On Cell Phones and Punishment: Encouraging Secure Mobile Behavior Through Morality

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Motivation

With many users personally owning a variety of capable mobile devices, considerable pressure emerges for employers to embrace organizational BYOD (Bring Your Own Device) policies. Unfortunately, the diverse array of smart mobile devices and the resulting interplay arising from employee roles and privileges makes enforcement of BYOD policies decidedly non-trivial.

Approach

To study user behavior related to smart phone security, we provided Android Nexus S smart phones along with an unlimited data, texting, and mobile-to-mobile minutes plan to 200 incoming freshman students. A data collection system was developed which collected statistics on how the phone was being used (e.g. amount of data being used, number of text message) as well as the current phone state (e.g. using a screen lock, etc).
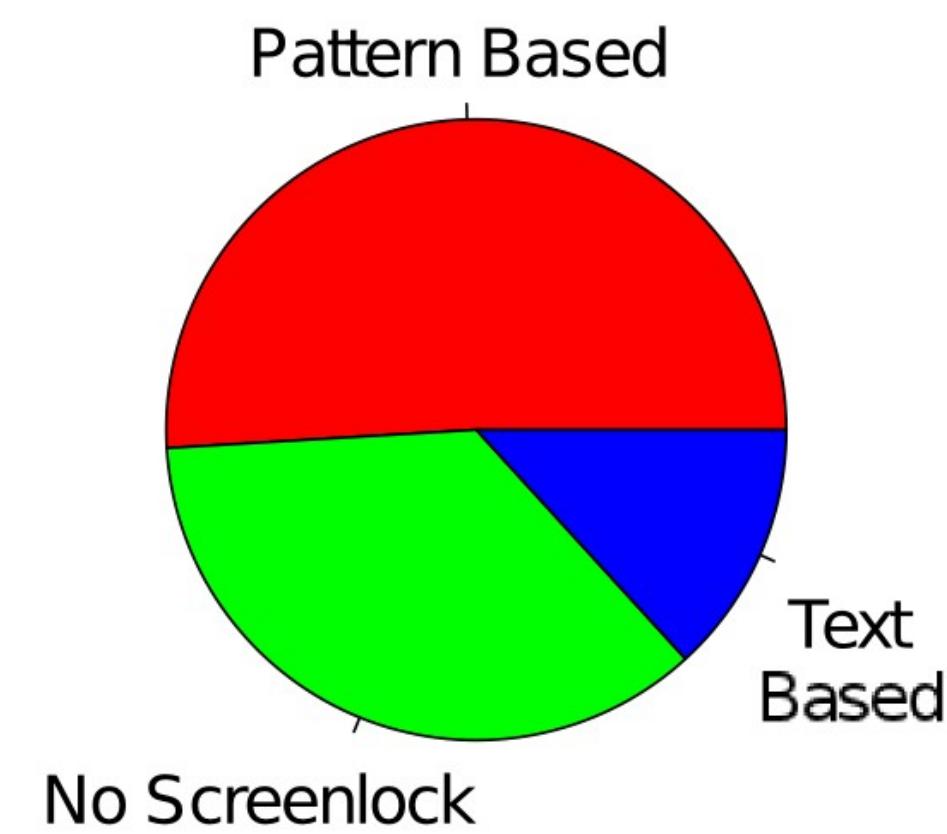
Screen Locks

Locking the screen on a smart phone is a basic first step to securing the information on the device. Therefore it is a good baseline security metric to collect and analyze.

Android provides two types of screen locks for users to choose from as shown below. These methods include text-based passwords similar to that used on a standard computer and pattern-based screen locking application that consists of a 3x3 grid of dots.
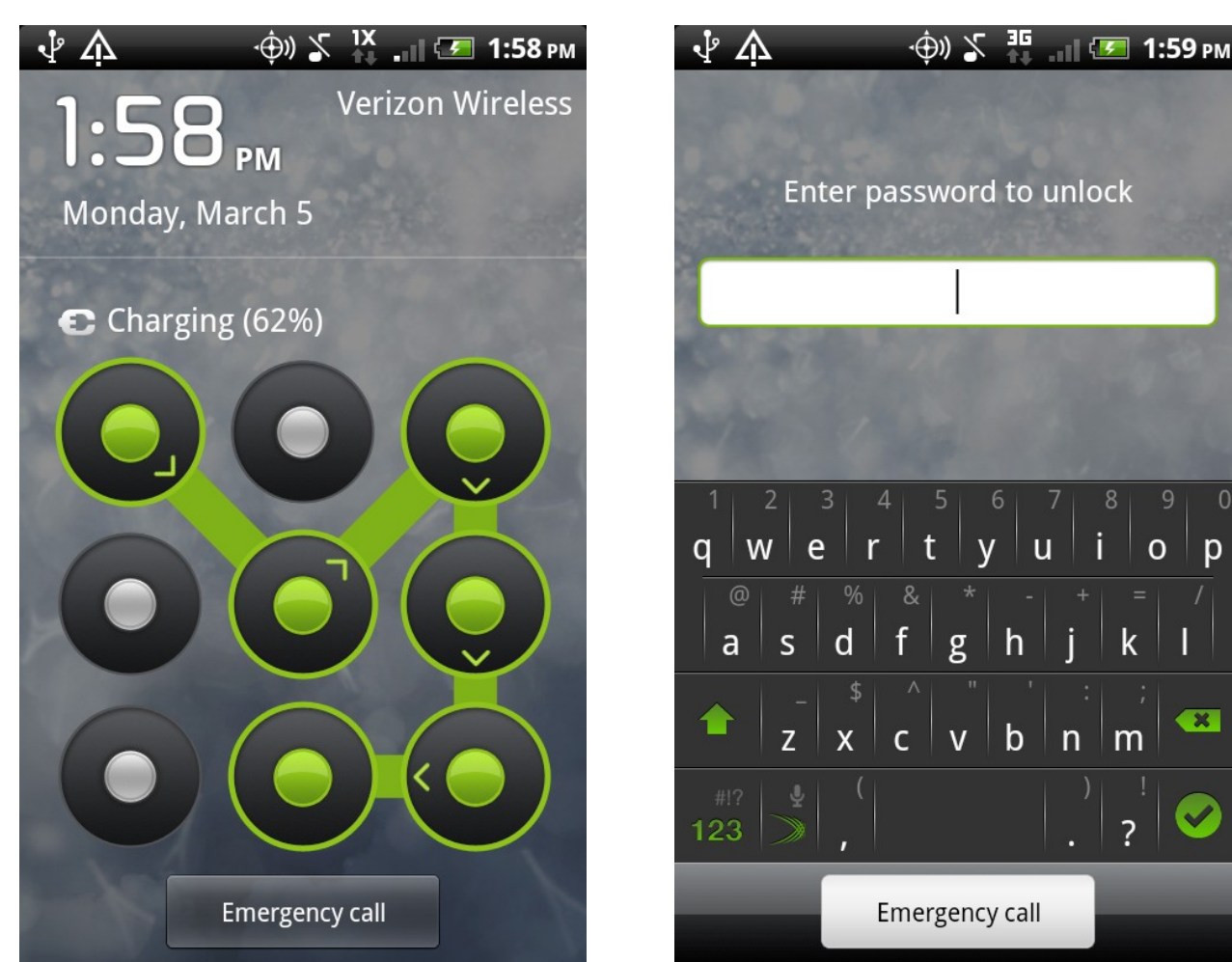
"IMPORTANT: Notre Dame believes that all student, faculty and staff info on digital devices should be secure. The right thing to do is to add a password to your phone so as to comply with this requirement. Visit this link for more information. [bit.ly]." - Morality based intervention message
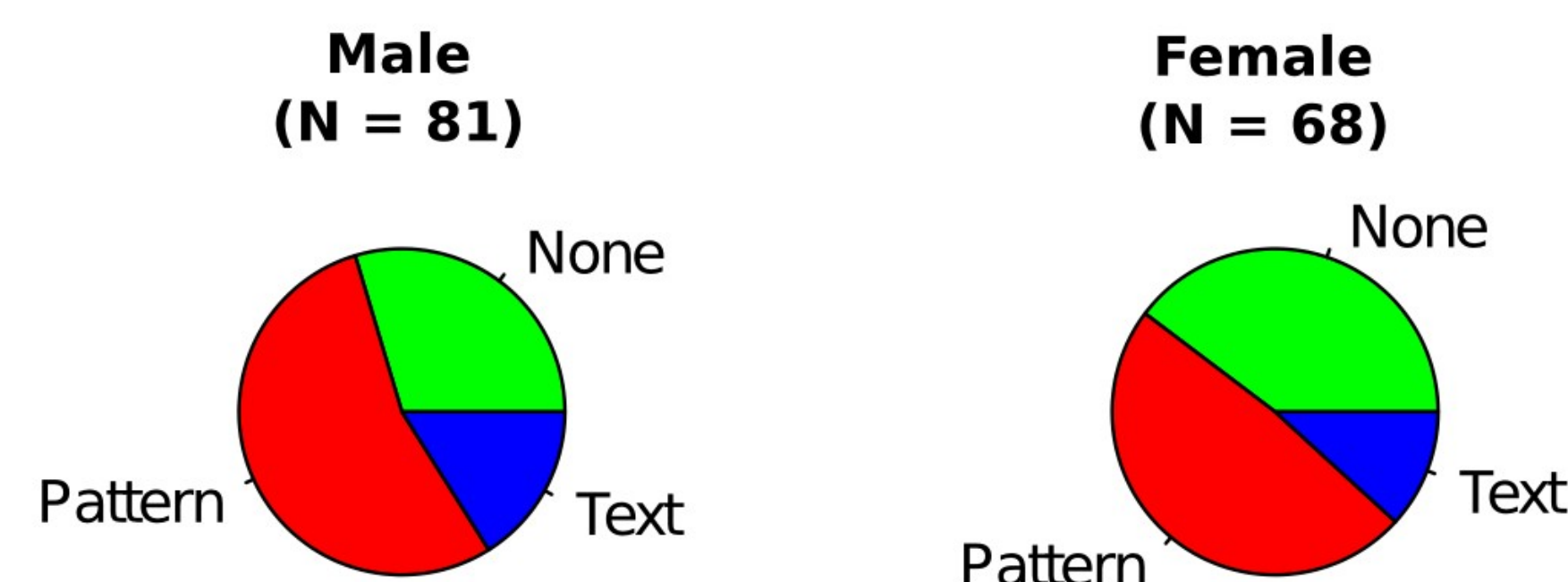
Overall Initial Usage

Overall Screen Lock Usage: Almost two-thirds used some type of screen lock.

Initial Usage by Gender

Screen Lock Usage by Gender: Males were more likely to utilize both types of screen locks.

Initial Usage by Previous Phone
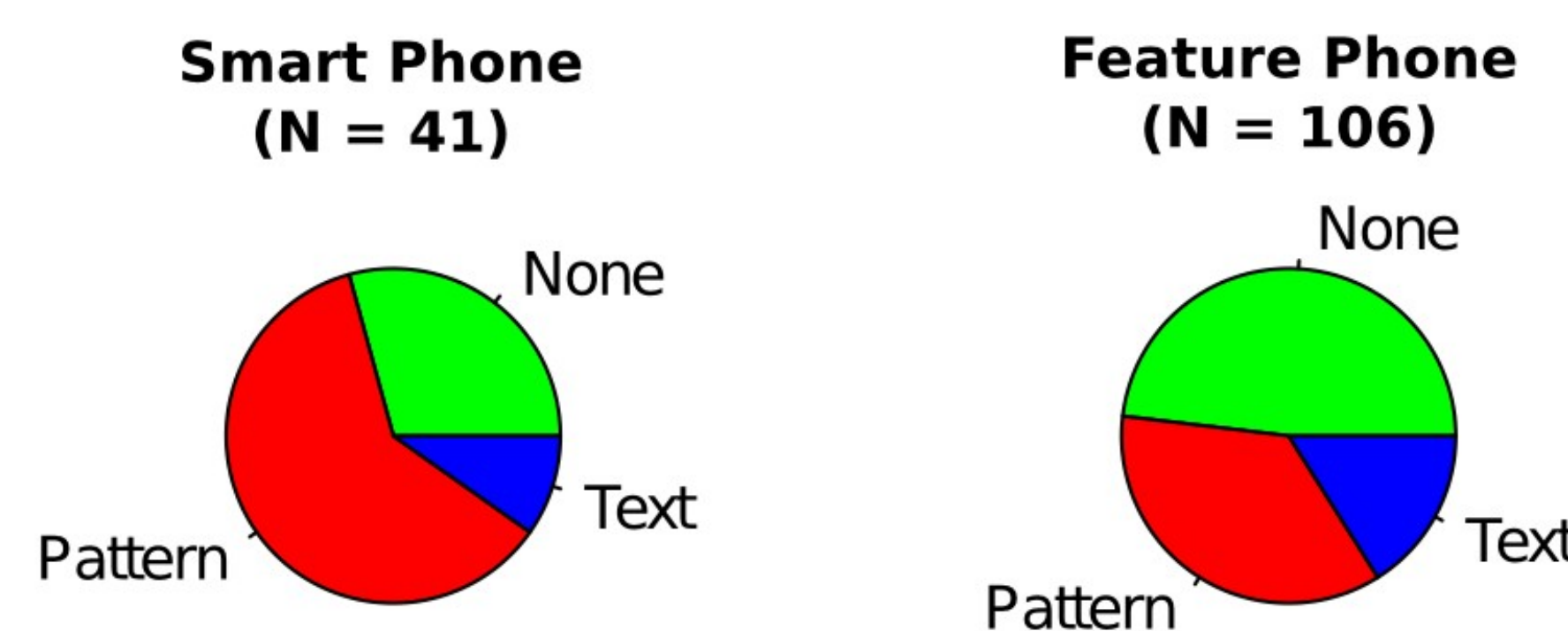
Screen Lock Usage by Previous Phone: Users who previously owned a feature phone were less likely to use a pattern lock but were more likely to use a text based lock.

Intervention Study

Two subgroups of the population were targeted for intervention: users who were not using either of the screen locks (N = 48) and users who were employing only pattern-based screen locks (N = 81). Intervention messages were based on the principles of deterrence, morality, and incentives. Both of the subgroups of participants were divided into four subgroups each, one for each type of intervention approach and a control group.
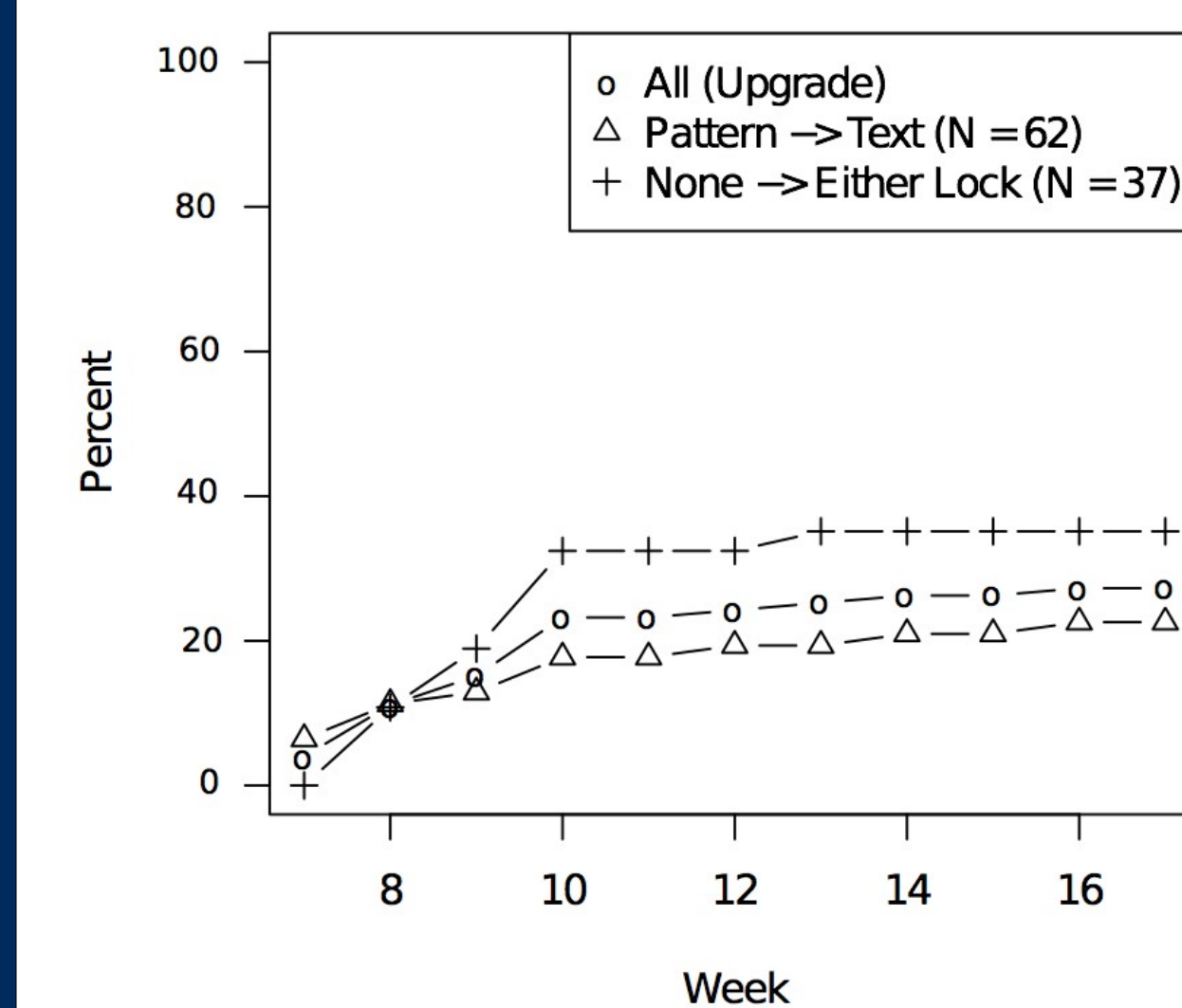
Intervention messages were designed to be sent as text messages to the same devices from which the data was being collected and were sent to the participants of each of the test groups once per week for five weeks. After the four reminders were complete, an additional five weeks were left for observation to see if any further changes would occur including regression.
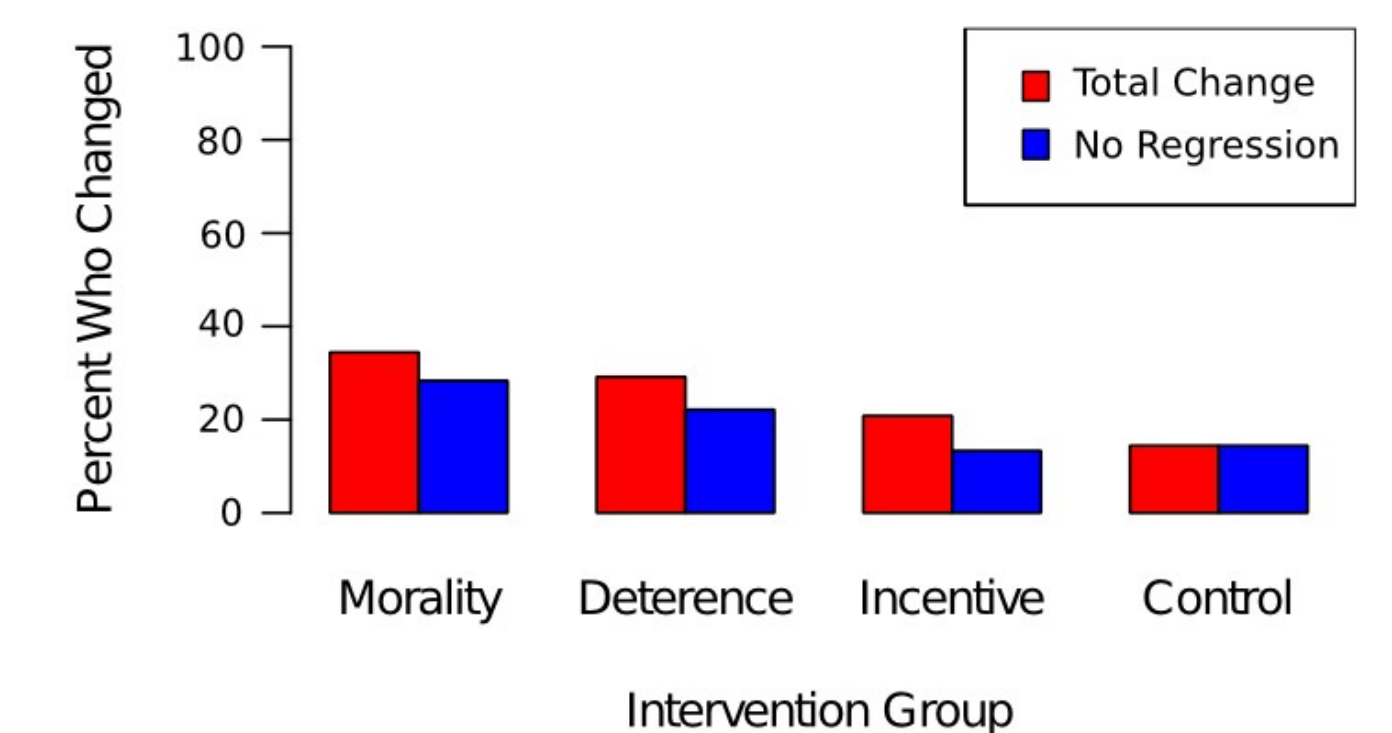
Results

Cumulative Change Over Time

The likelihood of users who employed a pattern-based screen lock to change was much lower than that of users with no screen lock. This is an important point indicating users with even minimal security practices are less likely to change their behavior than are non-security aware users.

Total Change vs. No Regression

Morality was the best intervention technique with almost 40% of users who received the message changing and over 30% retaining better security practices.

Conclusions

Although our findings point to the rising workforce as being more conscientious of security by virtue of locking their phone more than the baseline population, the fact that nearly one third of our user population did not lock their phone was still worrisome from a security perspective. The most critical finding of the work though was that users were unlikely to change their screen locking behavior once established.