

Stanford University School of Medicine

Project Name ...

Exercise Advice by Human vs. Computer: Testing 2 theories

Principal Investigator ...

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Background / Significance of Problem ...

Expanding the reach of successful behavioral interventions to increase regular physical activity (PA) represents an important public health challenge, as well as an opportunity to evaluate the predictive ability of two different theories of motivation: Social Influence Theory and Self-determination Theory. Social influence approaches represent a means of enhancing extrinsic motivation (i.e., forces originating outside of the person) for behavior change, while Self-determination theory focuses on the intrinsic motivational forces of perceived competence and autonomy that can promote and potentially sustain behavior change over time.

Research Question ...

This study compared telephone counseling delivered by humans (social influence enhancement) vs. automated technology (self-determination enhancement). We randomized 218 sedentary, healthy men and women aged 55 years and older ($M=60.6$ years ± 5.5) to a telephone-based PA counseling program delivered by health educators, the same program delivered by a computerized, automated telephone counseling system, or an attention-control (health education) program. The major outcome was weekly minutes spent in moderate or more vigorous PA, measured by the Stanford 7-Day Physical Activity Recall (PAR) and validated via accelerometry. Other PA measures developed specifically for older adults (i.e., the CHAMPS PA questionnaire and the Yale PA questionnaire) were included to add to the literature concerning how sensitive to change such instruments are in the context of PA interventions. A range of self-report and health measures were also collected to evaluate potential moderators and mediators of intervention effects across the 18-month trial.

Findings To-Date ...

- [•] During the 6-month adoption phase, participants in both the health educator-delivered and automated telephone counseling programs significantly increased their PA above the 150 minutes/week recommended by the current national guidelines, while participants in the control arm remained under-active (i.e., 169, 174, and 103 baseline-adjusted mean minutes/week, respectively, $p < .02$), with no differences between the two intervention arms.
- [•] While the 7-Day PAR and the CHAMPS were both shown to be sensitive to change at 6 months, the Yale was not found to be sensitive to change. This underscores the importance of choosing instruments to evaluate change as part of a PA intervention that have a proven track record of doing so in other intervention studies.

- Preliminary 12-month results indicate that participants in the two intervention arms maintained these levels of activity.
- Exercise-specific self-efficacy (confidence) and other motivational processes increased significantly and similarly in the 2 intervention arms relative to controls ($p < .02$). These motivational processes included enlisting support for PA from family and friends, committing oneself to becoming more active, and rewarding oneself for positive improvements in PA.
- A gender x arm interaction was found for the autonomy orientation process variable at 6 months. (This variable measures feelings of autonomy and control that individuals perceive related to their physical activity program.) Women assigned to the Human Advice arm had significant increases in feelings of autonomy and control for physical activity relative to the other arms, while men assigned to the Computer Advice arm had the greatest increases in this variable relative to the other arms. Such increases may predict PA participation over time.
- Application of signal detection analysis in the exploration of baseline moderators of 6-month intervention effects support the theory-based predictions for the project stemming from social influence and self-determination approaches. Specifically, participants with initial above-average levels of social anxiety were less likely to succeed in the Human Advice arm at 6 months relative to participants with lower social anxiety levels. The success rates for socially anxious individuals were found to be higher in the Computer Advice arm relative to the Human Advice arm. Meanwhile, participants with initially low levels of controlled motivation, indicating that they preferred not to have other people tell them what to do, had higher 6-month success rates in the Computer Advice arm relative to participants with greater preferences for accepting guidance from other people.

Implications ...

[for multibehavioral and multi-theoretical approaches to behavior change]

- The results underscore the utility of automated telephone counseling systems for physical activity as an efficacious and potentially lower-cost alternative to human counseling.
- They also provide initial information related to which subgroups of individuals might be particularly successful with computer vs. human counselor. The subgroup analyses undertaken thus far support applications of the two theories in better determining which types of interventions might prove most successful with which types of people.
- Results thus far have identified potentially important mediators of intervention effects for the two programs, including physical activity-specific self-efficacy and social support, other behaviorally-oriented motivational processes of change, and perceived autonomy and control for PA change. Such mediators will be further assessed through evaluation of their predictive effects for PA participation in months 7 through 18.

Future Research Directions ...

We will evaluate the sustained effectiveness of each program through 18 months, as well as undertaking cost-effectiveness analyses. We will also continue to explore the potential matching of empirically derived subgroups to the two types of intervention approaches. The results of this research will provide important information related to the potential public health impact of different telephone-assisted PA counseling programs for different segments of the older adult population.