Motivating Healthcare Workers with Mobile Learning Applications

Sorayma Piron
S4551966
Master Psychology: Behaviour Change
Research Paper
Internal Supervisor: Thijs Verwijmeren
Company: MeduProf-S
External Supervisor: Willem van Prooijen
Radboud University Nijmegen
19th of August, 2022
Word count: 7559

Abstract

This study investigated the intention to use a mobile e-learning application to stay up-to-date with current healthcare knowledge in two hospitals in rural Egypt. Since healthcare knowledge keeps changing, it is important for healthcare workers to stay up-to-date for the safety of healthcare workers and patients. This study looked at the validation of a process model to look at the variables that influence the intention to use a mobile learning application. Furthermore, this study tried to motivate healthcare workers to intend to use a mobile e-learning application in the future by hanging up posters that uses several Behaviour Change techniques. A regression analysis was performed and gave insight in the effects of the variables on the dependent variable of the intention to use a mobile learning application. Through a pre-measure and a post-measure in the two hospitals, the experimental group (with posters) and the control group (without posters) were compared to see if there was a significant effect. The results from the regression analysis showed that two variables had a significant effect on the intention to use a mobile learning application: colleague use and urgency. The results from the ANOVA analysis showed that the intervention with the poster did not have a significant effect on the intention to use a mobile e-learning application in the intervention group compared to the non-intervention group.

Keywords: mobile e-learning application, behaviour change, healthcare

Education has changed in recent years into education with more technological aids (Banday et al., 2013). Examples of technological aids are mobile learning applications, online courses and other web tools (Banday et al., 2013). Although more schools try to integrate technological aspects into their programs, not a lot of research has been done on the usage of mobile learning applications for staying up-to-date with knowledge after individuals finished their education (Martin & Ertzberger, 2013). Mobile learning applications can be a good aid in staying up-to-date with current knowledge on all kinds of topics.

Education uses mobile learning applications because it has multiple benefits. First of all, educational content is easily accessible for students, whenever and wherever they want (Criollo-C et al., 2018). This gives students the opportunity and freedom to learn more in a shorter time span since they can devote their time more efficiently (Criollo-C et al., 2018). This way, students are not dependent on the set school times anymore but are free to choose when and where to study; it gives them a lot of flexibility. Secondly, adding mobile devices to traditional teaching also includes aspects such as collaboration and motivation which now will be explained (Campanella, 2012).

Collaboration takes place in the form of feedback and tips for the use of mobile learning applications by sharing mutual goals. Collaboration can be beneficial because it enhances communication between students and teachers. It thus creates a bond and it improves mobile learning applications during the usage process.

Furthermore, motivation increases when learning through mobile learning applications can be combined with games to make learning more fun. When learning becomes more fun to do, students might be more motivated to learn and continue learning (Campanella, 2012).

Another benefit of using mobile learning applications is the universality of it (Jiugen & Ruonan, 2016). All students are able to use mobile learning applications anywhere and anytime; the content is the same for all students using the same mobile learning application as well. It also gives the opportunity for long distance education.

Literature shows that schools already integrate mobile learning applications into their programs. However, there is not much known about the use of mobile learning applications in the working field of healthcare. Also, when it comes to working in healthcare, there is a discrepancy between medical science changes and healthcare changes (Wickramasinghe & Schaffer, 2006). This means that the changes and developments made in medical science, do not always reach the practicalities in healthcare changes. When a healthcare worker does not stay up-to-date with current guidelines and information, this can lead to doing tasks insufficiently and this can have a negative impact on the patient (Wallin, 2009).

Because of the developments made in medical science, it is important to stay up-to-date with current knowledge after education. It can be problematic when healthcare workers are not up-to-date with current knowledge since new regulations and safety guidelines change with current events. For example, the recent pandemic of COVID-19 had specific safety guidelines that kept changing as well; the handwashing protocol was revised as well. For healthcare professionals and patients, it is important that healthcare professionals stay up-to-date with their knowledge and new demands on healthcare and keep studying current healthcare knowledge to provide the best healthcare possible and prevent mistakes (Christensen et al., 2009; Mohrman et al., 2012). Mistakes due to not being up-to-date with current healthcare knowledge can include spreading of diseases, not detecting illnesses or even death. It is thus extremely important for healthcare workers to be up-to-date with developments made in medical science.

There are numerous ways to educate healthcare professionals; one option is to use mobile learning apps to stay up-to-date with current healthcare knowledge. Mobile learning apps are increasingly used among students and students' intention to use mobile learning apps is high (Ansari & Tripathi, 2017; Camilleri & Camilleri, 2020). Organizations see the benefits of mobile learning applications as well and start to train their employees with mobile learning applications (Ally et al., 2013). However, the lack of research on using mobile learning applications suggests that healthcare has not yet integrated the use of these applications to stay up-to-date with current healthcare knowledge.

The benefits of mobile learning applications found in education, can be expected to

also be found in healthcare. Firstly, flexibility would help healthcare workers to obtain current healthcare knowledge whenever and wherever they want; during their workday and outside their workday. This flexibility might be beneficial since healthcare workers get the freedom to study on moments that suits them best instead of mandatory moments.

Secondly, collaboration to improve the mobile learning application together might take place as well. This can be beneficial for the communication between healthcare workers since they are working on the same goal; namely improving a mobile learning application together. Also, for the process of a mobile learning application itself it might be beneficial when there is room for improvement and feedback from healthcare workers who use the mobile learning application to make the application more suitable for healthcare workers. Thirdly, when mobile learning applications include fun aspects to make learning more fun, healthcare workers might get more motivated to keep learning in the future as well. Lastly, the universality of the mobile learning application ensures that healthcare workers can use the same content anywhere and anytime. This includes healthcare workers from different hospitals in different cities. This is important so the standard quality of care should be at the same level throughout the country to provide equal healthcare to all patients.

So far, it is clear that using mobile learning applications have a lot of benefits when it comes to processing new knowledge. However, even though it is important for healthcare workers to stay up-to-date with healthcare knowledge (Christensen et al., 2009; Mohrman et al., 2012), healthcare does not use mobile applications yet. This study investigated the intention to use a mobile learning application to improve current healthcare knowledge with healthcare workers. The goal of this paper is thus firstly to predict the intention to use a mobile learning application, and secondly to design an intervention to increase the intention to use a mobile learning application.

This research begins by explaining the predictors of the behaviour of using a mobile learning application. A process model of these predictors has been designed that will be tested in the first part of the study to predict the intention to adopt a mobile learning application (See Figure 1). The second part of the study includes an intervention that incorporates the variables that might have an effect on the intention to use a mobile learning application. The intervention is aimed at increasing the level of intention to use a mobile learning application among healthcare workers. The research question of this study is ‘What are predictors of the intention to use a mobile learning application to stay up-to-date with current healthcare knowledge and how can we motivate healthcare workers to use a mobile learning application?’. Next, the process model will be explained by describing the variables individually, starting with the dependent variable ‘Motivation’.

Motivation

Motivation is an important predictor of behaviour for healthcare workers to use a mobile learning app to stay up-to-date with current healthcare knowledge, according to Michie et al. (2011). Motivation can be explained as a psychological process towards accomplishing personal and organizational goals (Bhatnagar et al., 2016). It is often the case that after finishing studies, individuals do not keep up with current knowledge, even though research on healthcare is growing (Balas & Boren, 2000).

Motivation can be divided into intrinsic motivation and extrinsic motivation. Intrinsic motivation comes from a desire to learn a topic because it interests the learner, for self-fulfilment, pleasure and to achieve a mastery of the subject; the work itself is enjoyable (Gottfried et al., 2001). Intrinsic motivation is thus the motivation to do something for the enjoyment of the task itself without any consequences from doing the task, like rewards or punishments.

Research has shown that intrinsic motivation to learn is associated with better performance amongst high school students and college students in Canada and Sweden, compared to extrinsic motivation (Taylor et al., 2014). In the case of healthcare workers, this can mean that when healthcare workers are intrinsically motivated to stay up-to-date, they enjoy the task of studying itself and might have better work performances as well (Muthuri et al., 2020). Intrinsic motivation will also lead to keep seeking out current knowledge since the act of studying itself interests the healthcare worker (Ryan & Deci, 2020).

On the other hand, people with higher extrinsic motivation are more concentrated on accomplishing a certain result or outcome (Gaber & Moustafa, 2015; Henderlong & Lepper, 2002). According to the Self-Determination Theory, extrinsic motivation can be divided into four different types; external regulation, introjected regulation, identified regulation and integrated regulation. First of all, external regulation is behaviour through rewards and punishments and is thus non-autonomous; someone's behaviour is dependent on external factors.

Secondly, introjected regulation is a form of motivation that is partially internalized. Introjected regulation does not have the external factors of external regulation but behaviour is driven by internal rewards like success and achievement (Ryan & Deci, 2020). Both external regulation and introjected regulation are seen as controlled and non-autonomous forms of motivation since both forms are influenced by outside factors (rewards and internal rewards).

The other two types of external motivation can be seen as autonomously. Identified regulation explains a person's motivation through consciously identifying with or personally endorsing the value of a task. This shows a somewhat high degree of willingness to behave in that way. Even more autonomous however, is integrated regulation. With integrated

regulation a person also identifies with the value of a task, but on top of that also integrates their core interests and values with completing that task. Again, autonomous extrinsic motivation differs from intrinsic motivation even though it shares similarities with each other.

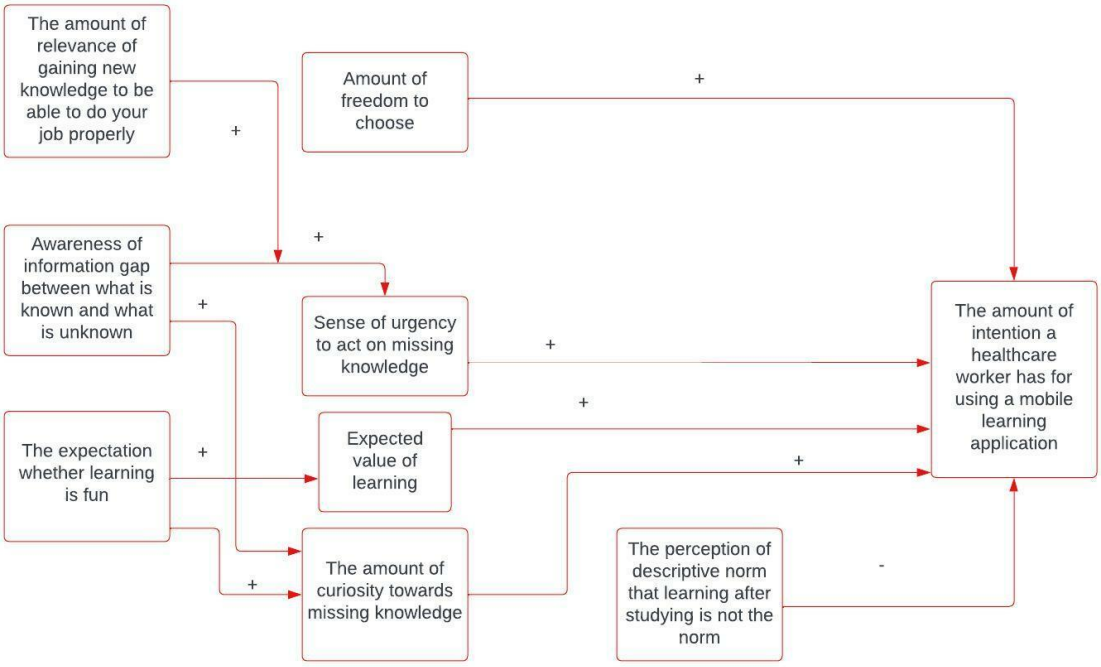
Intrinsic motivation is solely based on interest and enjoyment of the task, without having any value attached to doing the task. With autonomous extrinsic motivation it can also be the case that a person values doing the task without actually enjoying the task. In the case of a healthcare worker, this means that a healthcare worker values staying up-to-date with healthcare knowledge, but does not actually enjoy the task of learning in itself; this is thus called autonomous extrinsic motivation.

This research focused on intrinsic motivation because intrinsic motivation is an important predictor of sustainable behaviour; when an individual is intrinsically motivated, their behaviour does not depend on external rewards to behave a certain way and they are thus continuing their behaviour for their own personal interest (Deci, 1971). The intrinsic motivation will spark curiosity towards new healthcare knowledge, purely because a healthcare worker enjoys gaining new knowledge and is curious to know more about new healthcare topics. Curiosity in itself is a drive for behaviour; individuals are interested in gaining information about subjects they like and avoid information about subjects they do not like (Golman & Loewenstein, 2013).

This research focuses on six predictors of motivation to use a mobile learning application; the information gap, the degree of freedom to choose, social norms, urgency, curiosity of learning and relevance (See Figure 1). In this case, motivation is described as the intention to use a mobile learning application.

Figure 1

Process Model with Predictors on the Outcome Variable



Note: The arrows indicate the direction of the relationship between the factors. The + sign means that there is a positive effect of one factor on another. The – sign means there is a negative effect of one factor on another. For example, when the awareness of information gap between what is known and what is unknown is high, it increases the amount of curiosity towards missing knowledge.

The process model mentioned above can be mostly divided into the two forms of motivation, namely intrinsic and extrinsic motivation. The upper part (amount of freedom to choose, relevance and information gap) can be seen as mostly extrinsic motivation since these are influenced from outside the individual. The lower part of the process model (learning is fun, expected value of learning, the amount of curiosity) can be seen as mostly intrinsic motivation. The two forms of motivation can be seen as 'What I need to learn' (extrinsic motivation) and 'What I want to learn' (intrinsic motivation). The descriptive norm cannot be described as either intrinsic or extrinsic. The descriptive norm however is still an important factor for behaviour because of the social influence individuals have on each other, especially in hospitals, where there is a clear medical hierarchy (Kobayashi et al., 2006; Walton, 2006). Next, the six predictors of motivation will be explained and their relationship with motivation.

Social norms

A first factor that plays a part in the amount of motivation a healthcare worker feels

towards using a mobile learning app is the norm to stay up-to-date with current healthcare knowledge and to use a mobile learning app. Social norms are guidelines of how an individual ought to behave. Cialdini (1990) describes two forms of social norm: injunctive and descriptive norms. Injunctive norms are about what someone should do. Descriptive norms describe what the majority of people do. Deviating from the social norm gives feelings of emotions like guilt and embarrassment which people try to avoid as much as possible by conforming to the social norm to create and maintain social relationships (Cialdini, 2004; Jankowski & Takahashi, 2014). Since these negative emotions of guilt and embarrassment are unpleasant, people will avoid deviating from the social norm.

It is important to see what impact social norms have on studying with healthcare workers to see if social norms can motivate healthcare workers to use a mobile learning application. This research will increase knowledge about the role of social norms on intention to stay up-to-date with current healthcare knowledge. The focus thus lays on the descriptive social norm: what most people do.

Some interviews took place among hospital owners and doctors. An explanation that was given for not keeping up-to-date with current knowledge was the social norm. Hospital owners and doctors explained that after healthcare workers are done with their study, it is not often the case that healthcare workers keep studying or staying up-to-date with knowledge. If other healthcare workers find it normal to stop studying after their studies, healthcare workers feel less inclined to act towards this norm and thus will feel less motivated to use a mobile learning application since nobody else uses it or finds it relevant or helpful (Cialdini, 2004; Jankowski & Takahashi, 2014).

In this case, it means that if the social norm says that it is not common for healthcare workers to study after finishing their studies, it is unlikely that healthcare workers will put in effort to go against this norm since this might lead to negative emotions. Healthcare workers might feel unpleasant when they feel like they are going against the social norm on their own and thus will be less likely to put in effort to study after being finished with studying.

As has been mentioned above, social norms do not fit well in the distinction between intrinsic and extrinsic motivation. It is however a strong factor in behaviour. Especially in hospitals there exists a clear medical hierarchy (Kobayashi et al., 2006; Walton, 2006) which can determine the behaviour in the hospital.

The degree of freedom to choose

A second factor is the degree of freedom to choose, which also plays a role in the intention to use a mobile learning application. The degree of freedom to choose, also called autonomy, refers to the freedom someone feels towards making a decision (Ryan & Deci, 2020). The current study refers to the degree of freedom to choose as the level of freedom a

healthcare worker feels towards choosing to use a mobile learning application or not. When someone tells the healthcare worker to use a mobile learning application (their boss for example), the healthcare worker might feel resentment towards using the mobile learning application since it is not their choice to make and their degree of freedom to choose is thus low.

Restriction of freedom, also called reactance, triggers resentment. Reactance makes motivating healthcare workers to use the mobile learning application harder because the healthcare worker will try to re-establish their own freedom in response to reactance (Brehm, 1966). Healthcare workers might try to re-establish their freedom by not using a mobile learning application. Reactance is independent of the content and is purely focussed on the option to choose and feelings of freedom to choose (Worchel & Brehm, 1970). Reactance is an unpleasant motivational state which oftentimes leads to behaviour to regain their freedom (Steindl et al., 2015). In the case of a healthcare worker, this means that when a healthcare worker feels reactance towards using a mobile learning application, this can lead them to behave in the opposite direction to regain their freedom, namely not using a mobile learning application.

When the degree of freedom to choose is low, this can be seen as an external motivator since the message they receive is ‘I need to use a mobile learning application because my boss says so’. When the degree of freedom to choose is high, this can be seen as an internal motivator since healthcare workers can choose themselves if they want to use a mobile learning application or not. In that case, it is more about ‘I want to use a mobile learning application because I enjoy it’ or ‘I want to use a mobile learning application because I think it is important’. The latter one is more like the integrated regulational form of external motivation.

Urgency

A third factor is urgency. Urgency can be defined as the level to which someone feels the need to have instant attention to a certain incentive (Mitchell et al., 1997). Urgency leads to greater performance compared to less urgent messages because urgency triggers a need to act towards a message (Desai, 2010). In the case of healthcare workers, this might mean that when they feel a certain urgency towards staying up-to-date, they are more inclined to act upon that urgency. Kotter (1996) proposes that urgency is the first step and that urgency is necessary for change. Urgency thus calls for immediate action through importance of the message (Kotter, 1996). Urgency is an extrinsic motivator since it is about needing to learn something because it is important. It has little to do with wanting to learn something. When we feel a sense of urgency, we have a strong sense of having to act upon it. This is out of need instead of out of desire to act.

Curiosity of learning

The fourth factor is curiosity of learning. At birth, individuals have an innate curiosity towards learning from their environment. Curiosity can be seen as a motivational drive towards learning (Binson, 2009). Curiosity keeps individuals internally motivated to keep learning for the sake of gaining more knowledge (Binson, 2009).

An experiment by Kang et al. (2009) showed that inducing curiosity led to higher recall levels than with low levels of curiosity. As has been mentioned before, curiosity plays a part in the information gap as well; curiosity can be caused by the discrepancy between what one knows and what one does not know (Loewenstein, 1994). Improving learning through curiosity has important implications when it comes to increasing the level of intention healthcare workers feel towards using a mobile learning application to stay up-to-date.

At the same time, curiosity can be linked to enjoyment of learning. When there is intrinsic motivation to learn, thus enjoyment of learning, this gives a higher chance of curiosity towards learning as well (Singh & Manjaly, 2022). Curiosity towards learning in itself can be seen as an intrinsic motivator as well because it is about wanting to learn something and enjoying the act of learning instead of having to learn something.

For curiosity to occur, it seems logic that the individual needs to be aware of an information gap between what one knows and what one does not know. Without this awareness, curiosity might not take place because the individual already knows. For healthcare workers to get curious about learning, it is important that they come across information that they do not know yet. Apart from the information gap, relevance can also strengthen the curiosity towards learning but is not necessary for curiosity to occur.

Relevance

The fifth factor is relevance. A study by Kember et al. (2008) found that students were more motivated to learn when the relevance of the content was clear. Students replied that applying theory to practice was motivating; teaching abstract content was demotivating for learning. This shows that students find relevant information that can be applied more motivating. Relevance is a broad concept and can work on several subjects, namely on the topic itself, local relevance, which shows the relevance of your own environment, and relevance to everyday applications (Kember et al., 2008).

For healthcare workers it might be expected that relevance also plays an important role in motivation. Relevance can be established by applying new knowledge to practice and by giving concrete examples of the (un)desired behaviour. This way, healthcare workers might see the benefit of staying up-to-date with current healthcare knowledge because it is relevant for their work. It is possible that relevance is an extrinsic motivator since it is about

needing to act on it instead of wanting to act on it. If something needs to be relevant in order to act upon, it is not for the pleasure of learning itself.

The information gap

The sixth and last factor is the information gap. The information gap is the gap between what one knows and what one does not know. Awareness between what a person knows and does not know is necessary to learning (Loewenstein, 1994). Awareness of the information gap between what healthcare workers know and what they do not know will activate curiosity towards gaining new healthcare knowledge and will also activate a sense of urgency to act on this missing knowledge (Golman & Loewenstein, 2013).

A mediating factor with the awareness of the information gap between what healthcare workers knows and what they do not know is a sense of relevance (Golman & Loewenstein, 2013). Healthcare workers need to see that gaining new knowledge is relevant for their work performance and general knowledge to have the motivation to act on it. This sense of relevance will strengthen the urgency to act on the discrepancy between what healthcare workers know and what they do not know (Scot, 2021).

The information gap should not be too big, because if the gap is large, a person would not focus on the information gap but on what one does know and thus will not try to fill in the information gap (Loewenstein, 1994). When the information gap is smaller, this increases curiosity and the person will focus on the information gap and how to fill the gap (Loewenstein, 1994).

Awareness of the information gap can be extrinsic, because of a feeling of needing to learn. It can also be intrinsic, because of the feeling of wanting to learn more.

The intervention

So far, this paper looked at the psychological factors that might have an effect on the intention to use a mobile learning application among healthcare workers (See Figure 1). After validating this process model, an intervention took place with the goal of increasing the level of intention to use a mobile learning application. Hypothesis 1 states that the intervention group will have a significantly higher score on the intention to use a mobile learning application at the post-measure compared to the pre-measure. Hypothesis 2 states that the intervention group scores significantly higher on intention to use a mobile learning application compared to the control group at the post-measure.

The intervention consisted of a cartoon poster in which three behaviour change aspects were included, namely the information gap, enjoyment of learning and social norms. These three aspects were chosen because of substantial research pointing into the direction that these three have a big impact on motivation; these will now be explained (Ortiz-Neira, 2019; Ridout & Campbell, 2014). The poster itself mentions a non-existent mobile learning

application because there is no existent mobile learning application yet for healthcare workers and due to limited time it was impossible to develop a working mobile learning application.

First of all, an information gap was mentioned in the poster between knowing an old handwashing protocol and the new handwashing protocol. This way, healthcare workers are being made aware of what they know and what they do not know. This idea is based on a study of Ortiz-Neira (2019) which showed that information gap activities led to better performances in language learning when students were made aware of their information gaps.

At the same time, the information gap of the handwashing protocol targets the sense of urgency as well; especially in these times with a recent pandemic, washing hands the right way is very important for healthcare workers who come in close contact with patients (Fox et al., 2015). The handwashing protocol is used as an example of a possible information gap. Also, it might make healthcare workers think about other new protocols that they are not aware of and this might lead them to seek out new knowledge.

Secondly, the poster mentions the enjoyment of learning. In the process model, this is also linked to curiosity towards learning. In a broader term, enjoyment of learning is seen as intrinsic motivation; doing an activity because the activity itself is enjoyable. The poster mentions enjoyment to activate intrinsic motivation towards learning. It has the goal of reminding healthcare workers that they enjoy the task of learning because it is enjoyable in itself.

Thirdly, social norms were integrated into the poster. The poster mentions that most colleagues use a mobile learning application. This implies the descriptive norm of staying up-to-date with current healthcare knowledge through a mobile learning application. An example of a study done by Nolan et al. (2008) has shown that giving individuals information about the descriptive norms when it comes to the behaviour of being environmentally friendly, individuals change their behaviour to adhere to the social norm. Several studies done by using social norm information among students also show that social norms are a strong predictor of behaviour. Another study done by Ridout and Campbell (2014) showed that the descriptive norm could reduce alcohol intake in university students by correcting misperceptions. Literature thus shows that descriptive social norms can be a predictor of behaviour. In the case of healthcare workers, when they receive information about the social norm of using a mobile learning application, it might lead them to adhere to this social norm and thus also use a mobile learning application. Appendix B shows what the poster looked like.

Method

Participants

Before the study took place, a power analysis has been done in *G*Power*. It was calculated that with a power of .80, α = .05 and a medium effect size *f* of .25, the sample size should have been at least 34 participants. Participants consisted of 30 Egyptian nurses of Al-Fayoum International Hospital and 45 Egyptian nurses of El Nabawy El Mohandes General Hospital in Al-Fayoum. All nurses from Al-Fayoum International hospital filled out the pre-measure survey and the post-measure survey. Thirteen nurses from El Nabawy El Mohandes General Hospital in Al-Fayoum did not fill out the post-measure survey; this leaves a total of 75 participants (*N* = 75) for the pre-measure and 62 participants (*N* = 62) for the post-measure.

Materials and procedure

Materials used in this study consisted of a survey and a printed poster.

Survey. The survey was created on Qualtrics (http://qualtrics.com); both an online and paper version were available. The survey consisted of a front page with information about the study and a consent form (See Appendix A). The information and consent form was the same for the control group and the experimental group. After the participant gave consent, the participant had to fill out 9 questions on a Likert scale from 1-6. A Likert scale from 1-6 was chosen because literature suggests that a higher number than 6 for a Likert scale does not add any psychometric advances (Simms et al., 2019). The questions were based on 8 concepts which would determine the amount of intention a participant feels towards using a mobile learning application. The 9th questions asked directly how likely it is for them to use a mobile learning application. The other 8 concepts consisted of not knowing something that they needed to know for work (information gap), how normal it is to study after you're done with studying (social norm), how much they enjoy learning, curiosity towards learning, urgency of learning, pressure from authorities to use a mobile learning application, freedom of choice to use a mobile learning application and if colleagues used a mobile learning application. Each concept was one item in the survey. The survey was translated by a translator from English to colloquial Arabic to ensure that participants understood the questions correctly. The printed version was handed out in the intervention hospital; the online version was used for the control group hospital. In both conditions participants were personally asked to take part in the study. There was a week in between the pre-measurement and the post-measurement due to limited time of being in Egypt. To minimize social desirability, healthcare workers were asked to fill out the survey individually and whenever it suited them on the day itself. They were also told that filling out the questionnaire was completely anonymous.

Poster. The poster was created by using three behaviour change concepts, namely Information Gap, Social Norm and Enjoyment for learning. The poster was designed in the colloquial Arabic language. See Appendix B for the poster with used behaviour change concepts. The posters were hung in the intervention hospital in hallways and examination rooms for visibility.

Data-analysis

First, assumptions were checked and met before executing a step-wise linear regression analysis. Then, the step-wise linear regression was done on the variables to look at the support of the process model. The 75 participants of the pre-measure were used for the linear regression analysis. The variables that were used were given the following names: NotKnowingPre, StudyingAfterPre, EnjoyLearningPre, CuriousLearningPre, UrgentLearningPre, AuthorityPressurePre, FreedomPre, and ColleagueUsePre. The dependent variable was LikelyToUsePre. The model which predicted the intention best had two predictors, namely ColleagueUsePre and UrgentLearningPre. The choice for a step-wise linear regression was made because of too many variables in combination with not enough power.

Then, assumptions were checked and met before executing a Repeated Measures ANOVA. To look at the effect of the intervention, a mixed Repeated Measures ANOVA has been executed with time as within-subject factor (pre-measure/post-measure); and condition as the between-subject factor (intervention/control). The 62 participants who completed the pre-measure and the post-measure were used for the Repeated Measures ANOVA analysis. The dependent variable was the intention to use a mobile learning application.

Results

To look at the interaction between the variables on the main dependent variable, a step-wise linear regression analysis on the dependent variable Intention showed two significant effects of two variables. Colleague use had a significant effect on the intention (p = .001). This means that participants are more likely to use a mobile learning application when they think their colleagues use it as well. The second significant effect was found with the variable of urgency (p = .006). All other variables, namely relevance, information gap, freedom to choose, enjoyment of learning and curiosity did not have a significant effect on the intention to use a mobile learning application.

Assumptions for the Repeated Measures ANOVA were checked after the regression analysis. Normality was not violated and N was bigger than 30 (Field, 2013). The test of Homogeneity of Variances showed a p-value of .286. There was thus no need for a non-parametric test. The results of the repeated measures ANOVA mixed-design showed that

there was no significant effect of Time (pre-measure/post-measure) ($F(1,60) = .384$, $p = .538$) or an interaction effect of time and group ($F(1,60) = .000$, $p = .984$). This means that there was no difference in results in the intention to use a mobile learning application with the control group and the experimental group in the pre-measure and post-measure. The descriptive statistics can be found in Appendix C. The correlations between the predictors can be found in the correlation matrix in Appendix D. The descriptive statistics show that the mean scores of the intention to use were already quite high; pre-measure $M = 4.83$, post-measure $M = 4.89$.

Discussion

This study had the goal of answering the following research question: 'What are predictors of the intention to use a mobile learning application to stay up-to-date with current healthcare knowledge and how can we motivate healthcare workers to use a mobile learning application by using an intervention?'. Hypothesis 1 stated that the intervention group had a significantly higher score on the intention to use a mobile learning application at the post-measure compared to the pre-measure. Hypothesis 2 stated that the intervention group scored significantly higher on intention to use a mobile learning application compared to the control group at the post-measure. This study thus looked at what would motivate healthcare workers more: focussing on 'You need to learn this' or 'You want to learn this'. Three findings will now be discussed. First, the results of validating the process model will be discussed to see which two variables had a significant effect on the intention to use a mobile learning application. Then, the result from the intervention will be discussed. Lastly, limitations and the conclusion of this study will be mentioned.

To begin with, this paper looked at variables that have an impact on motivation. Since there is no actual mobile learning application yet for Egyptian healthcare workers to use, this study looked at the intention to use a mobile learning application if this was available to them. Although literature shows there is an intention-behaviour gap (Sheeran, 2002), it is still believed that intention measurements are related to behaviour, according to the Theory of Planned Behaviour (Ajzen, 1991). The Theory of Planned Behaviour includes the variables Attitude towards the behaviour, Subjective norm, Perceived behavioural control and Intention. All variables interact with each other and the attitude, subjective norm and perceived behavioural control lead to the intention, which in turn lead to the actual behaviour. It is also believed that perceived behavioural control can directly lead to behaviour. Future research should look into the actual behaviour of staying up-to-date with current healthcare knowledge through a mobile learning application with healthcare workers in rural Egypt to see if the intention matches the behaviour.

The first result of this study showed that the descriptive norm, aka colleague use,

had a significant effect on the intention to use a mobile learning application. In practical terms, this means that to increase the chances of healthcare workers using a mobile learning application, information can be given about how many colleagues use the mobile learning application if people believe a lot of their colleagues use it.

This is in line with the study of Melnyk et al., (2019) which showed that descriptive norms directly influence behaviour. However, literature also shows that social norm information is only helpful if it shows that the majority follows the social norm and the reference group is suited (Goldstein et al., 2008). If, for example, healthcare workers see that only one colleague is using a mobile learning application, it will not lead to participation in the behaviour because the social norm is not clear enough. It is also important to look at the reference group; research has shown that social norm compliance or norm adherence is influenced by the amount of perceived similarity of others (Burnkrant & Cousineau, 1975; Moschis, 1976). People tend to follow behaviours from others with homogenous demographics such as age (Murray et al., 1984), gender (White et al., 2002), but also with similar attitudes (Suedfield et al., 1971). Identifying oneself with the reference group is an important factor for norm adherence (Goldstein et al., 2008). In practice, this means that there are factors that need to be taken into account to strengthen the message using social norms. For healthcare workers this means that they need to see that the majority of their colleagues use a mobile learning application. By showing that the majority uses it, the social norm adherence will be stronger and by mentioning colleagues, the reference group gets activated and will lead to social norm compliance as well.

Since colleague use had a significant effect on the intention to use a mobile learning application, it can thus be said that this study shows that it is more important to focus on extrinsic motivation (namely the social norm that colleagues use a mobile learning application) than on intrinsic motivation when looking at intention to use a mobile learning application in Egyptian healthcare workers. Social norm is an extrinsic motivator since the behaviour gets influenced from outside the individual, namely by the (direct or indirect) behaviour of others and also because something can be gained from it (Kreps, 1997).

The second finding of this study was that urgency had a significant effect on the intention to use a mobile learning application. This means that when a message feels urgent, healthcare workers feel more inclined to act upon that urgency, in this case to use a mobile learning application. Kotter (1996) states that establishing a sense of urgency is the first step towards change. This is in line with the result of this study in which urgency had a significant effect on the intention to use a mobile learning application.

An explanation of the results that healthcare workers in rural Egypt get motivated more by focussing on needing to learn instead of wanting to learn is that it is possible that healthcare workers are aware of the importance of staying-up-to-date with knowledge

because they are prevention-focused. Prevention focus is focussed on security, safety and responsibility. Promotion focus is more concerned with growth, advancement and accomplishment (Crowe & Higgins, 1997). Although there is not much research on prevention versus promotion focus in healthcare workers, it makes sense for healthcare workers to be prevention focussed since healthcare is about safety instead of growth. According to Crowe and Higgins (1997), the promotion focus is about making hits and preventing errors of omission. The prevention focus is about correcting rejections and prevents errors of commission. The promotion focus in healthcare would mean that healthcare workers would experiment about what the best course of action is to reach the ideal state instead of creating a safe state for patients. It makes more sense for healthcare workers to secure someone's health and make sure they are safe and do not harm them instead of focussing on growth or the ideal situation. Healthcare is not about making hits but about safety and preventing patients to get worse. At the same time, it can be assumed that a prevention focus is more related to needing to learn and the promotion focus is more related to wanting to learn (and thus experiment a little). In this light, the results of this study imply that needing to learn is more effective to motivate healthcare workers to use a mobile learning application.

The third finding of this study was that the intention to use a mobile learning application is already quite high under healthcare workers in rural Egypt and the poster intervention did not have a significant effect. This means that both hypotheses are rejected. A possible explanation for the finding that the intention to use a mobile learning application is already quite high can be that because of the recent pandemic, it became clear how important staying up-to-date is with current healthcare knowledge. Healthcare workers might have experienced the changing hygiene rules for example, which made them aware of the importance of staying up-to-date for their safety and their patients. This could have led to healthcare workers already being motivated to use a mobile learning application to stay up-to-date with current healthcare knowledge.

The finding that the intention to use a mobile learning application was already quite high was surprising because before this study took place, hospital owners in Egypt were asked what their healthcare staff would think about a mobile learning application. The majority of hospital owners in Egypt believed that their staff would not be interested. However, this study showed the opposite: healthcare workers were already motivated to use a mobile learning application and gave high levels of likelihood to use a mobile learning application when asked. This shows a discrepancy between what hospital owners think healthcare staff find important and are interested in and what healthcare staff actually find important and are interested in. This can have important implications for educational learning for healthcare workers; when hospital owners know that healthcare workers are interested in

staying up-to-date with current healthcare knowledge and are motivated to study, they might give them educational opportunities. In a broader scope, it is also possible to check with hospital owners and healthcare staff together when looking at interventions in general to see if both parties see the same problems and think an intervention could help.

Since this project took place in hospitals in Egypt, it is also important to look at the cultural aspects of a non-western country and to the hospital culture to see what is found important for healthcare workers to adhere to certain behaviours. To begin with, there are some cultural differences with Egypt compared to Western countries. Egypt has an authoritarian state (Kira et al., 2017; Sika & Khodary, 2012), which is especially relevant information in this specific case. In general, nurses are seen as subordinates of physicians by physicians (Elsous et al., 2017). In hospitals there exists a clear medical hierarchy (Kobayashi et al., 2006; Walton, 2006). This medical hierarchy in itself can lead to not speaking up to colleagues or supervisors when mistakes are made; especially when it comes to senior colleagues (Samuel et al., 2012). This is problematic since the safety of patients is on the line. The existence of the medical hierarchy can also be led back to the importance of the social norm; relationships between colleagues have a big impact on healthcare workers. An explanation for hospital owners thinking that their healthcare workers are not interested in staying up-to-date with healthcare knowledge might be the hospital hierarchy and thus a different reference group of the hospital owners. Future research should keep in mind that there can be a difference between what hospital owners think their healthcare workers need or want, and what healthcare workers actually need or want. There also lays a task of communicating this discrepancy to the hospital owners.

It is important to note that there are some limitations to this study that need to be taken into account. First of all, since this study took place in two hospitals in rural Egypt, the generalization of the findings can only be attributed to healthcare workers in rural Egypt. For future research it is important to look at non-rural areas in Egypt as well to see if there is a difference in intention to use a mobile learning application. Second limitation includes a confounding variable between the control group and the intervention group. It was not possible to get permission from the control group hospital to hand out the surveys in person, so the control group received the survey online through a personal message. This might explain why the post-measure had less participants in the control group than the pre-measure. A third limitation involves the intervention itself. The original plan was to hang the posters in the hallways and examination rooms so healthcare workers are exposed to it as much as possible. However, the intervention hospital revoked their permission to hang the posters in the hallways. Instead, three posters were hung in three examination rooms and the participants who took part in the surveys received the poster personally. It is likely that healthcare workers thus were less exposed to the poster than they would have been if the

posters were also hung in the hallways as well. Nevertheless, this study provided insight in the intention to use a mobile learning application among healthcare workers in rural Egypt.

To conclude, the findings in this study show that healthcare workers already have high levels of intention to use a mobile learning application if this has been made available to them. The significant predictors of the level of intention to use a mobile learning application was the belief that colleagues would use a mobile learning application as well and the urgency of the message. These findings can be used to strengthen the motivation and intention to use a mobile learning application among healthcare workers. This study helps to increase the chances of healthcare workers using a mobile learning application to stay up-to-date with current healthcare knowledge. This study thus points to motivating healthcare workers by focussing on ‘needing to learn’ instead of ‘wanting to learn’. The current study is a first step towards knowledge about motivating healthcare workers to use a mobile learning application with the goal of staying up-to-date with current healthcare knowledge.

Reference List

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behavior and Human Decision Processes, 50*, 179-211. https://doi.org/10.1016/0749-5978(91)90020-T

Ally, M., Samaka, M., Ismail, L., & Impagliazzo, J. (2010). Use of Mobile Learning Apps in Workplace Learning. *Bulletin of the IEEE Technical Committee on Learning Technology, 15*, 6-9.

Ansari, S. M., & Tripathi, A. (2017). An Investigation of Effectiveness of Mobile Learning Apps in Higher Education in India. *International Journal of Information Studies & Libraries, 2*, 33-41.

Banday, M. T., Ahmed, M., & Jan, T. R. (2014). Applications of e-Learning in engineering education: A case study. *ProcediaSocial and Behavioral Sciences, 123*, 406-413. https:// doi.org/10.1016/J.SBSPRO.2014.01.1439

Bhatnagar, A., Gupta, S., Alonge, O., & George, A. S. (2016). Primary health care workers' views of motivating factors at individual, community and organizational levels: a qualitative study from Nasarawa and Ondo states, Nigeria. *The International Journal of Health Planning and Management, 32*, 217-233. https://doi.org/10.1002/hpm.2342

Binson, B. (2009). Curiosity-based learning (CBL) program. *US-China Education Review, 6*, 13-22.

Burnkrant, R. E., & Cousineau, A. (1975). Informational and Normative Social Influence in Buyer Behavior. *Journal of Consumer Research, 2*, 206–15.

Camilleri, M. A., & Camilleri, A. C. (2020). The students' readiness to engage with mobile learning apps. *Interactive Technology and Smart Education, 17*, 28-38. https://doi.org/10.1108/ITSE-06-2019-0027

Campanella, P. (2012). Mobile Learning: New forms of education. *IEEE 10th International Conference on Emerging eLearning Technologies and Applications (ICETA),* 51-56. https://doi.org/10.1109/ICETA.2012.6418282

Christensen, C., Grossman, J., & Hwang, J. (2009). *The Innovator's Prescription: A Disruptive Solution for Health Care*, (First edition), McGraw-Hill.

Cialdini, R.B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology, 58*, 1015–1026. https://doi.org/10.1037/0022-3514.58.6.1015

Cialdini, R. B., & Goldstein, N. J. (2004). Social influence: compliance and conformity. *Annual Reviews Psychology, 55*, 591–621. https://doi.org/10.1146/annurev.psych.55.090902.142015

Criollo-C, S., Luján-Mora, S., & Jaramillo-Alcázar, A. (2018). Advantages and disadvantages of m-learning in current education. *IEEE World Engineering Education Conference (EDUNINE),*1-6. https://doi.org/10.1109/EDUNINE.2018.8450979

Crowe, E., & Higgins, E. T. (1997). Regulatory Focus and Strategic Inclinations: Promotion and Prevention in Decision-Making. *Organizational Behavior and Human Decision Processes, 69*, 117–132. https://doi.org/10.1006/obhd.1996.2675

Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology, 18*, 105–115. https://doi.org/10.1037/h0030644

Elsous, A., Radwan, M., & Mohsen, S. (2017). Nurses and physicians attitudes toward nurse-physician collaboration: a survey from Gaza. *Nursing Research and Practice, 2017*, 1-7. https://doi.org/10.1155/2017/7406278

Field, A. (2013). *Discovering statistics using IBM SPSS statistics, 4th edition* (4th ed.). SAGE Publications.

Fox, C., Wavra, T., Drake, D. A., Mulligan, D., Bennett, Y. P., Nelson, C., Kirkwood, P., Jones, L., & Bader, M. K. (2015). Use of a patient hand hygiene protocol to reduce hospital-acquired infections and improve nurses' hand washing. *American Journal of Critical Care, 24*, 216-224. https://doi.org/10.4037/ajcc2015898

Gaber, M. A., & Moustafa, M. S. (2015). Development of motivational strategies for nursing students at Zagazig University in Egypt. *Journal of Nursing Education and Practice, 5*. http://dx.doi.org/10.5430/jnep.v5n6p62

Goldstein, N. J., Cialdini, R .B., & Griskevicius, V. (2008). A room with a viewpoint: using social norms to motivate environmental conservation in hotels. *Journal of Consumer Research, 35*, 472-482. https://doi.org/10.1086/586910

Golman, R., & Loewenstein, G. (2013). Curiosity, information gaps, and the utility of knowledge. *Department of Social and Decision Sciences.*

Gottfried, A. E., Fleming, J. S., & Gottfried, A. W. (2001). Continuity of academic intrinsic motivation from childhood through late adolescence: a longitudinal study. *Journal of Educational Psychology, 1*, 3-13. https://doi.org/10.1037/0022-0663.93.1.3

Henderlong, J., & Lepper, M. R. (2002). The Effects of Praise on Children's Intrinsic Motivation. *Psychological Bulletin, 128*, 774-795. https://doi.org/10.1037/0033-2909.128.5.774

Jankowski, K. F., & Takahashi, H. (2014). Cognitive neuroscience of social emotions and implications for psychopathology: examining embarrassment, guilt, envy, and schadenfreude. *Psychiatry Clinical Neuroscience, 68*, 319–36. https://doi.org/10.1111/pcn.12182

Jessop, D. C., Simmonds, L. V., & Sparks, P. (2009). Motivational and behavioural consequences of self-affirmation interventions: A study of sunscreen use among women. *Psychology and Health, 24*, 529-544, https://doi.org/10.1080/08870440801930320

Jiugen, Y., & Ruonan, X. (2016). Mobile Terminal based Mobile Learning System Design. *The 11th International Conference on Computer Science & Education (ICCSE 2016),* 699-703. https://doi.org/10.1109/ICCSE.2016.7581664

Kang, M. J., Hsu, M., Krajbich, I. M., Loewenstein, G., McClure, S. M., Wang, J. T. Y., & Camerer, C. F. (2009). The wick in the candle of learning: Epistemic curiosity activates reward circuitry and enhances memory. *Psychological Science, 20*, 963-973. https://doi.org/ 10.1111/j.1467-9280.2009.02402.x

Kember, D., Ho, A., & Hong, C. (2008). The importance of establishing relevance in motivating student learning. *Active Learning in Higher Education, 9*, 249–263. https://doi.org/ 10.1177/1469787408095849

Kira, I. A., Shuwiekh, H., & Bujold-Bugeaud, M. (2017). Toward Identifying the Etiologies of Gender Differences in Authoritarianism and Mental Health: An Egyptian Study. *Journal of Peace Psychology, 23*, 183-188. http://dx.doi.org/10.1037/pac0000206

Kobayashi, H., Pian-Smith, M., Sato M., Sawa, R., Takeshita, T., Raemer, D. (2006). A cross-cultural survey of residents' perceived barriers in questioning/challenging authority. *Quality & Safety in Health Care, 15*, 277-283. http://dx.doi.org/10.1136/qshc.2005.017368

Kotter, J. P. (1996). *Leading Change*. Harvard Business Press.

Kreps, D. M. (1997). Intrinsic Motivation and Extrinsic Incentives. *The American Economic Review, 87*, 359-364.

Loewenstein, G. (1994). The psychology of curiosity: A review and reinterpretation. *Psychological Bulletin, 116*, 75–98. https://doi.org/10.1037/0033-2909.116.1.75

Marchau, V. A. W. J., Walker, W. E., Bloemen, P. J. T. M., & Popper, S. W. (2019). *Decision Making under Deep Uncertainty: From Theory to Practice*. Springer Nature Switzerland AG. https://doi.org/10.1007/978-3-030-05252-2

Martin, F. & Ertzberger, J. (2013). Here and now mobile learning: an experimental study on the use of mobile technology. *Computers & Education, 68*, 76–85. http://dx.doi.org/10.1016/j.compedu.2013.04.021

Melnyk, V., van Herpen, E., Jak, S., & van Trijp, H. C. M. (2019). The Mechanisms of Social Norms' Influence on Consumer Decision Making. *Zeitschrift für Psychologie, 227*, 4-17. https://doi.org/10.1027/2151-2604/a000352

Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change Wheel: a new method for characterising and designing behaviour change interventions. *Implementation Science, 6*. https://doi.org/10.1186/1748-5908-6-42

Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: defining the principle of who and what really counts. Academy of Management Review, 22, 853-886. https://doi.org/10.5465/amr.1997.9711022105

Mohrman, S., Shani, R. A. B., & McCracken, A. (2012). Organizing for sustainable healthcare: the emerging global challenge. *Organizing for Sustainability, 2*, 1-39. https://doi.org/10.1108/S2045-0605(2012)0000002013

Moschis, G. P. (1976). Social comparison and informal group influence. *Journal of Marketing Research, 13*, 237-244. https://doi.org/10.2307/3150733

Murray, D. M., Luepker, R. V., Johnson, A. C., & Mittelmark, M. B. (1984). The Prevention of Cigarette Smoking in Children: A Comparison of Four Strategies. *Journal of Applied Social Psychology, 14*, 274–88. https://doi.org/10.1111/j.1559-1816.1984.tb02236.x

Muthuri, N. D. K., Senkubuge, F., & Hongoro, C. (2020). Determinants of motivation among healthcare workers in the East African community between 2009-2019: a systematic review. *Healthcare, 8*. https://doi.org/10.3390/healthcare8020164

Nolan, J. M., Schultz, P.W., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2008). Normative Social Influence is Underdetected. *Personality and Social Psychology Bulletin, 34*, 913-923. https://doi.org/ 10.1177/0146167208316691

Papacharisis, V., Simou, K., & Goudas, M. (2003). The relationship between intrinsic motivation and intention towards exercise. *Journal of Human Movement Studies, 45*, 377-386

Ridout, B., & Campbell, A. (2014). Using Facebook to deliver a social norm intervention to reduce problem drinking at university. *Drug and Alcohol Review, 33*, 667–673. https://doi.org/10.1111/dar.12141

Ryan, R. M. & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology, 61*. https://doi.org/10.1016/j.cedpsych.2020.101860

Samuel, R., Shuen, A., Dendle, C., Kotsanas, D., Scott, C., & Stuart, R. L. (2012). Hierarchy and hand hygiene: would medical students speak up to prevent hospital-acquired infection? *Infection Control & Hospital Epidemiology, 33*, 861-863. https://doi.org/10.1086/666634

Scot, K. (2021). You won't believe what's in this paper! Clickbait, relevance and the curiosity gap. *Journal of Pragmatics, 175*, 53-66. https://doi.org/10.1016/j.pragma.2020.12.023

Sheeran, P. (2002). Intention—Behavior Relations: A Conceptual and Empirical Review. *European Review of Social Psychology, 12*, 1-36, https://doi.org/10.1080/14792772143000003

Simms, L. J., Zelazny, K., Williams, T. F., & Bernstein, L. (2019). Does the Number of Response Options Matter? Psychometric Perspectives Using Personality Questionnaire Data. *Psychological Assessment, 31*, 557–566. http://dx.doi.org/10.1037/pas0000648

Singh, A., & Manjaly, J. A. (2021). The effect of information gap and uncertainty on curiosity and its resolution. *Journal of Cognitive Psychology, 33*, 403-423. https://doi.org/10.1080/20445911.2021.1908311

Skinner, B. F. (1971). Operant conditioning. *Encyclopedia of Education, 1.* Macmillan and Free Press, 29–33.

Steindl, C., Jonas, E., Sittenthaler, S., Traut-Mattausch, E., & Greenberg, J. (2015). Understanding psychological reactance: new developments and findings. *Zeitschrift für Psychologie, 223*. https://doi-org.ru.idm.oclc.org/10.1027/2151-2604/a000222

Suedfeld, P., Bochner, S., & Matas, C. (1971). Petitioner's Attire and Petition Signing by Peace Demonstrators: A Field Experiment. *Journal of Applied Social Psychology, 1*, 278–83. https://doi.org/10.1111/j.1559-1816.1971.tb00366.x

Taylor, G., Jungert, T., Mageau, G. A., Schattke, K., Dedic, H., Rosenfield, S., & Koestner, R. (2014). A self-determination theory approach to predicting school achievement over time: The unique role of intrinsic motivation. *Contemporary Educational Psychology, 39,* 342–358. https://doi.org/10.1016/j.cedpsych.2014.08.002

Wallin, L. (2009). Knowledge translation and implementation research in nursing. *International Journal of Nursing Studies, 46*, 576–587. https://doi.org/10.1016/j.ijnurstu.2008.05.006

Walton, M. M. (2006). Hierarchies: the Berlin Wall of patient safety. *Quality & Safety in Health Care, 15*, 229-230. http://dx.doi.org/10.1136/qshc.2006.019240

White, K. M., Hogg, M. A., & Terry, D. J. (2002). Improving Attitude-Behavior Correspondence through Exposure to Normative Support from a Salient Ingroup. *Basic and Applied Social Psychology, 24*, 91–103. https://doi.org/10.1207/S15324834BASP2402_2

Wickramasinghe, N, Schaffer, J. L. (2006). Creating knowledge-driven healthcare processes with the Intelligence Continuum. *International Journal Electronic Healthcare, 2*, 164-74. https://doi.org/10.1504/IJEH.2006.008830

Worchel, S. & Brehm, J. W. (1970). Effect of threats to attitudinal freedom as a function of agreement with the communicator. *Journal of Personality and Social Psychology, 14,* 18-22. https://doi.org/10.1037/h0028620

Appendix A

Information and consent form

A Conversational learning application for Egyptian health workers

MeduProf-S (NL) is in cooperation with Accent (NL), working on a mobile learning application with a catalog of subjects for health workers in Egypt. It enables the academic management (medical doctors) of health centres and hospitals in Egypt to systematically develop and improve the knowledge and skills of health workers they need for dealing with a broad range of patients.

This survey

We target a broad and large group of health workers, including nurses and laboratory staff, interacting with patients and processing samples, who need to adhere to strict guidelines for their own and the patient's safety. We like to see whether health workers are interested in using such a mobile learning app. We would love for you to answer some questions about staying-up-to-date and the use of a mobile learning application. Your answers are anonymous. Please answer as honestly as possible. Your participation is completely voluntarily. If you decide to not take part in this study, this will have no negative consequence for you whatsoever. If during the survey you decide to quit, you are free to do so.

If you have questions, you can send an e-mail to sorayma.piron@ru.nl

Thank u in advance!

I herewith confirm that:
- I have been satisfactorily informed of the study in writing;
- I have read the written information about the study;
- I have been given the opportunity to ask questions about the study;
- I have been given ample opportunity to think carefully about participating in the study;
- I participate in the study entirely on a voluntary basis.

I understand that:
- I have the right to withdraw my consent at any time without having to state reasons and without fear of adverse consequences;
- I have the right to have my research data deleted up until 1 month after the research has been completed
- the tests and questionnaires used are not medical/clinical tests

I agree that:
- my research data within this research will be obtained for scientific purposes and will be available for verification, reuse and replication for 10 years.
- the signed consent form with my personal data is kept for 10 years.
- supervisory authorities may inspect my research data for the purpose of auditing the research.

I agree to participate in the study.

Yes

No

Appendix B

Poster

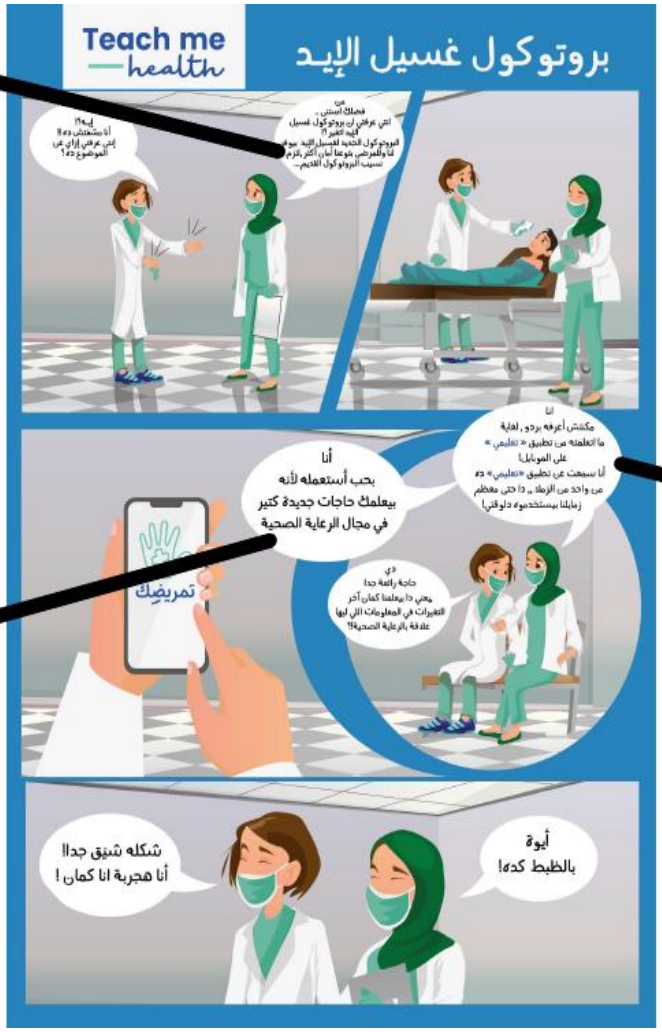
'Hey wait! Did you see that the handwashing protocol has changed?

The new handwashing protocol provides more safety for us and our patients; We should abandon the old protocol!'

(information gap)

'I like using it just because it teaches you a lot of new things on different healthcare subjects.'

(Enjoyment)



'I heard about a mobile learning app from a colleague, most of our colleagues use it now!'

(social norm)

Appendix C

Descriptive Statistics of the predictors and dependent variable

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
On a scale of 1 (never) to 6 (very often), how often do you experience that you do not know something that you need to know to do your work properly?	75	1	6	3.60	1.516
On a scale of 1 (not normal) to 6 (very normal), how normal is it to study work-related content after you finished your official education?	75	1	6	4.41	1.471
On a scale of 1 (not much) to 6 (very much), how much do you enjoy learning new things about your job?	75	1	6	5.31	1.174
On a scale of 1 (not curious) to 6 (very curious), how curious are you to learn new things about your job?	75	1	6	5.43	1.129
On a scale of 1 (not urgent) to 6 (very urgent), if you would find out that you do not know a specific task at work, how urgent would you think learning about this is?	75	1	6	5.17	1.190
On a scale of 1 (not likely) to 6 (very likely), how likely is it that you would use a mobile learning app to study new knowledge for your work?	75	1	6	4.83	1.256
On a scale of 1 (not much) to 6 (very much), how much pressure do you experience from your boss or other authorities to use a mobile learning app for your work?	75	1	6	3.23	1.760
On a scale of 1 (not much) to 6 (very much), how much freedom do you experience to choose whether you use a mobile learning app or not?	75	1	6	4.16	1.661
On a scale of 1 (not likely) to 6 (very likely), to what extent do you think your colleagues would use a mobile learning app if released right now?	75	1	6	4.35	1.623
NotKnowingPost	62	1	6	4.21	1.527
StudyingAfterPost	62	1	6	4.61	1.453
EnjoyLearningPost	62	1	6	5.45	1.051
CuriousLearningPost	62	1	6	5.32	1.225
UrgentLearningPost	62	2	6	5.13	1.274
LikelyToUsePost	62	1	6	4.89	1.404
AuthorityPressurePost	62	1	6	3.47	1.948
FreedomPost	62	1	6	4.74	1.492
ColleagueUsePost	62	2	6	4.61	1.383
Valid N (listwise)	62				

Appendix D

Correlation Matrix

Correlations

		On a scale of 1 (never) to 6 (very often), how often do you experience that you do not know something that you need to know to do your work properly?	On a scale of 1 (not normal) to 6 (very normal), how normal is it to study work-related content after you finished your official education?	On a scale of 1 (not much) to 6 (very much), how much do you enjoy learning new things about your job?	On a scale of 1 (not curious) to 6 (very curious), how curious are you to learn new things about your job?	On a scale of 1 (not urgent) to 6 (very urgent), if you would find out that you do not know a specific task at work, how urgent would you think learning about this is?	On a scale of 1 (not likely) to 6 (very likely), how likely is it that you would use a mobile learning app to study new knowledge for your work?	On a scale of 1 (not much) to 6 (very much), how much pressure do you experience from your boss or other authorities to use a mobile learning app for your work?	On a scale of 1 (not much) to 6 (very much), how much freedom do you experience to choose whether you use a mobile learning app or not?	On a scale of 1 (not likely) to 6 (very likely), to what extent do you think your colleagues would use a mobile learning app if released right now?
On a scale of 1 (never) to 6 (very often), how often do you experience that you do not know something that you need to know to do your work properly?	Pearson Correlation	1	.136	.199	.125	.121	.112	.110	-.082	-.058
	Sig. (2-tailed)		.246	.087	.286	.299	.338	.345	.486	.620
	N	75	75	75	75	75	75	75	75	75
On a scale of 1 (not normal) to 6 (very normal), how normal is it to study work-related content after you finished your official education?	Pearson Correlation	.136	1	.223	.324**	.267*	.164	.047	-.088	.171
	Sig. (2-tailed)	.246		.055	.005	.020	.161	.690	.451	.142
	N	75	75	75	75	75	75	75	75	75
On a scale of 1 (not much) to 6 (very much), how much do you enjoy learning new things about your job?	Pearson Correlation	.199	.223	1	.369**	.290*	.284*	-.014	-.088	.192
	Sig. (2-tailed)	.087	.055		.001	.011	.014	.902	.453	.099
	N	75	75	75	75	75	75	75	75	75
On a scale of 1 (not curious) to 6 (very curious), how curious are you to learn new things about your job?	Pearson Correlation	.125	.324**	.369**	1	.497**	.367**	.216	.035	.272*
	Sig. (2-tailed)	.286	.005	.001		<.001	.001	.063	.765	.018
	N	75	75	75	75	75	75	75	75	75
On a scale of 1 (not urgent) to 6 (very urgent), if you would find out that you do not know a specific task at work, how urgent would you think learning about this is?	Pearson Correlation	.121	.267*	.290*	.497**	1	.328**	.175	.157	.094
	Sig. (2-tailed)	.299	.020	.011	<.001		.004	.134	.179	.420
	N	75	75	75	75	75	75	75	75	75
On a scale of 1 (not likely) to 6 (very likely), how likely is it that you would use a mobile learning app to study new knowledge for your work?	Pearson Correlation	.112	.164	.284*	.367**	.328**	1	.263*	.188	.375**
	Sig. (2-tailed)	.338	.161	.014	.001	.004		.023	.106	<.001
	N	75	75	75	75	75	75	75	75	75
On a scale of 1 (not much) to 6 (very much), how much pressure do you experience from your boss or other authorities to use a mobile learning app for your work?	Pearson Correlation	.110	.047	-.014	.216	.175	.263*	1	.163	.124
	Sig. (2-tailed)	.345	.690	.902	.063	.134	.023		.162	.291
	N	75	75	75	75	75	75	75	75	75
On a scale of 1 (not much) to 6 (very much), how much freedom do you experience to choose whether you use a mobile learning app or not?	Pearson Correlation	-.082	-.088	-.088	.035	.157	.188	.163	1	.345**
	Sig. (2-tailed)	.486	.451	.453	.765	.179	.106	.162		.002
	N	75	75	75	75	75	75	75	75	75
On a scale of 1 (not likely) to 6 (very likely), to what extent do you think your colleagues would use a mobile learning app if released right now?	Pearson Correlation	-.058	.171	.192	.272*	.094	.375**	.124	.345**	1
	Sig. (2-tailed)	.620	.142	.099	.018	.420	<.001	.291	.002	
	N	75	75	75	75	75	75	75	75	75

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).