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A worksite intervention module encouraging the use of stairs: results and evaluation issues

Summary

Objectives: Recent recommendations suggest that health benefits can also be derived from regular daily activities of moderate intensity which accelerate breathing, such as climbing stairs. The purpose of this study was to examine the effect of an intervention programme on behaviour change in stair use in a working environment.

Methods: Intervention field workers were instructed to offer attractive or pull actions. 338 employees of four offices of the Swiss federal government were involved in the evaluation. Two methods were used to assess stair and lift use both before and after the four month intervention period: a non-covered personal observation and an automatic measurement.

Results: Taking all four offices together, a significant increase in stair use, from 61.8% to 67.1% ($p = 0.028$), was found between the baseline and the follow-up observation. The automatic measurement during observation time reveals a change in stair use from 68.8% to 71.4% ($p = 0.268$). The pattern of stair use examined for 24 hours by automatic means, however, was not so consistent. Due to the proportion of stair use in each office it is assumed that environmental factors influences the behaviour. The highest percentage of stair use at baseline (86.2%) was identified in an office with a bright stairwell and a small number of steps between floors. The lowest proportion (31.4%) was observed in an office with a dark stairwell, a large number of steps between floors and a stairwell accessible only with a key.

Conclusions: However, our findings indicate that intervention with "rewarding" elements encourage individuals to use stairs.

Key-Words: Daily life activities – Physical activity – Intervention – Behaviour change – Evaluation.

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Physical activity is a cornerstone in the health policy. Recent studies have demonstrated that a physically active lifestyle offers numerous benefits for improved physical and psychological health[1–3]. In contrast, physical inactivity plays an important part in the aetiology of chronic diseases such as coronary heart disease, hypercholesterolaemia, hypertension, stroke, non-insulin dependent diabetes mellitus, and certain forms of cancer[2,4]. It is important to note that the WHO[5] and a number of governments are presently changing the emphasis of their health promotion programmes from the advocacy of vigorous aerobic exercise to the concept of "active living", the incorporation of moderate intensity physical activity into everyday living[6]. Recent recommendations for health enhancing physical activity have been defined as the accumulation of 30 minutes or more of moderate-intensity exercise on most, or preferably, all days of the week[2,7,8]. This corresponds to an additional energy expenditure of at least 1000 kcal (4.2 MJ) per week. Despite the increasing evidence regarding the benefits of regular physical activity, there remains a high prevalence of sedentariness in industrialised countries, with a large percentage of the population not participating in regular exercise. In Switzerland, for example, according to an analysis of available surveys on physical activity, at least one third of the Swiss population have a sedentary lifestyle with no physical activity during their leisure time[9] Data from the Swiss Health Survey of 1992 shows similar results: 31% of men and only 27% of women claim to be physically active at least three times a week and with an intensity sufficient to work up sweat[10]. Raising the proportion of individuals interested in initiating or increasing exercise behaviour is currently a major public health challenge. More and more programmes focus on promoting daily life activities such as brisk walking while commuting to and from work, climbing stairs, gardening, etc.[11,12]. This focus leads to the question of how health

enhancing physical activity programmes should be designed to meet the needs of those individuals who are not active enough and what kind of evaluation is best to assess the effect of the intervention.

Encouraged by the studies from Blamey et al.[13] as well as from Brownell et al.[14], we developed our intervention module "stairs instead of lifts". This module is based on the assumption that to start climbing stairs does not take an enormous amount of time, requires no special skills nor any financial expense, and can be performed regularly.

Investigations from Blamey et al. as well as from Brownell et al. considered the effects of a sign, placed near a lift, encouraging the public to make use of the stairs in order to enjoy better health. The aim of the Blamey study and the Brownell study was to influence people's behaviour with a cognitive behaviour intervention saying "Stay Healthy, Save Time, Use the Stairs" and "Your Heart Needs Exercise, Here's Your Chance", respectively. Analysis revealed that the motivational signs increased the percentage of subjects using the stairs from baseline to intervention phase by a minimum of 7%, and up to a maximum of 8.3%, according to age, gender, race, and weight. It is noteworthy that the overall stair use at baseline was very low – less than 15%.

Our intervention was influenced by the transtheoretical model. Initially, this model had been applied to smoking behaviour change[15]. Subsequently, the application was generalised to include exercise behaviour[16]. The model suggests that individuals attempting to change their health behaviour move through a series of stages of readiness for change: "precontemplation" (not intending to make changes or denying the need to change), "contemplation" (seriously considering making a change), "preparation" (making small changes), "action" (actively engaging in exercise but for less than six months), and "maintenance" (exercising regularly for the past six months). The concept of stages reflects a temporal dimension. That is, stages can last over long periods of time but can also change relatively quickly. Processes of change are one important component of the transtheoretical model. These are strategies or techniques people use as they progress through the different stages of change over time. Ten processes have been identified. Research has demonstrated that five of them, the experiential processes, are more critical for individuals in the earlier stages of change and the five other ones, the behavioural processes, are more important for those in the later stages[15,16]. The techniques of the experiential-processes-group include seeking more information about benefits of exercise and negative health consequences of inactivity as well as reappraisal with respect to exercise activity. The main techniques of the behavioural-processes-group are organising incentives before or after exercise.

For the intervention module "stairs instead of lifts" the knowledge of the transtheoretical model was helpful, firstly to understand that changing behaviour can be a long term process. Secondly, it was used as a support for working out appropriate strategies to meet the requirements of those who are not sufficiently active. However, the way in which the programme was carried out did not allow for an individualised stage-matched intervention.

In our intervention study "Office in Motion" we attempted to "translate" recent recommendations of health enhancing everyday physical activity into the real life situation of a working environment. The success rate of the module "stairs instead of lifts" was evaluated by using a non-covered personal observation and also by using a non-covered automatic head count. We assumed that observation would offer the most valid results regarding behaviour change. Owing to the time factor, we installed simultaneously an automatic head counter – a method which is less time consuming – with the aim of comparing these two types of outcome evaluation.

Firstly, we assumed that an intervention with written information about deriving health benefits from daily life activities, and mainly attractive or pull techniques would encourage people to use the stairs instead of the lifts.

Secondly, we want to answer the question as to what the appropriate method should be to evaluate the change in stair use.

Methods

Sample

After a pilot project (n = 209) the programme was implemented in six offices of the Swiss federal administration. The baseline evaluation indicated that in one office, stair use was above 95% [1]. Therefore no observation was carried out and the office was excluded from analysis. In one more office the automatic measurements malfunctioned and therefore this office was excluded as well.

Participants included all 338 male and female employees of four offices, with mostly sedentary occupations. At the start of the study 253 employees (74.9%) returned a questionnaire on physical activities during commuting to work, during work, during leisure time including sport activities, and on demographic characteristics shown in Table 1. A comparison of the demographic data between the offices revealed no statistically significant differences in mean age, years of education and body mass index (BMI). However, in Office 4

[1] This was because, firstly, the lift was much farther away from the main entrance than the stairs and secondly, it was very slow.

Mean age	42.9 (SD 10) years
Mean years of education	16.4 (SD 3.4) years
Body Mass Index (BMI) [a]	23.3 (SD 3.3)
Sex (female)	32.4 %
Non smokers	79.4 %
Subjects expending less than 1000 kcal per week [b]	33.6 %

[a] According to the WHO guidelines BMI (kg/m²) 18.5–24.9 is classified as "normal range" [5].
[b] Subjects expending less than 1000 kcal (4.2 MJ) with physical activity of at least moderate intensity (> = 4.5 METs).

Table 1 Demographic characteristics

there was a significantly higher proportion of women (58.3% vs. 26.3%, $Chi^2 = 18.171$, df = 1, p = 0.000) and a lower proportion of non smokers (62.5% vs. 83.3%, $Chi^2 = 10.298$, df = 1, p = 0.001) than in the other 3 offices. Furthermore, in Office 1 and 4 the proportion of sufficiently active people was lower than in Office 2 and 3 (58.2% vs. 78.7%, $Chi^2 = 11.418$, df = 1, p = 0.001).

Measurement

Stairway use during working hours was observed and also automatically measured both before and two to three weeks after the four month intervention period. It should be mentioned that the applied method of measurement revealed behaviour change in stair use but did not provide information about the change of intention and the behaviour change over time with regard to stair use.

Non-covered observation: The pilot project was intended to determine the number of details which can be registered by the observer. Gender, age class (over 40/under 40), weight class (obese/non obese), and direction of the movement (up/down) were recorded. People carrying heavy or bulky items were recorded separately and later excluded from statistical analysis. Weight was not a useful characteristic because most of the participants were non obese. Further, it was difficult to assess age because most of the employees were between 31 and 50 years. Therefore both characteristics were not used. In the end, the observer recorded the frequency of stair and lift use, direction of movement, and gender, on a specially designed registration form.

Non-covered automatic measurement: For the automatic measurement recordings a photoelectric barrier (for climbing stairs) and a magnetic switch counter (for registering the opening of the lift door) were installed. The latter measurement included the disadvantage that only the opening of the door and not the number of lift users was registered. However, it was the only feasible method from the technical point of view.

Depending on the specific conditions in the different offices, the measurements were made either on the ground floor or on the top floor, to be able to identify number and gender of lift users. In all four offices stairs and lifts were adjacent. Office 1 is a new building with a bright stairwell. The employees work on the second and third floors. The measurements (observation and automatic count) were made on the last (third) floor. In Office 2 the stairwell is dark, the three floors are high and – like the lift – accessible only with a key. The measurements were made on the ground floor. In Office 3 the stairwell is much brighter; nevertheless the building is old and has high ceilings. The employees of the office work on the second and third floors. Measurements were made on the last (third) floor. Office 4 is a new building with a bright stairwell. The employees of the office work on the second and third floors. In contrast to the other offices there are two lifts next to each other. Measurements were made on the last (third) floor.

Personal observation of stair use was carried out during one week (five working days) for one hour each morning in each office. At the same time both before and after the observation, the data from the automatic counters was registered. In addition one person in each office read the counter every 24 h.

Procedure

For the implementation of the project, each office was asked to form a committee consisting of three to five representatives of the office. Approximately every three weeks this steering committee met with the project-manager, the evaluator, and the exercise professional to discuss further steps of the programme.

During the intervention period, written information about recent physical activity recommendations to achieve health benefits was provided, and action-days were arranged encouraging the use of stairs instead of lifts. The action elements of the interventions were mainly attractive or pull measures, in contrast to dissuasive or push ones. Apples or other fruit were offered on the stairs, and a game of chance was performed for stair users. During one day the lift was symbolically closed, the only dissuasive or "nasty" intervention. Out of respect for the particular wants and needs of the representatives of the offices the frequency and the number of different actions were not the same in each office. In all four offices written information about daily life activities and health benefits was distributed. In Office 1 (n = 75) additional apples were offered on four successive days. In Office 2 (n = 56) there was one apple-action-day. In Office 3

	Baseline		Follow-up			
Offices	Observations n	Stair use %	Observations n	Stair use %	Difference %	Significance p, Chi^2
4 Offices n = 338	819	61.8	774	67.1	5.3	p = 0.0281 χ^2 = 4.82
Office 1 n = 75	152	86.2	82	89.0	2.8	p = 0.535 χ^2 = 0.38
Office 2 n = 56	137	31.4	144	35.4	4	p = 0.474 χ^2 = 0.51
Office 3 n = 152	271	56.5	297	69.7	13.2	p = 0.001 χ^2 = 10.70
Office 4 n = 55	259	69.1	251	74.9	5.8	p = 0.145 χ^2 = 2.12

Table 2 Changes in stair use – observation data (one hour per day during five working days)

(n = 152) both apples and a game of chance were offered on two successive days. On one day the lift was symbolically closed. In Office 4 (n = 55) fruit was offered on 10 successive days. All actions took place during the first third of the intervention period. Afterwards, the intervention programme was focused on daily life activities such as walking and cycling, as well as on structured exercise.

Statistical Analysis

The change in proportion of people using the stairs from baseline to follow-up was analysed by using the Chi-square test. Results are presented as the proportion of stair users.

Results

Overall, at baseline the proportion of stair users in comparison to lift users was 61.8% for observation (one hour per day, five days per week) and 66.6% for automatic measurement (24 hours, five days per week). However, the stair use level of each office at baseline varied between 31.3% and 86.2% with reference to observation data and between 46.6% and 78.6% with reference to automatic measurement.

After the four month intervention period, observed stair use in all four offices together increased. In fact, in each office, observational data showed an increase in stair use but in only one office this was statistically significant (Table 2). Compared with the baseline value of 66.6%, stair use measured by photoelectric barrier was approximately the same at follow-up (66.9%).

The pattern of stair use examined by automatic means, however, was not as consistent. In two offices there was a decrease in stair use at follow-up, which was statistically significant in one office (from 78.6% to 74.9%, difference −3.7%). However, in the same office in which a significant increase in stair use was observed (Office 3), a significant increase was also measured by the photoelectric barrier from 64.7% to 69.2% (difference 4.5%).

At baseline, observational data show a slightly higher proportion of stair use by women (62.6%) than by men (61.3%). The intervention programme increased the percentage of women using the stairs to 66.7% at follow up. The corresponding proportion for men was 67.3%.

Depending on the assessment method (observation vs. automated measurement), the outcome varies. Table 3 shows the proportion of stair and lift use measured simultaneously one hour per day, five days per week.

With both methods an increase in the proportion of stair use was found. Further, the figures for lift use automatically measured are smaller in comparison with the figures for lift use measured by observation. Finally, the observation data for lift use at baseline clearly differs from automatically measured data at baseline. The most reasonable explanation is that the lift was more often used by more than one person at baseline.

Table 3 Comparison of two evaluation methods (observation vs. automatic counter. One hour per day, five days per week)

	Baseline		Follow-up	
	Observation	Counter	Observation	Counter
Stair use	506 (61.8%)	554 (68.8%)	519 (67.1%)	568 (71.4%)
Lift use	313 (38.2%)	251 (31.2%)	255 (32.9%)	228 (28.6%)

Discussion

Though most people do not spend much time on climbing stairs, the use of stairs can contribute to an accumulated daily activity programme. In addition, climbing stairs is often regarded as a key pattern, indicative of changes in general physical activity behaviour. It is the change of behaviour that counts, not simply the energy expenditure.

The purpose of this study was to examine the effect of an intervention programme on behaviour change in stair use. The hypothesis was that the knowledge about the new physical activity recommendations[2] and attractive techniques encourage people to use stairs instead of lifts. It is noteworthy that the study design does not allow for a distinction between intervention effect and the effect attributable to a non-covered measurement. Despite this limitation, our findings provide some important insights. First, most remarkable are the different proportions of stair use at baseline among the four offices. From our point of view environmental factors such as the attractiveness of the stairwell and the number of steps between the floors may be the reasons for these differences. Office 1 and 4 had the highest proportions of stair use at baseline (86.2% and 69.1% respectively). They are new buildings with brightly decorated stairwells and a moderate number of steps between floors. The lowest proportion of stair use was in Office 2 (31.4%) with a dark stairwell accessible only with a key and a large number of steps between floors. In comparison with the two studies from Blamey et al.[13] and Brownell et al.[14] we are surprised about the very high proportion of stair climbers in our study. It is difficult to explain these differences. In addition to the fact that in the two previous studies the alternative to stair use was an escalator and not a lift there are further assumptions. We assume that two important influential reasons are the large percentage of people with a high educational degree (49.8% of the sample have an academic degree vs. 21.2% among the Swiss population) – which is usually correlated with doing more sporting activity[10] – and the more convenient stair use over one floor because it is quicker than taking the lift.

Second, the improvement of stair use after the intervention period may relate to the number of actions taken to encourage people to use the stairs. In addition to the two types of strategies used to improve stair use in each office (leaflets and fruit) there were two further actions carried out in Office 3 (game of chance and symbolically closed lift). We assume that the techniques derived from the Transtheoretical Model, such as repeated invitations to use the stairs instead of the lift, new information about healthy behaviour, rewards for the positive behaviour change, and cues to increase stair use were all helpful reminders for the employees to engage in healthy behaviour.

Considering the stair use changes by gender, no significant differences were found. In our estimation this result could indicate that the programme was equally attractive for both genders.

Third, the behaviour appears to be sensitive to intervention with "attractive" elements. By observation, we found that a moderate effect had resulted from the intervention. Overall, there was a statistically significant increase in stair use up and down at follow-up. However, even if it may be supposed that the observer influenced the behaviour of the subjects by her mere presence, she was nevertheless able to encourage the use of stairs.

Fourth, the data gained from automated measurements (24 hours, five days per week) does not show the same pattern: the increase in stair use is less clear. These differences in outcome suggest that the observer influenced the behaviour of the employees. The possibility of manipulating the photoelectric barrier may be another reason for the different outcome. People were curious and tested the mechanism of the photoelectric barrier (stairs) by waving a hand backward and forward. If the manipulation of the photoelectric barrier was mainly during baseline – as we suppose – it would have caused an underestimation of the effect.

The proportions of stair and lift use simultaneously measured by observation and automatic counters (one hour, five days per week) reveal different figures. On the one hand large movements of the arms or a bag could trigger the counter of the photoelectric barrier twice. On the other hand the lift use was registered only once regardless of how many people used it at the same time. Owing to these biases, we feel that our automated measurement methods are not the best choice, either to measure the actual frequency of the behaviour or to record the change of the behaviour between baseline and follow up.

In conclusion, our study shows that it is possible to increase significantly the use of stairs by white collar employees with a low cost "lifestyle intervention". Furthermore, our study indicates, according to the baseline data, that the attractiveness of the stairwell influences the behaviour of climbing stairs. This finding supports the concept of health promotion which relates individual behaviour to structural and environmental factors. It is of practical importance that both elements are included in the intervention programme. However, due to the possible manipulation of non-covered automatic measurements and the influence of the non-covered observer on participant's behaviour it is recommended that a solution be found for a covered evaluation of stair use in order to obtain more results.

Zusammenfassung

Interventionsmodul zur Steigerung der Treppenbenutzung am Arbeitsplatz: Ergebnisse und Evaluationsmethoden im Vergleich

Fragestellung: Wie neuere epidemiologische Studien zeigen, haben bereits alltägliche Aktivitäten, bei denen man leicht ausser Atem kommt, wie Treppensteigen, gesundheitsförderliche Wirkung. Ziel dieser Studie war, den Effekt eines Interventionsprogramms zur Steigerung der Treppenbenutzung am Arbeitsplatz zu überprüfen.

Methoden: Es wurden vorwiegend „belohnende" Aktionen durchgeführt. Das Programm wurde in vier Ämtern der Schweizerischen Bundesverwaltung mit 338 Mitarbeitern und Mitarbeiterinnen angeboten und evaluiert. Um den Anteil Treppen- und LiftbenutzerInnen vor und nach der vier-monatigen Interventionsperiode zu überprüfen, wurden zwei Erhebungsmethoden angewandt: eine nicht verdeckte Beobachtung und eine nicht verdeckte automatische Zählung.

Ergebnisse: Fasst man die Beobachtungsdaten der vier Ämter zusammen, stieg der Anteil TreppenbenutzerInnen von 61,8% auf 67,1% (p = 0,028) an. Bei der während der Beobachtungszeit parallel verlaufenden automatischen Zählung nahm der Anteil Treppenbenutzung von 68,8% auf 71,4% (p = 0,267) zu. Bezugnehmend auf die 24-stündige automatische Zählung waren die Daten weniger konsistent. Hinweise auf den Einfluss von Umgebungsfaktoren auf das Verhalten geben die Prozentzahlen Treppenbenutzung in den einzelnen Ämtern. Der höchste Anteil (86,2%) ist in einem Gebäude mit hellem Treppenhaus und niedrigen Stockwerken, der niedrigste (31,4%) in einem Amt mit dunklem Treppenhaus, hohen Stockwerken und nur mit Schlüssel zugänglich.

Schlussfolgerungen: Die Beobachtungsergebnisse unterstützen die These, dass mit sogenannten „netten" Angeboten die Häufigkeit der Treppenbenutzung positiv beeinflusst werden kann.

Résumé

Module d'intervention encourageant l'utilisation des escaliers sur le lieu de travail: résultats et comparaison entre les stratégies d'évaluation

Objectifs: Des études épidémiologiques plus récentes ont démontré qu'on obtenait un effet favorisant la santé rien qu'en exerçant des activités quotidiennes pendant lesquelles on s'essouffle légèrement, comme par exemple monter/descendre les escaliers. Le but de cette étude était de vérifier l'effet d'un programme d'intervention visant à augmenter l'utilisation des escaliers sur le lieu de travail.

Méthodes: Le plus souvent, des actions avec des „récompenses" à la clef ont eu lieu. Le programme a été soumis et évalué dans quatre offices de l'Administration Fédérale Suisse comprenant 338 collaborateurs et collaboratrices. Deux méthodes de recensement ont été appliquées afin de pouvoir vérifier la part des utilisateurs/utilisatrices des escaliers et de l'ascenseur avant et après la période d'intervention de quatre mois: une observation non cachée et un comptage automatique non caché.

Résultats: En réunissant les dates d'observation des quatre offices, la part des utilisateurs/utilisatrices a augmenté de 61.8% à 66.6% (p = 0.028). Lors du comptage automatique qui a eu lieu parallèlement à la période d'observation, la part des utilisateurs/utilisatrices des escaliers a augmenté de 68.8% à 71.4% (p = 0.267). Quant au comptage automatique sur 24 heures, les données étaient moins consistantes. Les chiffres en pour cent de l'utilisation des escaliers pour chaque office donnent des indices sur l'influence que des facteurs d'environnement ont sur le comportement. La part la plus élevée (86.2%) a été relevée dans un immeuble avec une cage d'escaliers claire et des étages bas, la moins élevée (31.4%) dans un office avec une cage d'escaliers sombre, des étages hauts et accessible uniquement à l'aide d'une clé.

Conclusions: Les résultats de l'observation soutiennent la thèse qu'avec les prétendues offres «agréables», la fréquence d'utilisation des escaliers peut être influencée de manière positive.

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