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## Transtheoretical Model-based exercise counselling for older adults in Switzerland: quantitative results over a 1-year period

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### Summary

**Objectives:** To develop and test a counselling programme based on the Transtheoretical Model of behavioural change, for promoting exercise in people over the age of 65.

**Method:** The sample (n = 448) consisted of women and men aged between 65 and 92, recruited from Swiss GPs' practices between 2000 and 2004. After a baseline measurement (T1) and an initial counselling session, they received two counselling sessions, followed by a 12-month follow-up (T2). Changes in exercise behaviour were recorded by means of stage classification and the time spent on everyday moderate-intensity activities that increase the breathing rate.

**Results:** At T1 there was a tendency for women to be less physically active than men. T1 to T2 the proportion of inactive people fell from 12.2% to 4.2%, and the proportion of people sufficiently active rose from 19.0% to 31.3%. The changes in stage were significant in both men and women. At T2 more than half of the participants in the study spent more time exercising.

**Conclusions:** The results indicate that, with counselling, the exercise behaviour of the elderly can be positively influenced over a 1-year period.

**Keywords:** Physical activity – Transtheoretical Model – Elderly – Intervention – Behaviour change – Lifestyle activities.

### *Rationale for promoting exercise among older adults*

Regular physical activity of at least moderate intensity contributes to a number of health benefits for the elderly (U.S. Department of Health 1996; Mazzeo et al. 1998; Samitz & Mensink 2002). On the basis of international physical activity

recommendations (U. S. Department of Health 1996; Pate et al. 1995), Switzerland developed graded exercise recommendations for the whole population in the form of an “exercise pyramid” (Martin 2002). The first stage of the pyramid (basic recommendation) recommends at least half an hour of lifestyle moderate-intensity activities or sport of at least moderate intensity, which increases breathing rate, such as brisk walking. These 30 min should be carried out every day or nearly every day for women and men of any age and can also be taken in a minimum of three 10-minute bouts. The second stage corresponds to additional training for endurance or strength and mobility. The top of the pyramid provides for further sporting activities including competitive sports.

Despite the afore mentioned, among those over 65 (65–92 years), 45.4% were active according to the basic recommendations, 4.9% performed cardio-vascular endurance training and 49.7% were inactive (Martin et al. 1999). As these figures are based on summative self-assessment, they are likely to be an overestimate (Martin & Mäder 2002; Martin 2002b). Lamprecht and Stamm (2001) therefore assessed the level of activity on the basis of minutes of activity per day. For 60- to 74-year-olds (n = 368 people), 70.0% did not reach the basic recommendations, and can be considered inactive. In addition, longitudinal analysis of the Swiss health survey (Lamprecht & Stamm 2000) has shown that the proportion of inactive people (defined as no episode of perspiring per week in leisure time) increased by about 4% from 1992 to 1997. For public health reasons, there is therefore a need to promote exercise in the elderly.

### *The status of exercise intervention research*

Two reviews of the exercise intervention literature with older adults concluded that significant, mainly short-term behavioural changes are achieved with the systematic promotion of exercise (King et al. 1998; Möller 1999). There are two

reviews for the GP setting (Eakin et al. 2000; Eaton & Menard 1998) with similar conclusions. In recent years, an increasing number of studies were published in the USA on promoting exercise in the elderly (Burbank & Riebe 2002; Jones et al. 2001; Burbank et al. 2000). Generally, however, a target criterion for moderate physical lifestyle activities was not used. On the basis of the literature search very few intervention studies relate to lifestyle moderate-intensity activities for the over 65 age group, as this criterion has only been adopted officially since the mid-1990s (U.S. Department of Health 1996; Pate et al. 1995).

### Research question

This study was part of a project on multidimensional health promotion in people over 65 (Stuck & Born 2001) living independently at home. As part of this project, specially trained nurses were to record the exercise behaviour of those taking part and encourage it by giving appropriate counselling during home visits. The target variable was lifestyle moderate-intensity activities.

The aim of the study was to develop and test stage-matched counselling on promoting exercise. The primary research question was: How does older adults' exercise behaviour change during an exercise promotion programme based on the Transtheoretical Model of behavioural change (TTM) (baseline with counselling, two counselling sessions after about four months each and a 12-month follow-up)?

## Methodology

### Study design

This exploratory longitudinal intervention study is a pre/post test design without a control group. A control group was not used as comparative data on exercise behaviour is available from Swiss population surveys. At baseline (T1), a specially trained nurse carried out activity monitoring and TTM classification, provided stage-matched counselling and handed out stage-specific information material to the elderly person during a home visit. Two similar counselling sessions followed approximately 4 and 8 months later (details below). After 12 months (T2), the nurse carried out final activity monitoring and TTM classification.

### Context of the study

This study was part of the multidimensional assessment "Health Risk Appraisal for Older Persons" (Stuck & Born 2001), which was developed and tested with 33 GPs in a rural area of German-speaking Switzerland (Canton of Solothurn) between 2000 and 2004. Apart from exercise, this programme

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included also other health topics such as diet, fall prevention and mental well-being. All GPs invited their patients aged 65 years and above, in writing. Interested individuals were given an information sheet about the project and signed a consent form to take part. After a risk profile had been drawn up, corresponding multidimensional health counselling was given by specially trained nurses on home visits (Stuck & Born 2001). The study was approved by the ethics committee of Solothurn canton in October 2000.

### Sample

Exclusion criteria for the overall project, or for receiving exercise counselling, were living in senior residences or nursing homes, dementia or suspected dementia, a terminal illness, the presence of a severe psychiatric or mental disorder, insufficient knowledge of German to be able to understand the project documents, the need to have help in basic activities of daily living and severe physical limitations such as serious cardiovascular or pulmonary disorders.

Of the 566 people (100%) invited and not having any exclusion criteria, 118 people (20.8%) did not take part in any counselling or only the initial counselling session ( $n = 74$  and  $n = 44$ , respectively). Of these 118 people, 63 did not participate in the majority of the counselling sessions due to health problems (e.g. influenza, accident), 28 said that they were already very active, and 27 did not take part in the counselling for other reasons.

448 (59.4% female; average age = 74.1 years (SD = 5.64), median age = 73.3 years) were given all three counselling sessions and were included in the following analyses. Education level, last occupation prior to retirement and current living situation were assessed. However, none of these factors significantly influenced stage classification at T1 or changes in physical activity between T1 and T2 and thus will not be discussed further.

### Operationalization and measurement of physical activity

Based on the instrument of Marcus & Simkin (1993), the Swiss Federal Sports Office developed a questionnaire for recording moderate physical activity which was validated in intervention studies (Titze et al. 2001) and under test conditions (Mäder et al. 2002; Bernstein et al. 1998). Based on the TTM, this questionnaire distinguishes five stages for performing regular, lifestyle or sporting activities of at least moderate intensity which is defined as regularly increasing breathing rate for 30 min or 3 times a day for 10 min each time, on at least 5 days of the week (Pate et al. 1995; U.S. Department of Health 1996). For the present study, the wording was adapted for older people (Tab. 1). In addition, the exact type and duration (in minutes) of at least moderate-intensity activities which in-

creased breathing rate and which was carried out during the last four weeks was recorded in a table (activity monitoring). The overall number of minutes calculated on this basis allows for a finer differentiation of the level of exercise than the five-stage TTM classification (NSW Health 1999).

### *Exercise counselling programme*

The exercise promotion programme developed for this study is based on the TTM (Prochaska et al. 1992). The TTM has been developed and operationalized for various behaviours, e.g. smoking, physical activity, abstinence from alcohol and drugs (Prochaska et al. 1994; Keller 1999; Nigg et al. 1999; Nigg & Riebe 2002). Studies have shown that a stage-specific approach led to more effective behaviour change than just providing general information material (Marcus et al. 1998; Eakin et al. 2000).

The stage-specific written information material was adapted for older adults from the Swiss project “From counselling to action” – a TTM-based exercise promotion initiative for all age groups in GPs’ practices (Martin et al. 2001). Stage-matched counselling was conducted and stage-matched written information material was provided based on Burbank et al. (2000), Jones et al. (2001), Burbank & Riebe (2002), and Marcus & Forsyth (2003).

Precontemplators received information aiming to facilitate cognitive-emotional processes, specifically to increase perceived advantages of regular physical activity of at least moderate intensity in the nurse-led sessions and in a leaflet. With people at Contemplation stage, the benefits and costs of exercise and activity preference were discussed by the nurse. It was agreed, in writing, which physical activities the older person would like to regularly engage in until the next counselling session in 4 months’ time. The participant was also given a stage-matched leaflet, which deals with the advantages and disadvantages of exercise, similar to the Precontemplation leaflet. A list of suitable exercise courses in the area was also provided. The nurse asked Preparation stage people what additional activities they would like to do in order to increase their breathing rate more frequently or for a longer duration. Options for lifestyle physical activities were suggested, a stage-matched leaflet and a list of local exercise courses were handed out. Again it was agreed, in writing, which physical activities the older person would like to engage in. With people in the Action and Maintenance stage, physical activity options were provided to avoid boredom. An agreement was written down, a leaflet and a list with courses were given out.

At the 12 month follow-up, the nurse conducted an activity assessment with all participants. More intervention information can be found elsewhere (Märki 2004).

**Table 1** Operationalization of the lifestyle moderate-intensity activities based on the five TTM stages

1st stage: Precontemplation	No activities that increase the breathing rate, and neither does the person taking part want to change anything in the next 6 months
2nd stage: Contemplation	No activities that increase the breathing rate, but the person taking part wants to change this in the next 6 months
3rd stage: Preparation	Activities that increase the breathing rate, but for less than 30 min a day (or 3 times for at least 10 min) and/or on fewer than 5 days a week
4th stage: Action	Activities that increase the breathing rate for 30 min a day (or 3 times for at least 10 min) on at least 5 days a week, for less than half a year
5th stage: Maintenance	Activities as in stage 4, for more than half a year

### *Statistical analyses*

Changes between the five TTM stages from T1 to T2 were analysed by a Wilcoxon signed rank test. Changes in the mean number of minutes of weekly physical activity between T1 and T2 were analysed by a paired sample t-test. Differences between women and men regarding stage distribution at T1 and at T2 were analysed by a Fisher’s exact test and by a Chi<sup>2</sup> test. Differences between women and men regarding changes between T1 and T2 were analysed by a Chi<sup>2</sup> test. SPSS 12.0.1 (for Windows) was used for statistical testing.

## **Results**

### *Baseline activity level*

At baseline 12.2% (55 people) were inactive (Precontemplation and Contemplation), 68.8% not sufficiently active (Preparation, 308 people) and 19.0% (85 people) sufficiently active (Action and Maintenance).

### *Stage change from baseline (T1) to the 12-month follow-up (T2)*

Stage change analyses revealed a decrease in the number of inactive people (Precontemplation and Contemplation) (55 people = 12.2% vs. 19 people = 4.2%) and an increase in the number of people sufficiently active (Action and Maintenance) (19.0% vs. 31.3%). Of the 308 in Preparation at T1, 239 people stayed in Preparation, 60 people progressed in stage, and only 9 regressed. The change in stage from T1 to T2 is shown in Tab. 2.

Overall, 321 (71.6%) stayed at the same stage, 20 (4.5%) regressed by one or more stages and 107 (23.9%) progressed by one or more stages. A Wilcoxon signed rank test showed

that the changes in stages from T1 to T2 were significant ( $Z = -6.62$ ,  $p < 0.001$ ).

#### *Physical activity in women and men across the TTM stages*

Baseline TTM stage classification showed no significant differences between women ( $n = 266$ ) and men ( $n = 182$ ) (Fisher's exact = 7.2;  $p = 0.107$ ). There was, however, a tendency for fewer women than men to be classified as sufficiently active (15.7% vs. 23.6% in Action or Maintenance; see Tab. 2). About the same number of women as men were ranked as being inactive (11.3% vs. 13.4% in Precontemplation or Contemplation) – however, more women were in Preparation than men (73.0% vs. 63.0%). At T2, women and men were significantly different in terms of stage classification ( $\chi^2 = 13.69$ ,  $df = 4$ ,  $p = 0.008$ ). The pattern seen at baseline became more marked – fewer women than men were sufficiently physically active (28.0% vs. 37.6%). About the same number of women and men were classified as inactive (3.0% vs. 5.4%; although  $n$  was only 19). Of the people in Preparation, there were considerably more women than men (69.0% vs. 57.0%).

Regarding the change in stage from T1 to T2, there was no significant difference between women and men ( $\chi^2 = 1.23$ ,  $df = 2$ ,  $p = 0.53$ ): 3.8% of women and 5.5% of men went down a stage (for both genders: 4.5%), 73.3% of women and 69.2% of men stayed at the same stage (for both genders: 71.6%), 22.9% of women and 25.3% of men moved up a stage (for both genders: 23.9%).

#### *Change in the mean and median amount of time spent in regular lifestyle moderate-intensity activities*

The time spent on regular, lifestyle or sporting activities of at least moderate intensity was recorded for people in Preparation, Action and Maintenance. People in Precontemplation or Contemplation did not exercise with moderate intensity, as a result of which there was no data for the number of minutes and therefore were not included in the analyses. At baseline

average time spent in lifestyle or sports was 172 min (SD = 185.3; median = 120 min;  $n = 381$  [missing = 12]); at T2 the average time was 203 min (SD = 217.4; median = 150 min;  $n = 420$ , [missing = 9]).

Of the older adults who supplied data for both T1 and T2 ( $n = 368$ ), there was an increase in the time spent regularly on physical activities for 209 people (56.9%), a decrease in 90 people (24.4%) no change in 69 people (18.7%). From T1 to T2 there was a significant increase in the mean number of minutes of physical activity of 31 min (SD = 184.5;  $t = -3.9$ ;  $df = 367$ ;  $p < 0.001$ ).

## Discussion

This project illustrates the feasibility to develop and implement a TTM-based exercise promotion programme for the elderly with suitably trained nurses during home visits. Additional qualitative evaluation of the participants and the nurses shows (Märki 2004) that the programme was well accepted by the patients and was perceived as practical by the nurses. As recommended in recent publications (Satarino & McCauley 2003; Sallis 2003), the counseling programme particularly addressed barriers and facilitators in the participants' environments. All GPs who were approached were willing to recruit their own patients and acceptance of the exercise promotion programme by the patients was very high. 79% of the older adults who were asked to take part in the exercise promotion programme received all 3 counselling sessions and the 12-month follow-up. As about 80% of the participants were not sufficiently active at baseline, the programme obviously reached a particularly inactive clientele compared to the general population.

Our data showed that at baseline, barely a fifth of people were taking part in sufficient physical activity. This is considerably lower than in other Swiss surveys with similar age groups (Martin et al. 1999; Lamprecht & Stamm 2001). In the other

**Table 2** Classification at baseline and follow-up across the TTM stages by gender (N = 448)

	Baseline counselling session (T1)			Follow-up (T2)		
	Total (%)	Women (%)	Men (%)	Total (%)	Women (%)	Men (%)
Stage 1	12 (2.7)	5 (2)	7 (3.4)	10 (2.2)	3 (1.1)	7 (3.8)
Stage 2	43 (9.5)	25 (9.3)	18 (10)	9 (2)	6 (1.9)	3 (1.6)
Stage 3	308 (68.8)	194 (73)	114 (63)	289 (64.5)	185 (69)	104 (57)
Stage 4	3 (0.7)	2 (0.7)	1 (0.6)	30 (6.7)	20 (8)	10 (5.6)
Stage 5	82 (18.3)	40 (15)	42 (23)	110 (24.6)	52 (20)	58 (32)
Total	448 (100)	266 (100)	182 (100)	448 (100)	266 (100)	182 (100)

studies, the data was obtained anonymously, by telephone or in writing. By contrast, in our intervention study, at baseline the subjects were assigned to their stages in a personal discussion by trained nurses. This setting would have encouraged the relationship of trust between interviewers (nurses) and the elderly and may have decreased social desirability. Further, our staging based on detailed activity monitoring may be a more reliable and valid tool for portraying moderate physical activities.

The results are not representative of older Swiss adults as our clientele is not a random sample of the population but consists of people who had GPs established and practising in Solothurn canton. This clientele may have more health problems requiring treatment, which could partially explain the below-average exercise behaviour. From a public health point of view, this is a particularly relevant target group with potentially greater needs for counselling.

Somewhat surprisingly, about two thirds of the participants were in Preparation stage, i.e. people who increased their breathing rate through lifestyle or sporting moderate-intensity activities, but for less than 30 min a day. This included people who had the intention to do more, and people who did not want to do more. It would be useful for the counselling to be able to deal more specifically with these subgroups of Preparation. This was adjusted in a revised version of the instrument for the project "Zurich GPs' exercise counselling sessions for the over-65s" (Märki et al. in press), in that Preparation was subdivided into three differentiated algorithms. A similar division was undertaken by Martin-Diener et al. (2004).

Effectiveness analyses were based on stage change, and time spent in regular lifestyle moderate-intensity activities or sport of at least moderate intensity. The changes in behaviour from T1 to T2 pointed in the intended direction. About a quarter progressed in stage, just under three quarters stayed at the same stage and very few regressed in stage. There was a significant increase in the average time spent on lifestyle moderate-intensity activities or sport of at least moderate intensity among those people who at T1 and T2 had exercised with moderate intensity. The median number of minutes rose from 120 min a week at T1 to 150 min at T2, which corresponds to the basic recommendation (30 min on at least 5 days per week). Of those people with a value of at least 150 min per week, many however were not in Action or Maintenance, as the exercise was not distributed across five or more days. In future interventions particular attention should be paid to the sequencing of regular exercise.

The positive changes that were observed countered the expected secular trends over a one-year study period. The population-related studies referred to in the introduction show a rapid decrease in the level of exercise after the age of 65.

Similarly, the historical trend referred to in the introduction would suggest a further decrease in the level of exercise.

As there was no control group it cannot be ruled out that the observed changes may have been triggered at least in part by interventions on other areas of the multidimensional health promotion programme. Also, the visit to the GP undertaken as part of this programme and the corresponding medical treatment alone could have a positive effect on activity in the short-term – but less likely in the long-term. Indeed, many other GP-based intervention studies found short-term positive changes in exercise behaviour which disappeared in the longer term (Goldstein et al. 1999; NSW Health 1999).

Regarding gender differences, at baseline men tended more towards higher stages than women. Even though the differences were not significant, they are consistent with the results for the overall random sample of 15- to 92-year-olds of the same-language Swiss population (Martin et al. 1999).

The change in stage from T1 to T2 did not differ significantly between women and men; though more men than women progressed in stage. Both women and men achieved significant improvements in terms of their physical activities. This intervention seems to be appropriate for both genders. Investigating stage classification at the 12-month follow-up did show significant differences: of the people at Preparation, there were more women than men, but among those who were sufficiently active there were more men than women.

## Conclusions

This intervention study demonstrates that physical activity of elderly people recruited by their GPs can be promoted in the context of multidimensional health promotion counselling carried out at home by specially trained nurses. The design of the TTM-based exercise promotion counselling contributed to a clearly structured procedure and measurement of changes in exercise behaviour.

This exploratory study shows that the TTM-based exercise promotion programme was accompanied by a significant increase in exercise behaviour during the one-year observation period. As this positive change took place against the expected reduction in exercise behaviour under normal conditions in elderly people, the study provides an indication of the effectiveness of the programme. In order to determine its net effect more reliably, it is recommended that a follow-up study be carried out with a randomized control group design. At the same time we would recommend the examination of additional positive effects of the programme (e.g. on psychological wellbeing) and the study of longer-term effectiveness of repeated counselling sessions beyond a one-year observation period.

Although only a quarter of the participants progressed in stage, more than half increased the time spent on physical activity. Even small increases in the activity-induced use of energy result in health benefits (Martin 2002). The greatest benefit is to those who have previously been inactive. After one year in our programme the proportion of inactive people fell from 12.2% to 4.2%. Considering this potential public health impact, it seems justified to invest in exercise counselling programmes as presented.

In order to reduce costs, future exercise counselling programmes should be implemented in the primary care setting

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by general practitioners or by specially trained nurses in the context of routine visits instead of more costly house visits. The feasibility of this approach has already been investigated in the primary care setting in Switzerland (Märki et al. in press).

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#### Zusammenfassung

##### **Bewegungsberatung für ältere Menschen auf Basis des Transtheoretischen Modells der Verhaltensänderung: quantitative Ergebnisse im 1-Jahres-Verlauf**

**Fragestellung:** Ziel dieser Studie war die Bewegungsförderung bei über 65-Jährigen anhand eines auf dem Transtheoretischen Modell der Verhaltensänderung (TTM) beruhenden Beratungsprogramms.

**Methode:** Studienteilnehmende wurden in den Jahren 2000–2004 über Schweizer Hausarztpraxen rekrutiert. Die Stichprobe (n = 448) setzte sich aus Frauen und Männern im Alter von 65 bis 92 Jahren zusammen (Durchschnittsalter M = 74.1, SD = 5.64, Median = 73.3). Nach einer Baselineerhebung (T1) führten spezifisch geschulte Pflegefachfrauen eine erste systematische Bewegungsberatung durch und im Abstand von rund vier Monaten während Hausbesuchen zwei weitere, gefolgt von einem 12-Monats-Follow-up (T2). Mittels Stufeneinteilung für moderate körperliche Alltagsaktivitäten und aufgewendeter Zeit wurden die Veränderungen im Bewegungsverhalten erfasst.

**Ergebnisse:** Frauen waren bei T1 wie auch bei T2 weniger körperlich aktiv als Männer, was sich jedoch nur bei T2 signifikant unterschied. Der Anteil Inaktiver nahm von T1 zu T2 von 12.2% auf 4.2% ab, der Anteil gesundheitswirksam aktiver Personen stieg von 19.0% auf 31.3%. Die Stufenveränderungen waren bei beiden Geschlechtern signifikant. Mehr als die Hälfte der Studienteilnehmenden wendeten bei T2 mehr Zeit für Bewegung auf.

**Schlussfolgerungen:** Die Ergebnisse weisen darauf hin, dass sich mittels Beratungen das Bewegungsverhalten älterer Menschen im 1-Jahres-Verlauf positiv beeinflussen lässt.

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#### Résumé

##### **Promotion de l'activité physique auprès des personnes âgées sur la base du Modèle Transthéorique de changement des comportements en Suisse: résultats quantitatifs sur 1 an**

**Objectifs:** Développer et tester un programme de promotion de l'activité physique basé sur le Modèle Transthéorique de changement de comportement et ciblant des personnes âgées de plus de 65 ans.

**Méthodes:** Un échantillon (n = 448) de femmes et d'hommes âgés de 65 à 92 ans a été recruté auprès de médecins généralistes en Suisse entre 2000 et 2004. Après une mesure de base (T1) et une séance de conseil initial, ces participants ont bénéficié de deux autres séances et d'un suivi à 12 mois (T2). Les modifications dans la pratique de l'activité physique ont été classifiées selon les différentes étapes du modèle et selon le temps consacré à une activité physique quotidienne augmentant le rythme respiratoire.

**Résultats:** A T1, les femmes tendaient à être moins actives que les hommes. Entre T1 et T2, la proportion de personnes inactives est tombée de 12.2% à 4.2% ; la proportion de personnes suffisamment actives a augmenté de 19.0% à 31.3%. L'évolution dans les étapes du modèle était significative pour les hommes et les femmes. A T2, plus de la moitié des participants consacraient plus de temps à la pratique d'une activité physique.

**Conclusions:** Par le conseil, l'activité physique des personnes âgées peut être positivement influencée sur une période d'une année.

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