various branches, who regularly worked with a computer, were approached. Of them, 1183 persons completed the baseline questionnaire. The participants were assigned to either the intervention group (28 clusters, N=605) or the usual care group (22 clusters, N=578) by means of cluster randomisation. At baseline and after 12 months of follow-up, the participants completed the RSI QuickScan questionnaire on exposure to the risk factors and on the prevalence of arm, shoulder and neck symptoms. A tailor-made intervention programme was proposed to those departments of organizations or participants in the intervention group with a high risk profile at baseline. Examples of implemented interventions are an individual workstation check or a visit to the occupational physician. The usual care group did not receive interventions based on the risk profile during the time of the study. Analyses to estimate the effect of the intervention were done according to the intention-to-treat principle. The primary outcome measure was the prevalence of arm, shoulder and neck symptoms. Secondary outcome measures were the scores on risk factors and the number of days of sick leave. Sick leave data were obtained from company registers. Multilevel regression analyses were used to test the effectiveness. Statistically significant effects were found as to an increase in receiving education and a decrease in exposure to adverse postures and movements. With regard to the other risk factors, symptoms and sick leave, only small and non-significant effects were found.

Cost-effectiveness of the intervention programme

In *chapter 6* an economic evaluation of the RSI QuickScan intervention programme for computer workers was performed, from both the societal and companies' perspective. The economic evaluation was conducted alongside the randomised controlled trial. To compare costs between the intervention and usual care groups, confidence intervals for cost differences were computed by bias-corrected and accelerated bootstrapping. In this study, the RSI QuickScan intervention programme did not prove to be cost-effective from both the societal and companies' perspective. Therefore, this study does not provide a financial reason for implementing this intervention. However, with a relatively small investment, the programme did increase the number of workers who received information on healthy computer use and the number of workers who improved their work posture and movement.

General discussion

In the last chapter of this thesis, the most important findings of this thesis are summarized and interpreted in light of the three research questions that were posed in the

General Introduction. The strengths and limitations of the various studies are discussed and final conclusions are drawn. Recommendations are made for practical application and future research.

The evidence that the risk factors in the RSI QuickScan questionnaire play a role in the development of symptoms and the possible pathophysiological pathways of these risk factors, are discussed. Several suggestions to improve the RSI QuickScan questionnaire are made. It is concluded that the RSI QuickScan questionnaire for computer workers was reliable, consistent and valid.

The evidence regarding the effectiveness of the interventions and the implementation process of interventions is assessed. A theory failure implicates that an intervention has been perfectly implemented, but the theory is faulty; hence the expected results do not occur. A programme failure implicates that the planned interventions are not delivered; hence the expected results do not occur. The possibility that the results obtained from the intervention studies are due to a programme and theory failure is discussed. It is concluded that these results are likely the result of a programme failure and not of theory failure. It is concluded that the RSI QuickScan intervention programme was not effective in reducing the prevalence of arm, shoulder and neck symptoms, only partly effective in reducing exposure to risk factors, and not effective in reducing sick leave in a population of computer workers. The RSI QuickScan intervention programme for computer workers was not cost-effective.

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