Swiss francs seem to make insured move: comparing daily and monthly financial incentives of a scalable digital health intervention

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Abstract: Despite the widely known necessity to counteract the increase in physical inactivity, only small strides have been achieved so far. Digital health interventions (DHIs) are proposed to reach both healthy and at-risk populations on a large scale. However, designing scalable DHIs that are engaging in the long term remains a challenge. Small financial incentives may help to achieve such long-lasting behaviour changes. This work, thus, investigates the effects of daily or monthly paid small financial incentives on step counts and goal achievements in physical activity. Six-month observational field data of a physical activity DHI (PADHI), offered by a Swiss health insurer, was used for this investigation. From 1‘623 contacted customers, 742 (45.7%) joined the PADHI. Step counts and times the challenging goal was reached were significantly higher in the condition of daily paid incentives. The findings from objectively measure daily step counts and goal achievements indicate better outcomes when incentives are paid daily. Further findings indicate the importance of recording various physical activities and not only step counts.

1 INTRODUCTION

Despite various attempts and approaches, physical inactivity remains an immense problem as a health risk factor. At least 20% of the world’s population is insufficiently active and doesn’t meet the recommended 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic physical activity (PA) per week (Sallis et al., 2016). Findings from further studies underline the necessity to promote PA. These findings show that PA decreases the risk of mortality (Lear et al., 2017), the risk of noncommunicable diseases such as diabetes, cancer or coronary heart diseases (Kyu et al., 2016; Lee et al., 2012, Kyu, 2016), and the cox hazard ratio of cardiovascular events and fractures (Harris et al., 2019). Western societies are increasingly becoming older. One problem of this demographic change is that older people tend to suffer longer and more frequently from sicknesses and chronic diseases. Therefore, a cost increase in healthcare is imminent and affordable and scalable changes in healthcare become inevitable.

One frequently discussed solution is the use of digital health interventions (DHI) delivered via smartphones, wearable devices, or websites (Kowatsch, Otto, Harperink, Cotti, & Schlieter, 2019). They inform individuals about their current health condition and are capable of delivering personalized interventions to the masses at low costs (Steinhubl, Muse, & Topol, 2015; Troiano et al., 2008).

However, reaching vulnerable individuals that would most benefit from DHIs remains a key challenge. However, reaching vulnerable individuals that would most benefit from DHIs remains a crucial challenge. This selection bias is even higher when participation is voluntary and not "prescribed" by a doctor (Chinn, White, Howel, Harland, & Drinkwater, 2006). Furthermore, the maintenance of these behaviour adjustments for a substantial amount of time poses a difficult challenge (Finkelstein et al., 2016). One promising approach to attract and maintain participation in DHIs is the use of financial incentives. Studies using relatively large incentive values of an average maximal amount of $ 20.75 per

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week seem to effectively change the amount of PA (Strohacker, Galarraga, & Williams, 2014). These relatively high incentives improved different objective measures of PA (Barte & Wendel-Vos, 2017), the number of times PA exercises attended (Barte & Wendel-Vos, 2017; Mitchell et al., 2013; Strohacker et al., 2014), and exercise behaviour (Mitchell et al., 2013).

Unfortunately, different studies show that after withdrawing incentives, the PA changes typically do not sustain and therefore need to be paid over a long time (Finkelstein et al., 2016; Harkins, Kullgren, Bellamy, Karlawish, & Glanz, 2017; Patel, Asch, Rosin, Small, Bellamy, Eberbach, et al., 2016; Patel, Asch, Rosin, Small, Bellamy, Heuer, et al., 2016; Patel et al., 2018). To provide these necessary financial incentives on a large scale and for a long time, a crucial feature would be to keep them relatively small (Kramer, Tinschert, Scholz, Fleisch, & Kowatsch, 2019). Quite small financial incentives having a significant impact on PA were around $1 per day (Patel, Asch, Rosin, Small, Bellamy, Heuer, et al., 2016; Shin et al., 2017; Strohacker et al., 2015). In a cluster-randomized trial study, small personal or charity financial incentives (monthly payment between CHF 5.00 to 10.00) led to an increase of PA (Kramer et al., 2019). Surprisingly, participation and reached step goals declined even while the study was running and incentives not yet withdrawn. The authors argue that incentives may need to be modified to counter this decline in participation and achieve lasting changes in behaviour. Accordingly, prior studies (Barte & Wendel-Vos, 2017; Strohacker et al., 2014); (Mitchell et al., 2013) showed relatively stable effects as long as the participants received financial incentives.

Against this background, this study aims to postulate relevant criteria for the implementation of large and scalable DHI. It investigates the differences in daily step data, attrition rate and goal achievement arising from differently placed monthly or everyday payments. In brief, the research question of this study is whether a small daily paid incentive or a monthly paid incentive leads to better results regarding a PA increase.

In the following method section, the contacted population, the developed DHI, and the analyses used to address the research question are described. Then the results of this six-month observational field study are described and discussed. Finally, implications for the design of future scalable DHIs targeting PA are drawn.

2 METHOD

This 6-month real-world study was conducted between April 1st and September 30th of 2016 in cooperation with a large Swiss insurance company. Participants, that already participated in the previous study by Kramer et al. (2019) were invited by e-mail to participate again in this current study. To participate in the study the participants needed to be at least 18 years of age, enrolled in the complimentary insurance program (see Section 2.2 below), and had to accept the terms of participation and privacy policy. Furthermore, they had to confirm currently not undergoing any medical treatment that forbid PA. Even though no eligibility criteria were defined on the canton (federal state of Switzerland) level, all participants that provided demographic information resided in a German-speaking canton. In the invitation e-mail a brief description of the initiative and a link to the insurer's platform, with more detailed information was provided. On the linked platform the participants signed up and were asked to complete a survey to collect demographic data such as gender, age, and level of activity.

2.1 Incentive Schemes

Participants received financial incentives if they reached specific daily step goals. For the first three months, participants received a monthly payment if they reached the daily step goal averaged over the entire month. They received CHF 10.00 if the average daily step of the month was above 10'000 steps or received CHF 5.00 if they achieved at least 7'500 steps per day but didn't reach the goal of 10'000 steps per day. Participants with an average daily step count below 7'500 didn't receive any financial incentive.

After three months the incentive scheme was changed. The participants received daily payments for three months if they reached the same goals as defined above. Participants reaching at least 10'000 steps per day received a payment of CHF 0.40 on that day. Participants reaching 7'500 steps per day but not 10'000 steps per day received CHF 0.20 on that day. Table 1 shows the amount of financial incentives by the goal that was achieved and the incentive scheme.

Table 1: Incentive mechanisms of Physical Activity DHI.

Averaged Daily Steps	Monthly Payment (Apr – Jun)	Daily Payment (Jul - Sep)
< 7'500	CHF 0.00	CHF 0.00
7'500 – 10'000	CHF 5.00	CHF 0.20

> 10’000	CHF 10.00	CHF 0.40

Due to these different financial schemes for the first and last three months, all participants could earn a total amount between CHF 33.00 and CHF 66.00 depending on their performance within each of the parts.

For two weeks after the first three months, no financial incentive was paid. This break arose due to a technical problem by switching from monthly to daily payments, leading to no steps being recorded within those two weeks. Unfortunately, this break resulted in different amounts of data points for further analysis. To address this, only the first 76 days within every three months of the study were used for further analysis.

2.2 Study Sample

Due to legal reasons, the PADHI could not be part of the statutory health insurance program. It could only be offered to insureds with a complimentary insurance plan. It is important to take into consideration, that 75% of all Swiss are enrolled in such an insurance plan (Eisler & Lüber, 2016).

In total 1’632 people from the previous study by Kramer et al. (2019) were contacted for recruitment.

2.3 Measures and Statistical Analysis

Participants recorded their daily steps via commercial pedometers offered by Garmin, Jawbone, or Fitbit, or a specific smartphone app by Fitbit. The app option was offered because buying a compatible pedometer, although at a reimbursed price, was the most cited reason for non-participation (41%) of participants that did not want to participate in a prior study by Kramer et al. (2019). Demographic data were in addition to the data from the pedometer measured via a self-report questionnaire.

From the provided data the average daily step count, the number of days the app was used, the last day the app was used, and the dropout rate were calculated. Depended two-tailed t-tests with and α-level of 0.05 to compare the average daily step count, and the number of days the 10’000 or 7’500 goal was reached within each of the different financial incentive scheme were used for statistical analysis.

For the initial description and some analyses, all participants, that used the app at least once and had an average step count that did not exceed four standard deviations from the mean, were included. Average step counts exceeding four standard deviations from the mean were considered a technical fault or personal manipulation. For further analyses, participants not providing data for at least 150 days of the study were excluded. This is corresponding to non-participation of more than one month. Participants were marked as a dropout if they provided no data for at least one week and did not provide any further data afterwards at any point until the end of the study. These dropouts were still included in the analysis as they provided at least 150 days of data, which can be considered to be sufficient in the remaining window of time (Guertler, Vandelanotte, Kirwan, & Duncan, 2015).

The effect of the two different incentive schemes on the number of goals achieved was calculated by a four-field Chi-Square Test, with an α-level of 0.05.

3 RESULTS

From initially 1,632 contacted insurance members 742 (45.5%) signed up and provided at least one day of data. Of these only one participant exceeded the mean number of steps by four standard deviations, leaving 741 (45.4%) participants that met this criterion. Data for at least 150 days was provided by 392 (24.0%) participants. Table 2 compares the number of participants and the dropout rate for all participants and those providing at least 150 days of data. Except the initial attrition considering the number of people that were contacted, the dropout rate within the study is 23.5% for the participants that used the app at least once and 2.6% for the participants that provided at least 150 days of data. Figure 1 shows the attrition rate for all participants of the study, the attrition by gender and age groups.

Table 2: Number and attrition of participants

	Used DHI at least once	Used DHI at least 150 times
Number of Participants at Start (Attrition from start)	741 (54.5%)	392 (76%)
Number of Participants at Monthly Inc. End (Attrition from start)	631 (14.8%)	392 (0%)
Number of Participants at Daily Inc. Start (Attrition from start)	623 (15.9%)	392 (0%)
Number of Participants at Daily Inc. End (Attrition from start)	567 (23.5%)	382 (2.6%)

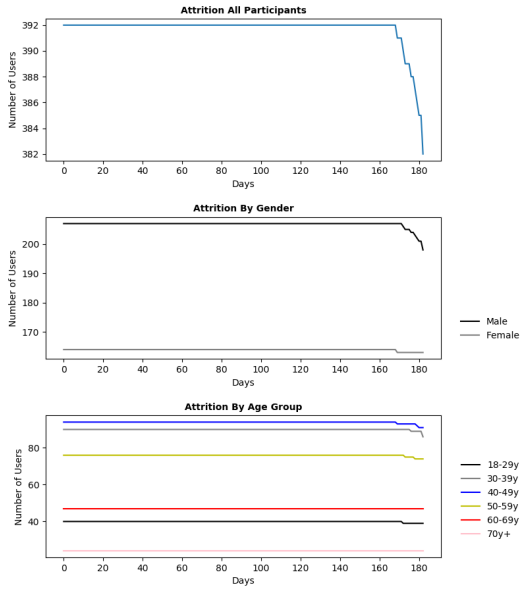

Figure 1: Attrition for all participants that used the DHI at least 150 times, and attrition for all participants that used the DHI at least once by gender or age.

The following descriptions are for the 392 participants included in the analysis. Demographic information was provided by 371 (94.6%) participants, 55.8% being males. The mean age was 46.4 (SD = 13.8) ranging from 21 to 92 years.

An overview of the analysed measures and their distribution are reported in Figures 2 for averaged daily steps and Figure 3 for reached goals within each financial incentive scheme.

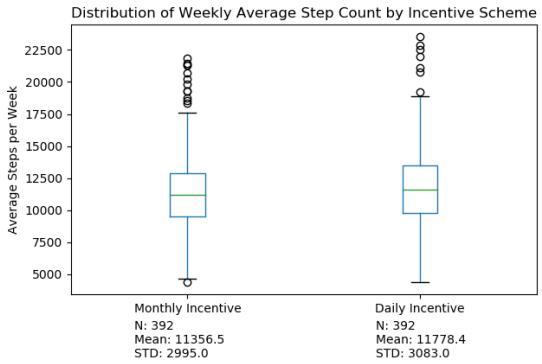

Figure 2: Distribution of weekly averaged steps counts by financial incentive scheme.

There was a highly significant increase of average daily step data from the monthly incentive payments (M = 11552.8, SD = 2962.6) to the daily incentive payments (M = 11971.9, SD = 3047.1), $t(391) = 4.85$, $p < .001$. A significant increase from the average days per week the 10'000-step goals reached from the monthly incentive payment (M = 4.1, SD = 1.8) to the daily incentive payments (M = 4.6, SD = 1.8) was observed, $t(391) = 7.48$, $p < .001$. The average number of days per week the 7'500-step goal was reached significantly decreased from the monthly incentive payments (M = 1.2, SD = 0.8) to the daily incentive payments (M = 1.0, SD = 0.8), $t(391) = 5.27$, $p < .001$.

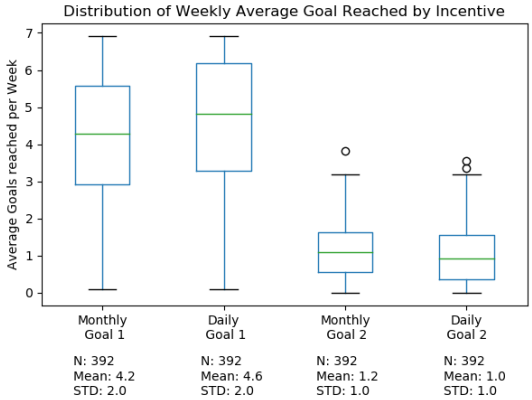

Figure 3: Distribution of Weekly Averaged Reached Goals by financial incentive scheme (Goal 1 = 10'000 daily steps reached, Goal 2 = 7'500 daily steps reached).

The number of days the 10'000 daily step goal was reached significantly differed by which incentive scheme was used, X^2 (1, N = 50'270) = 167.9, $p < .01$. The daily incentive scheme displays more days the more challenging goal was reached (19'739 number of days for daily incentives vs 17'973 for monthly incentives). The number of days the 7'500 daily step goal was reached did not significantly differ by which incentive scheme was used, X^2 (1, N = 21'863) = 0.8, $p = .39$. Figure 4 illustrates the number of days the different goals were reached and the days the goals were not reached.

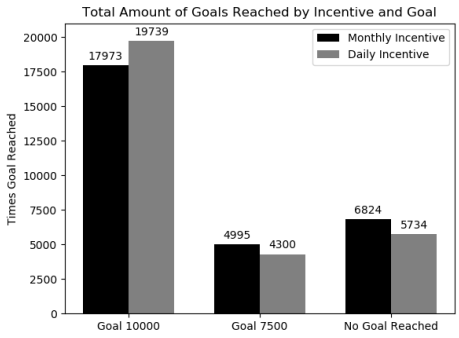

Figure 4: Times the 10’000 daily step goal, the 7’500 daily step goal, or no goal was reached by incentive scheme.

4 DISCUSSION

This study investigates the effect of different financial incentive schemes (monthly vs. daily payments) on attrition, PA (measured by the number of steps), and step goal achievements.

The percentage of people responding to the initial recruitment was fairly good (45.5%). It is important to take into consideration that participants were recruited from a previous study investigating the effect of DHIs. The number of participants that provided sufficient data (at least 150 days of data) to be analysed is in contrast low. Only 14% of the initially contacted 1‘623 participants met this criterion.

In contrast, within the 6-months of the study, the attrition rate was very low compared to the prior work by Kramer et al. (2019). Interestingly the two weeks of no financial activity had almost no drop-out effect. The attrition rate of the group that provided at least 150 days of data was only 2.6%. This finding could be important for future work as it shows that frequent users once engaged seem to consistently interact with the DHI regardless of a break in the payment of the financial incentive.

The results from analysing the average daily steps made, the average number of times the more challenging 10’000 steps goal was reached per week, and the total number of days the more challenging 10’000 steps goal was reached seem to favour the daily paid incentive. Only the average number of days per week the less challenging 7’500 steps goal was reached seems to favour the monthly paid incentives. The analysis revealed no significant difference for the total amount of days the less challenging 7’500 steps goal was achieved. Due to the fact, that the number of days the 10’000 daily step goal was reached, was higher over both financial incentive schemes it seems that participants either aim high and in turn achieve the higher goal or do not really try to reach a goal and in turn do not achieve any goal at all. For further research, it could be interesting to investigate whether providing only one goal has a positive effect due to the reduction of the complexity or if more but very challenging goals have a positive influence on PA and continuous participation. Both approaches could be supported by the theory of implementation intentions (Gollwitzer, 1999) stating that goals should be specific and challenging. Taken this tendency to reach the higher goal and the average steps made per week into account the results suggest that a daily financial incentive seems to have a positive effect on the number of steps for every day.

The findings of the current work are limited in several ways. First, it can be assumed that the contacted individuals are already relatively active due to the fact, that they participated in an earlier study that investigated the use of DHI as well and that voluntary PA initiatives, in general, tend to attract people that are already sufficiently active and show health-supportive behaviour.

Second, the findings of the current work may be country or at least region-specific. It is, therefore, possible that other countries are less or more open to the use of tracking devices and digital coaching applications.

Finally, causal inferences cannot be drawn from the current study due to the nature of the observational study design.

Therefore, the results are limited in their generalizability. They rather give interesting insights into possible future studies investigating the differences between monthly and daily financial incentive schemes that have the goal to increase physical.

5 SUMMARY AND CONCLUSIONS

Relatively small daily paid financial incentives seemed to lead to higher daily steps counts compared to relatively small monthly paid financial incentives. Participants seemed to aim for the higher goal or not bother to reach any goal on that specific day at all.

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