RAPID RESEARCH IN COVID-19 PROGRAMME

The ABC (**A**nxiety, health **B**ehaviour, and **C**ognition) of Social Distancing and Isolation:
Evaluating the Role of Technology in Remote Support

AIMS

This project had 2 aims, first to better understand the potential negative effects of social distancing and isolation. This included effects on people's health choices (such as how much sleep they got and what foods they ate), the ability to think and make decisions, and if it reduced levels of physical activity. The second aim was to evaluate how we could use mobile technology to support Scotland's population to help support physical activity and mental health.
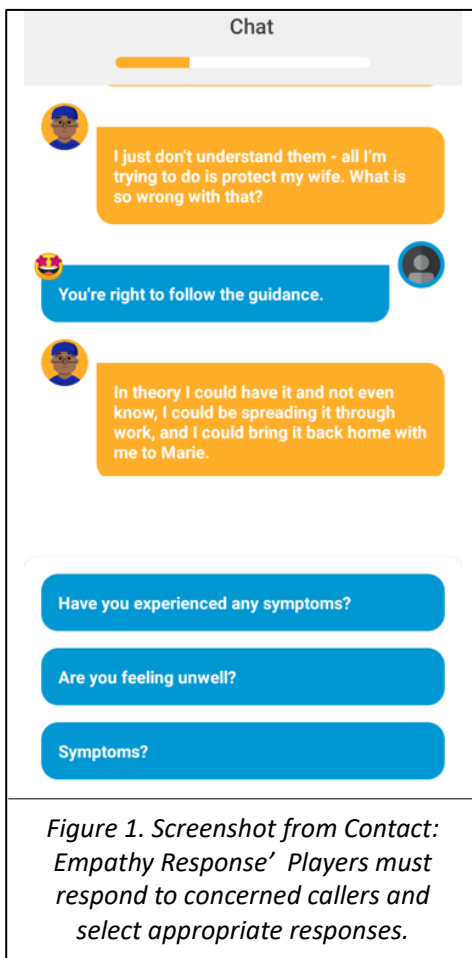
KEY FINDINGS

- Mood, the ability to think, and make decisions got worse when social isolation was imposed but improved again as restrictions were lifted. This effect was reduced for those who remained physically active.

- When compared to the equivalent weeks before lockdown individuals undertook less physical activity, and activity was less vigorous.

- Commercial activity trackers provide a 'big-data' record which can track health behaviours when restrictions are imposed too quickly for traditional research studies to be feasible.

- Serious game and 'gamification' approaches (which use game elements such as challenges or rewards to support user education) are feasible methods of teaching empathy and understanding, particularly and can allow individuals to test responses to difficult or emotionally charged topics in a 'safe space'.

- A Just-In-Time mobile App helped individuals maintain, or even increase levels of physical activity during periods of social isolation and was effective at tracking physical activity, mood, and quality of life over long periods of time.

WHAT DID THE STUDY INVOLVE?

Phase 1 Surveying the Effects of Social Distancing: We performed two surveys to investigate the effects of social distancing restrictions. In the first survey we invited members of the public to visit a study website and take part in a series of tests designed to examine how well they could perform different mental tasks such as attention, memory, decision making, learning, and time perception. We also collected information about their lives, and any changes in their health choices to see if that had any influence on how well they performed the tasks. We repeated the tests 2, 4, 8, and 12 weeks later as social distancing restrictions were eased.

The second survey assessed physical activity changes following social distancing restrictions. To do this we needed reliable measures of activity from before the start of lockdown. We recruited individuals who routinely wear activity trackers (FitBit wrist bands) which automatically record activity enabling users to build up months or years of data. Using a social media campaign, we asked Fitbit users to give their authorisation for the team to collect this data. We then compared their activity data for the first week of lockdown, with the month before lockdown and a month into lockdown. Because activity trackers allow this long-term data storage, and since seasonal weather can also affect activity levels, we also compared activity data between the first week of lockdown and the same week in 2019.

Phase 2 Evaluating Technological Support: We aimed to assess how technology could help overcome two issues that social distancing and isolation raised: reduced physical activity and empathy with others experiencing poorer mental health.

Figure 1. Screenshot from Contact: Empathy Response' Players must respond to concerned callers and select appropriate responses.

Our first project helped individuals to empathise with others struggling with aspects of the pandemic. This involved the production of a serious game designed as a mobile App called 'Contact: Empathy Response' (serious games use gaming approaches to provide training or education). We designed a narrative-styled game where the player must progress through pandemic related experiences by making decisions. The player takes on the role of a call worker at a COVID-19 helpline and works through different scenario's written by award-winning Scottish novelist Martin MacInnes and which include: an elderly woman (scared of going outside), a middle-aged man (worried about spreading virus to partner), an unknown caller who does not believe in the pandemic, and the call line support worker themselves.

At the beginning of each story, the caller is 'stuck' having been affected by the pandemic, and they don't know what to do. It is the player's task to help them by listening to their stories, asking open questions, and reassuring them, with the game encouraging patience, empathy, and understanding. The details in the callers' stories may be 'painful' or 'difficult', and the game rewards empathy via feedback and scoring that rewards responses that prioritise listening, empathy, and compassion. The only way to 'complete' the game is to listen to all of each caller's story.
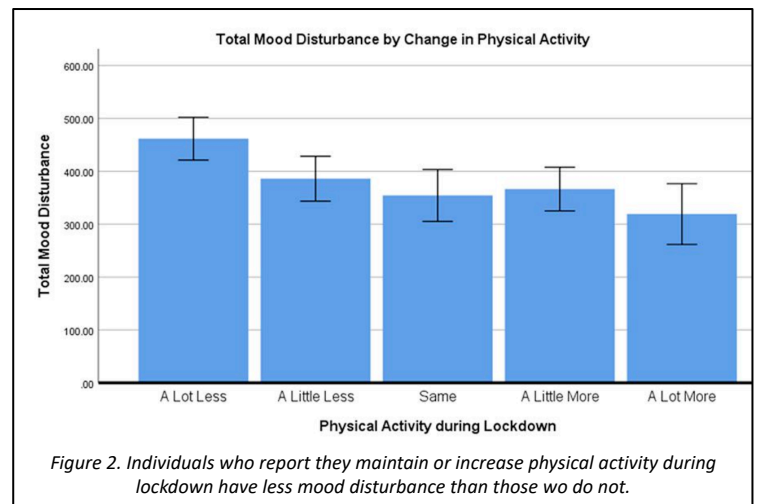
Our second project involved the development of a research led, 'Just-In-Time' (JIT) mobile App, grounded in behaviour change theory, to help older individuals maintain their activity levels despite the social distancing measures. We recruited 40 men and women over the age of 65 to take part in a 6-week study and provided them with our App ('JitaBug') to deliver our JIT programme. The App used behaviour change models including goal setting to select the type and size of their activity goal, planning and reminders for specific activities, educational information, and self-reflection of confidence and preparedness to change activity habits.

Participants were sent ongoing support messages at times where the messages would be useful. The support messages were individually tailored, using a remote server which checked each participant's progress every hour to see if they had met their daily goal. In addition, three times a day, the server would also check participants current activity data, progress to their goal, their location, and the weather at that location, resulting in a participant specific message. These where intended to be motivational, give an update on their progress, and suggest activities for later in the day depending on their local weather; for example, if the forecast was for rain, the message might suggest an indoor activity rather than going for a walk. The App also collected longitudinal research data from users in the form of questionnaires, ratings, and qualitative audio 'snippets' (short, spoken recordings by participants detailing what had helped or hindered their activity habits that day). Remote messaging was used to remind participants to complete these tasks. Finally, to see if the intervention was effective, we also collected activity data using gold standard accelerometers before and after the study.

WHAT WERE THE RESULTS AND WHAT DO THEY MEAN?

Results from Phase 1 Surveys: During lockdown mood and performance on mental tasks was worse. Those with better mood scores also reported they had maintained or improved the quality of their diet, the quality of their sleep, or who had improved the amount of regular exercise they took. As social distancing restrictions eased, participants improved their attention, memory, and decision-making ability. Interestingly, those people who were shielding did not show the same pattern, possibly because they did not benefit in the same way from the reduced restrictions. The physical activity survey found that compared to when

Figure 2. Individuals who report they maintain or increase physical activity during lockdown have less mood disturbance than those wo do not.

there were no restrictions, there was a significant reduction in the weekly step count, and weekly moderate and vigorous physical activity (MVPA) both at the start of lock down, and one month into lockdown. Participants also had fewer periods of MVPA each day.

Taken together, these findings mean that long periods in restrictive social distancing can worsen mood, health choices, decision making. These results demonstrate for the first time that this decline similar to that reported in older adults, is evident across a range of ages. These results support the concept that social interactions require mental engagement, and therefore help preserve those

abilities. Moreover, the relationship between physical activity and physical and mental health is well known. The reduction in physical activity, and in MVPA specifically, adds to the evidence that without support, social distancing and isolation may have unintended consequences for public health.

Results from Phase 2: The development of the serious game 'Contact: Empathy Response' has demonstrated the feasibility of developing a serious game App at speed, and scale. It has also demonstrated the feasibility of a narrative base game focussing on empathy and compassion, to allow players to experience the different perspectives of vulnerable groups during a pandemic. The emphasis on the Serious Game App Design will act as a framework to influence policy and development during the construction of Apps for similar purposes in the future. It will also contribute to the Serious Games Content Integration Framework and provide validation of a Serious Game Assessment and Evaluation Framework. Thus it will significantly contribute to the development of a set of principles to guide development of assistive serious game apps in a future pandemic or similar situation.

Figure 3. Screenshot from the 'JitaBug' App, to support activity during lockdown

The JitaBug study is first study to examine the usefulness of a smartphone JIT intervention in an older population. The results demonstrated that delivering a JIT physical activity intervention to this age group, using a smartphone App was feasible, and that older individuals find the approach equally as acceptable as younger cohorts. Engagement with the App was high, including completion of questionnaires, recording of 'snippets' and planning and setting reminders. Around 80% of participants met or exceeded their activity goal on at least one occasion, just under 50% did so on more than one occasion, and a quarter of participants met or exceeded their activity goals more than 3 days a week for two or more weeks of the study. We were also able to demonstrate that using this approach it was possible to run a personalised JIT program, and collect data completely remotely, with no physical meetings required. This means that the protocol is a feasible way of supporting older adults stay active during lockdown restrictions. As a result, protocol can also be used by us, other researchers, or other support groups to help older adults stay healthy.
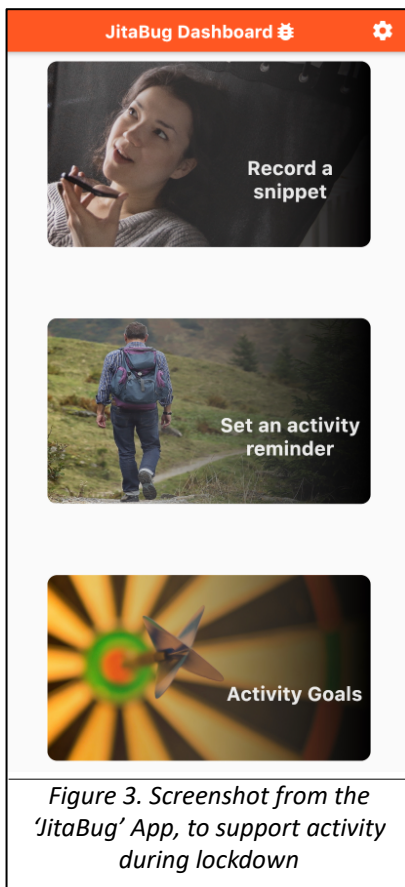
WHAT IMPACT COULD THE FINDINGS HAVE?

Our survey data has already informed policy makers, and the public, about how social distancing and isolation can affect behaviour, mood, and healthy lifestyles. This will help both groups to better plan, design, and introduce effective strategies to limit these negative effects. These findings will also focus the design of future interventions that will help individual's and their families overcome the negative consequences of social distancing and isolation.

'Contact: Empathy Response' could provide an important method of training particularly for sectors that have to rapidly scale up text or telephone support lines during a pandemic. The development process will provide a framework for future serious games developments targeting social distancing or pandemic management. Similarly, the success of the JIT trial means that it too can act as a template for researchers to design interventions aimed at supporting physical activity in older adults. The App is already being modified to provide remote support to other 'at risk' groups who experience social distancing restrictions for longer than the wider population.

HOW WILL THE OUTCOMES BE DISSEMINATED?

Some of the phase 1 survey data has already been disseminated though a journal article (Ingram, Maciejewski & Hand, 2020), with an accompanying press release, and news coverage. Three further articles detailing the impact which lockdown conditions had on cognitive function, and activity patterns are currently under review and once accepted for scientific publication we will arrange a press release to highlight the details of the research. This team are continuing this work and have won follow on funding to assess cognitive function with colleagues in Japan. Further work assessing the longer-term effects of social isolation, and the potential effects of 'long-COVID' on cognitive function are also planned.

The 'Contact: Empathy Response' App has been published on Google Play Store and Apple App Store. The evaluation of the App will result in a journal article and conference paper. The development cycle process is currently being developed as a case study for a book covering serious games development.

The JitaBug App is published on the Apple App Store, and Google Play Store. Papers in preparation include an invited commentary and two academic articles outlining the feasibility, acceptability, and effectiveness of the intervention.. The App is under active development, has been adapted to increase the types of data that can be collected, and has formed the basis of several follow-on funding applications in Scotland and the UK. Future work will also seek to use the App, and the intervention protocol to support the physical activity in other at risk or shielding groups.

CONCLUSION

While social distancing is a necessary it also has some unavoidable consequences. Increased isolation worsens mood, reduces how effectively we can think and make healthy choices, and makes it difficult to get enough physical activity. While these issues appear to reduce as restrictions ease, sustained periods of lockdown will require strategies which will limit these negative consequences, but which can also be delivered remotely. We have demonstrated two approaches that could be effective using mobile technology. Using a serious games approach, an educational app can be used to help improve empathy and understanding in individuals and organisations. Similarly, Just-In-Time approaches, allied to tried and tested psychological techniques such as goal setting and planning, can help improve the amount of physical activity in older adults. Both these approaches show potential for aiding in future periods of social isolation, and both could be adapted to provide support in other groups or conditions.

RESEARCH TEAM & CONTACT

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Generation of JIT Messages.

The central server collects each users self-selected goal and latest location from their Firebase data store.

The users live activity data is collected and compared to their chosen activity goal.

The user location is used to identify the weather forecast for the next 6 hours.

By identifying how much of their goal they have achieved, and their local weather, a personalised message is selected and sent.
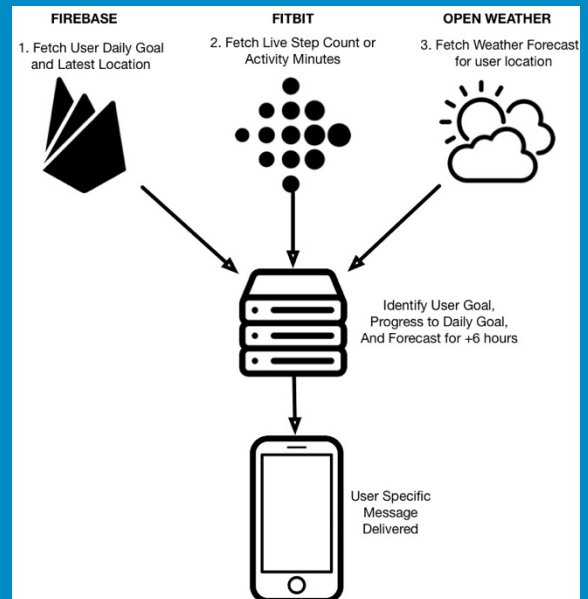
ADDITIONAL INFORMATION

This project start: March 2020 completed: November 2020. Funding: £128,882