Motivational Resources for Physical Exercises: Evaluation of User Experience in Mobile Fitness Applications

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ABSTRACT

Mobile devices may act as support tools to achieve a balance between the technologic world and a physically active life, through the use of Mobile Fitness Applications (MFA), for example. However, keeping a long-term routine of exercising, even with the support of MFAs, demands high levels of motivation. In this paper we present an analysis of how MFAs with support for jogging and running have been dealing with aspects related to the first experiences of use and to the motivation for evolving on the exercises, among young adults. In this initial study, we used analytic and empirical evaluation methods, exploring usability, user experience and emotional aspects. The results show the relation between motivational and emotional aspects and MFAs resources, as well as the quality of its resources.

RESUMO

Este artigo apresenta uma avaliação da qualidade da primeira experiência de uso dos recursos capazes e motivar a fidelidade e evolução à prática de exercícios físicos através de Mobile Fitness Applications (MFAs). Utilizamos métodos de avaliação analíticos e empíricos, explorando a usabilidade, experiência de uso e aspectos emocionais. Os resultados iniciais apontam para uma relação entre os aspectos emocionais, motivacionais e recursos disponibilizados pelos MFAs, assim como a qualidade desses recursos. Apresentamos a primeira parte de uma pesquisa cujo objetivo final é identificar quais são as características necessárias para projetar MFAs capazes de motivar usuários no engajamento e fidelização na prática de exercícios físicos.

Categories and Subject Descriptors

H.5.2 [**Information Interfaces and Presentation (e.g., IHC)**]: User Interfaces – *ergonomics, evaluation/methodology, graphical user interfaces.*

General Terms

Design, Human Factors, Measurement.

Keywords

User experience, Mobile Fitness Applications, Usability, Emotional Factors and Evaluation Methods.

1. INTRODUCTION

Mobile interactive technology has permitted the efficient use of information and of the Information and Communications Technology (ICT) in the most varied areas, raising the perspectives of offering new and personalized solutions to the users. During the last years, as the use of smartphones became popular for different audiences, the use of mobile applications focused on fitness and health have increased. Mobile devices may act as support tools to achieve a balance between the technologic world and the physically active life [1], especially with Mobile Fitness Applications (MFAs). MFAs are smartphone applications based on the principle that fitness can be maintained through small and consistent actions that add up over time. These applications may work as reminders to check the person's progress, for staying the course, and for keeping the person's willpower strong. For this, such applications offer a range of features, that usually work based on the personal goals set. Tracking tools (calories or steps counters), virtual coaches and connection to the practitioners' community for cheering, support, or competition are examples of the features MFAs offer.

There is a big diversity of commercial MFAs to stimulate the search for a healthier life through the practice of simple and cheap physical exercises, as jogging or running (e.g. RunKeeper, Nike+Running, Runtastic and Endomondo). There are initiatives in the academy to classify and to categorize MFAs according to their audience and features [9, 22]. There is still a need for analyzing the quality of these applications, in the academic literature [6, 20]. Silva et al (2015) propose an instrument to evaluate the usability of these applications for elderly people. West et al (2014) make comparisons between the most popular MFAs in the market, in different platforms. Furthermore, there are studies that investigate the effects of the social interaction provided by these applications, upon the sports practice [3, 18].

However, keeping a long-term routine of exercising demands high levels of motivation, that includes other reasons not related to physical health [9, 7]. Regarding motivations and stimuli, Kranz et al (2013) present GymSkill, a MFA for elderly people, that offer individualized and personalized automated feedback on the phone, with the goal to track training quality and success and give feedback to the user, as well as to engage and motivate regular exercising. Consolvo et al (2006) describe Houston, a prototype mobile phone application for encouraging activity by sharing step count with friends. They also present four design requirements for technologies that encourage physical activity based on an *in situ* pilot study, that was conducted with women who wanted to increase their physical activity, which are: give users proper credit for activities; provide personal awareness of activity level; support social influence; and consider the practical constraints of users' lifestyles.

Although these are relevant aspects for the design of MFAs, for one to engage and maintain the practice of physical activity, it is

important to explore properly the intrinsic and extrinsic motivations of the user [7, 9, 18]. MFAs should properly explore these aspects in order to give the user a pleasant experience that makes her feel challenged and instigated to evolve in the practice of the exercise, instead of giving up.

There is a need to promote a better understanding and an adequate, relevant and meaningful use of the MFAs, according to the intrinsic and extrinsic motivations of the user, while engaging in a physical activity. Academics, software engineers, developers or simply interested end users lack a comprehensive overview of the development and evaluation of MFAs taking the motivational aspects into consideration. This is necessary not only for MFAs developed for specific needs or audiences, but also for wide audience commercial MFAs.

To verify the stimulation of motivation in the context of physical activities, it is necessary to evaluate the usability and the user experience aiming to minimize the difficulties of user interaction, reducing the impact of the differences between the existing platforms and improving the quality of these applications [8, 3]. The focus on user experience is a strong determinant of quality in a big number of MFAs that compete with each other [19].

Moreover, the emotional aspects are not only relevant for the beginning and the maintenance of the activity, but also for the use of the MFA [12]. Gender and culture may also influence the search for physical exercises [7]. Hence, the evaluation of MFAs should consider all these aspects to find if the application is providing the user with the proper motivation.

The present paper describes the first of a three-phased research, which final objective is to identify the necessary requirement to design MFAs capable to engage the users on the physical activity. We discuss the audiences of MFAs and how the users face the MFAs resources, as well as the resources that the MFAs have been using to help the user to commit to the activity. In the second phase, the analysis will be extended (in relation to the audience, the time of use of the applications e to the number of evaluators), and the results will be organized as guidelines to the design of MFAs. In the third phase, an instrument to evaluate the degree of motivation activated by MFAs will be developed and validated, based on the collected data and other evaluation instruments of usability, UX and affection.

The objectives of the work described in this paper are: 1) Assess the commercial MFAs RunKeeper and Nike+Running, evaluating their usability and user experience. 2) Identify if the motivational resources offered by the MFA are in accordance with the users' needs. We analyzed emotional factors, considering it as an important component of the experience of use in the MFA context and in the exploration of its tools to engage the user on the physical activities.

The remainder of this paper is organized as follows. Section 2 discusses the types of motivation for the adherence to exercises, and how a person evolves her motivations. The research methodology is presented in Section 3, which is followed in Section 4 by the description of each phase of the evaluation. Section 5 presents the results obtained in the assessments performed. We discuss the results and its implications in Section 6. Section 7 provides some final conclusions and directions for future work

2. EXERCISE MOTIVATION AND STAGES OF CHANGE

The adherence to the practice of physical exercises can be understood according to the nature of the motivation, which may be intrinsic or extrinsic. When intrinsically motivated, individuals engage in an activity primarily for the enjoyment and satisfaction gained from participation per se (e.g., *I love running, it makes me feel so alive!)*; when extrinsically motivated, individuals participate in order to obtain rewards that are extrinsic to the behaviour itself (e.g., *I need to lose 5 pounds before the summer vacation!).*

These different motivational perspectives have different impacts on cognitive, emotional and behavioral aspects. Extrinsic motives may lead to tension, pressure to perform, and feeling of compulsion, whereas intrinsic motives allow freedom from pressure and the experience of choice, and are more likely to foster long-term engagement [7].

Intrinsic motivations have a bigger role in the adherence to physical activity over time. However, the rewards may not appear in the initial period of the practicing of the exercise. In this period, the motivations derived from physical results become more relevant. In this way, the earlier stages of physical activity relates more to extrinsic motives, whereas the later stages usually associates with intrinsic motives [7]. For Ingledew et al (1998), the stage of change *constructo* (Fig. 1) can be used to understand the dynamic of motivations on different stages of adherence to physical activity, since the initial moment until the maintenance. The *constructo* consists of five stages: precontemplation, contemplation, preparation, action and maintenance.

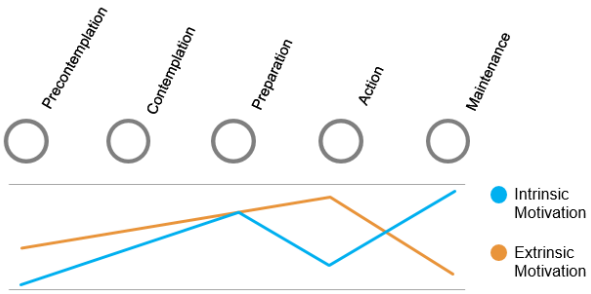

Figure 1. Ingledew's stage of change *constructo*: five stages of changing and their correspondence with the different types of motivations.

In the precontemplation stage, people don't have any intention, in short time (about 6 months), of changing their habits. In the preparation stage, they assume a commitment with themselves of changing a habit as soon as possible. In the action stage, they assume an active posture on the change of a habit through their attitudes. If they persist on it for more than six months, they are classified as being in the maintenance stage.

Different motivations predominate in each of the stages. In precontemplation, extrinsic motivations (physical appearance, control of weight) prevail over intrinsic motivation (sense of achievement / pleasure in the activity). In contemplation, this previously domain is smoothed by the increase of intrinsic motivation. In preparation, this difference disappears. In action, with the beginning of the practice per se, extrinsic motivations once again prevail over intrinsic ones. These increase as one

becomes loyal to the practice, decreasing the extrinsic motivations.

We can comprehend that, although the adherence to the practice of the exercise is initially motivated by the results obtained (extrinsic motivation), it is necessary to increase the intrinsic motivations, making the exercise enjoyable and important by itself. Otherwise, the person may abandon the physical activity after obtaining the first rewards. It means that MFAs should explore these aspects in order to provide the user a pleasant experience that makes her feel challenged to evolve, instead of giving up.

3. METHODOLOGY

The evaluation of the MFAs occurred according to the framework DECIDE [16], in three steps: Initial Researches and Data Collection, Applications Investigation and Evaluation with Users. Each phase had a step of consolidation of the results, using the suitable methods for each dataset.

We performed the evaluations with three groups of users between 18 and 35 years old, totaling 97 users. In the first moment, we released an online survey, answered by 79 people (52% women), varying from regular practitioners to non-practitioners of physical activity. In the second moment, researchers interviewed 12 runners (four women), being two men runner coaches. Finally, in the third moment, six users (three women) used the applications while guided and observed by the evaluators. All the evaluations occurred in a Brazilian metropolis. This sample will be expanded in the future works. For all the assessments, it was a requirement that the participants practiced the physical activity (jogging/running). The sampling of the online survey, as an instrument of initial collection, was the only in which non-practitioners were also included, in such a way that 43% were practitioners and 57%, non- practitioner. The practitioner's data was the most explored sample of the survey.

A survey performed between practitioners of running or jogging pointed out that MFAs RunKeeper (29%) and Nike+Running (21%) are the two as the most used applications (Fig. 2). We considered the features related to goal management, to the accompanying of the evolution and the use of the application during the effective practice of running/jogging.

The versions of the applications evaluated were Nike+Running 1.4.1 and RunKeeper 4.7 (both free versions) on a Motorola Razr D3 running operating system Android 4.1.2 Jelly Bean. It is interesting to point out that, in spite of presenting similar functionalities, the applications differ in some interface aspects, which contributed to our choice. The first difference relates to the personality: Nike+Running works with a playful proposal, with a visual style that explores the color contrast, expressive typography and massive use of graphics. RunKeeper, on the other hand, is marked by a simpler visual style, with less color contrast, simple typography and minimalist graphics. The second difference is observed in navigation structure: Nike+Running presents its sections from a hidden menu, while RunKeeper divides its sections in tabs, arranged horizontally. The language used to communicate with the user is the last difference: Nike+Running addresses a speech predominantly personal and casual, in contrast to RunKeeper, that communicates in an impersonal way, using technical terms more often.

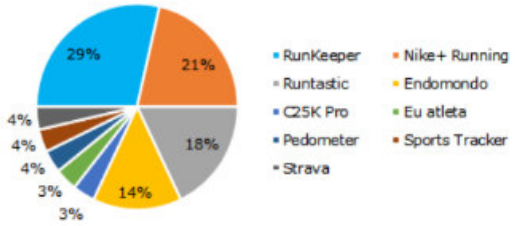

Figure 2. Applications used by the participants of the online survey. RunKeeper and Nike+Running are the most used.

These different aspects are clear when comparing the screens presented in Fig. 3a-3d and Fig. 4a-4d. We considered the elements of the interface that included functionalities related to the running, goals settings, monitoring user evolution, and the motivational mechanisms on these functionalities.

4. EVALUATION OF THE MFAs

4.1 Initial Researches and Data Collection

The Initial Researches consisted in a bibliographic review, the structuration of the evaluation process and an autoethnography [5] made by three researches.

The autoethnographic exploration identified the characteristics and motivational resources offered by each MFA. In Nike+Running (Fig. 3), we identified the following characteristics and features: main navigation accessible by menu; embedded music player (integrated to the application); function PowerSong (allow the user to select exciting songs and activate them anytime during the running); sonorous feedback in English (informing the time and the covered distance); smooth transition between songs; screen locker during the running; possibility of record comments about the activity; charts; the feature Challenge (it permits the user to invite a friend to a challenge and rank the performances); system of rewards using badges and scores according to the user progress; notifications about activities of running plans. The provided information is summarized (time, distance and velocity), but the application does not offer calorie-counting.

In relation to RunKeeper (Fig. 4), we identified the following items: main navigation accessible divided in tabs indicating the sections; sonorous feedback in Portuguese; integration with the camera during the running; distinct modes of interface presentation (night mode and landscape); performance charts accessible during the activity; sonorous feedback at touching the screen; detailed report of the performance at the end of the activity; sonorous summary of the performance; setting and reminders of goals; training planners; automatic pause; many options of outdoors activities. The free version limits the access to the training planner.

After the Initial Researches, the Data Collection phase consisted of an online survey and a set of interviews, resulting in the creation of user profiles (Table 1). We identified two user profiles: Profile A – independent runner/jogger, and Profile B – expert-assisted runner/jogger. The further evaluation methods consider only Profile A, since this is the audience that uses smartphone to support the activity. The survey was online for five days and was composed of one open and 20 closed questions, responded by 79 people. The interviews were semi-structured and consisted of 17 questions. Two pairs of evaluators interviewed 12

runners/joggers in loco, in sessions of approximately 15 minutes. We created the user profiles using the information gathered from the interviews and the practitioners' responses to the initial questionnaire. Based on these data, the behavior, goals, and the resources used during physical activity were mapped and used to substantiate profiles' consolidation.

We used data triangulation charts and simple statistical analysis on the data obtained from these two methods, with a quantitative focus. It gave us understanding of the audience and their experience to elaborate the user profiles. Moreover, it helped us to choose the applications and the portion of the interface to evaluate.

Table 1. User profiles identified

PROFILE A *Independent runner/jogger*	**PROFILE *B*** *Expert-assisted runner/jogger*
- Men and women; - Between 18 and 35 years old; - Uses the smartphone to support the activity; - Practices exercise alone, few social interaction between peers; - Motivations mainly related to the need of good health, for example; - Primary objective: get in shape; - Secondary objectives: good health, pleasure, keep a good shape.	- Men and women; - Between 18 and 35 years old; - Uses specific devices to support the activity (e.g. watch with GPS); - The practice includes a group, there is social interaction between peers; - Motivations mainly related to pleasure, despite the need of good health; - Primary objective: good health; - Secondary objectives: performance.

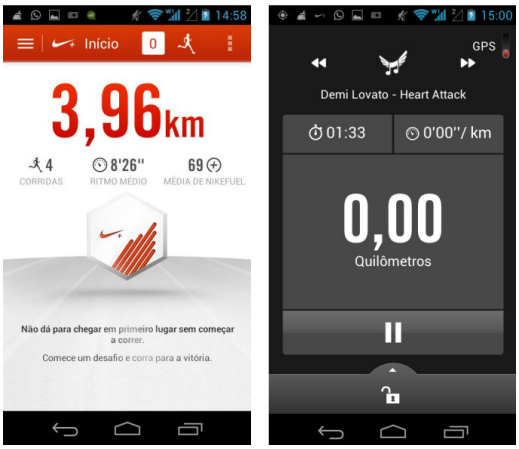

Figure 3a and 3b. Nike+Running. Respectively: Initial screen, and Monitoring of the running/jogging

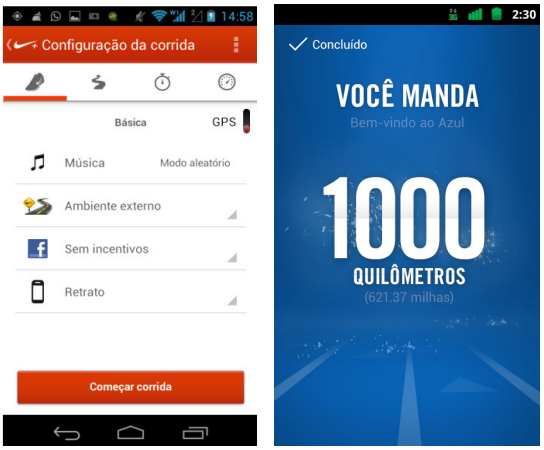

Figure 3b and 3c. Nike+Running. Respectively: Settings of the running, and Rewards;

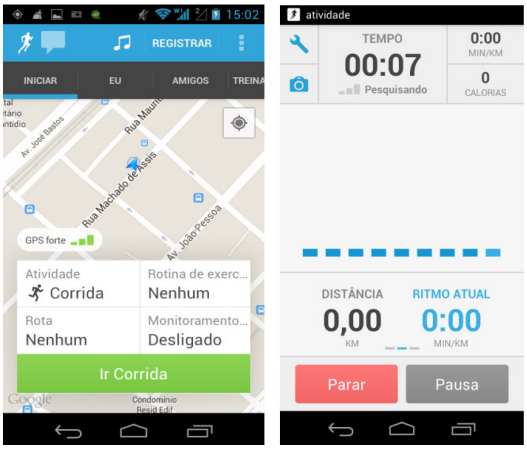

Figure 4a and 4b. RunKeeper. Respectively: Initial screen, and Monitoring of the running/jogging;

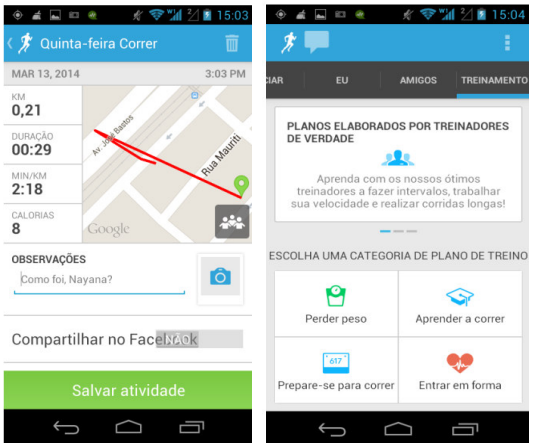

Figure 4b and 4c. RunKeeper. Respectively: Records of performance post-run, and Training planner.

4.2 Applications Investigation

We performed two types of analysis of the MFAs. First, a set of usability inspections aiming to identify the problems that affect directly the user's performance during the use of the application. Second, a set of observations with users in which the objective was to evaluate the first experience of use and the level of satisfaction and the emotions related to the use.

Two evaluators performed a usability inspection according to UBICUA, an evaluation method derived from Usability Engineering, focused on the evaluation of mobile devices, identifying usability violations [2, 12]. Each evaluator conducted the inspections twice per application in sessions of about 1h20min, looking for problems related to the nine verification items proposed by UBIQUA: *(V1) Current structure and configuration of the application; (V2) Relation between the Application and the reality; (V3) User freedom; (V4) Interface standards for mobile devices; (V5) Error prevention; (V6) Recognition facility; (V7) Increasing of the quality of use; (V8) Patterns and aesthetic structure of the interface; and (V9) Feedback and help information for the user.* This evaluation considered the execution of three tasks: use the application as a support to achieve the goal of running 5km (UT1); verify the evolution on the practice and check if the information provided is satisfactory to do so (UT2); and finally perform a jog/run using the application (UT3).

Other two evaluators carried out a Cognitive Walkthrough [21], to identify possible problematic interactions and to verify the easiness of learning. We analyzed five tasks, per application, each one analyzed by two evaluators, in sessions of 1h45min on average: start and finish a run (PT1), explore motivational resources in the application (PT2), set a goal of 5km and start a run with this goal (PT3), set up a training plan and start a run (PT4), and see the personal evolution (PT5). The evaluators classified the problems found during both methods as usability problems following the usability principles of Nielsen [12] scoring its severity on a scale of zero (cosmetic) to four (catastrophic).

4.3 Evaluation with Users

The context of use of MFAs is dynamic, exposed to external interruptions and limitations of the mobile devices. These limitations include the size and quality of the display, network availability, luminosity, security at the local of use and ergonomic comfort during the use of the device [19]. A usability evaluation conducted in a laboratory neglect these aspects of the context, suggesting an analysis based on artificial data, because the experience of use is displaced of its real context of use [19].

That is why in this work the evaluation with users was projected to include the natural context of use, using resources, and collecting and analysis methods adequate to the use of applications outdoors, as it happens in the practice of jogging or running. The Evaluation with Users consisted of the execution of the same three tasks considered on the UBICUA evaluation, including a real run using the MFAs combined with observation (with video capture of the MFAs utilization test), the Think Aloud technique [13] and pre and post-test interviews. There are evidences that the combination of video capture of the user-application interaction with Think Aloud techniques can be a very effective way of identifying the usability problems in a similar environment of city streets [19]. The goal was to evaluate the first experience of use and the level of satisfaction. The test was performed by six users (3 men and 3 women), who performed the same tasks considered on the usability inspection. In the future, we intend to expand the sample and use control groups.

To make the analysis and interpretation, two pairs of evaluators used Content Analysis [11] with a quanti-qualitative focus. They defined 15 mutually exclusive and unambiguous categories [11], among them: Goals and motivations to the practice of the physical exercise; Perceptions about the exercise; Interaction with devices; and Opinions about gender differences. Then, the video recording of the interactions were transcripted, segmented and classified by two coders, with intercoder reliability verification.. A simple statistical analysis of the classifications guided the tendencies of the positioning of the participants about aspects of their experience of use. Finally, the pairs validated the categorization analysis mutually and crossed the data with the results of the usability inspection. Finally, the Self-Assessment Manikin (SAM) [10], a non-verbal pictorial assessment technique that directly measures the pleasure, arousal, and dominance associated with a person's affective reaction to a wide variety of stimuli, was used to assess the affective quality of the MFAs' features. The evaluators mapped the problematic interactions by keeping records of description, location, context and the user reaction.

5. RESULTS

The online survey allowed us to observe an interesting relation between the MFA resources, runners/joggers and people who aspire to practice this physical activity (Fig. 5). Overall, the most relevant MFA resources for users are stopwatch, control of goals evolution, training plans and music. It is interesting to point out that the aspirants assigned a considerably higher relevance to the resources more related to extrinsic motivations. For example, social interaction (50% of the aspirants / 24% of the practitioners), application inherent motivations (68% aspirants / 27% practitioners) and the immediate results shown in evolution info (75% aspirants / 45% practitioners).

On the other hand, monitoring the results of the discriminant analysis indicate that the actual progress of inactivity to activity relates to a higher level of intrinsic reasons [7, 9]. That is why goals evolution (64%) and training plans (61%) are the most relevant for the practitioners. Some resources as stopwatch and music seem to be equally relevant for both groups, although the aspirants rated music higher than the practitioners did. It shows the motivations are not exclusive to each group and represents beginners moving to the stage of maintenance.

From the point of view of the context of use, 55% of the practitioners declared that they do not usually take their smartphones to running activities. The main reason to it is the lack of public security, followed by the lack of ergonomy. The survey data between practitioners (Fig. 6) showed that the motivations of both genders are similar and rely mostly on good shape (for 71% of the women and 89% of the men) and health (64% women / 33% men). The biggest difficulties for both groups are maintenance (50% women / 72% men) and motivation (36% women / 39% men). According to the interviews, all women and three men affirmed to have started the activity for health issues related to losing weight - also an esthetic aspect. The other five men affirmed to have started running for pleasure. Two of these were coaches. They affirmed that usually their students' initial behavior relates to get in shape (especially women). However, after a few months their motivations tend to change to enjoy the activity and increase their performance, for both genders.

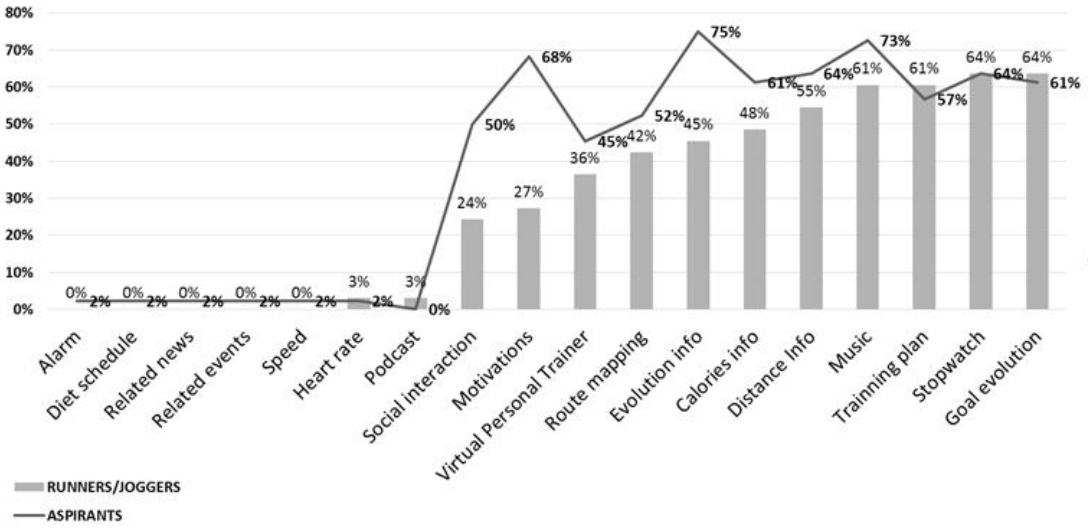

Figure 5. Relevant resources of MFAs to practitioners (19 men, 14 women) and aspirants (19 men, 25 women).

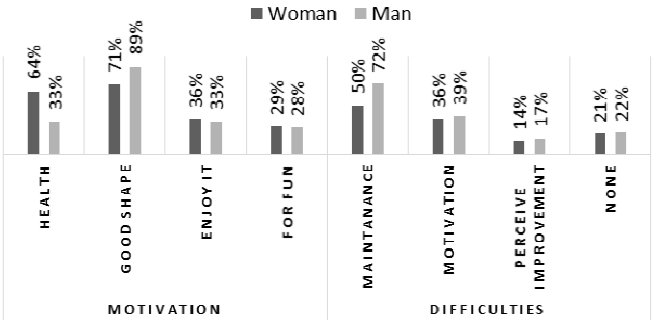

Figure 6. Comparison between motivations and difficulties of man and woman practitioners

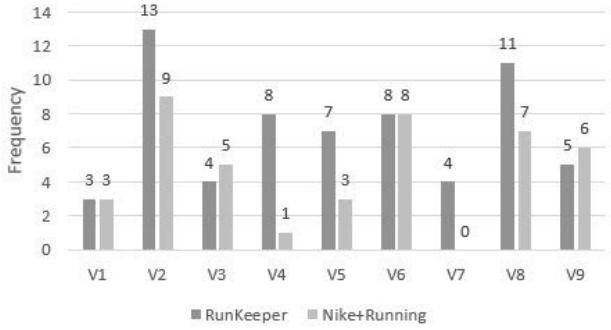

Figure 7. UBICUA violations in both MFAs.

The UBICUA method [2] identified usability problems related to all of its nine verification items, described in Section 4.2. One violation may be classified in more than one category. The results (Fig. 7) show that *V2 - Relation between the Application and the reality* holds most of the problems in all evaluated versions (22 violations). Both presented, for example, buttons hard to recognize. It means that the main usability problems of these MFAs have connection with perception, interpretation and feedback issues. Verifications *V6 - Recognition facility* (16 violations) and *V8 - Patterns and aesthetic structure of the interface* (18 violations) are also significant for the usability issues in both MFAs. They reveal problems related to communicability, affordances, recognition and use of interface elements, and the overall application layout. RunKeeper was the most problematic in terms of usability, with a higher number of errors detected during the verifications. It presented at least two violations in each category and 40 distinct violations, being 13 violations related to (V2) and 11 to (V8) (Tab. 2).

The Cognitive Walkthrough confirmed and extended the results of UBICUA. All the applications presented problems only in tasks (PT3) and (PT4) concerning mainly to the information architecture (labeling, organization, navigation) and restriction. In this sense, users have difficulties to find, inside the interface, the right way to activate a tool. Another difficulty is the discrepancy between the meaning attributed to a label and its actual meaning inside the interface. These problems match the V2 and V6 violations found on the usability evaluation, and, later, we confirmed it with the observation method. In spite of these difficulties, Nike+Running showed to be easier than RunKeeper to be learned in the first use, confirming the result of the usability inspection.

Table 2. Main problems detected with the UBICUA method.

Problem Description	Verif.
Nike+Running	
Sonorous feedback during exercise is available only in English	V2
The fixed bar of the application is visually polluted, presenting too many icons. Often the textual label that identifies the active section appears incomplete.	V1; V8; V6
Once the user enters a training plan, without even having selected the "Done" option, there is no return to the information-editing screen.	V3
Some error messages are confusing. If the user chooses a conclusion date for the training that precedes the date suggested by the virtual coach, the application will inform that the training plan is delayed. The logic of this construction is not easy to understand and it may annoy and confuse the user.	V3; V9
In the chart of activities comparison, there is no indication that the user can touch the bar of an activity to view details of the exercise performed.	v1; v2
RunKeeper	
The option to delete a goal is not easy to find, and there is no indication of it.	V3; V6
There is no indication of which areas of the interface are touchable. It may prevent the user to find some information or feature.	v4.V5; V6
In many portions of the interface, there are English words (even when the language is set to Portuguese), translation erros, abbreviations and phrases squeezed into very small spaces.	V2; V8
Messages about pause and resume of the run are transmitted only via audio.	V5
At the "individual" screen of goals, there are buttons that overlap the labels.	V4; V8

With the interpretation of the evaluation with users (Tab. 3), we detected 15 problems in RunKeeper and Nike+Running presented 16 problems for Tasks 1 (UT1) and 2 (UT2). On Nike+Running, 50% of users were unable to complete Task 1 (UT1) against 67% who failed on RunKeeper. For Task 2 (UT2), all RunKeeper users concluded it, but 33% did not complete it on Nike+Running. While performing the run, 25% of RunKeeper users completed Task 1 (UT1) with 22 taps on average, while the ideal would be 5-9 taps. All RunKeeper users were able to finish Task 2 (UT2). All Nike+Running users completed Task 2 (UT2) with seven taps (ideal). However, 25% were unable to finish Task 2 (UT2), even after ten taps when two taps were the ideal (users could not find the button, reinforcing the problems cited before).

Table 3. Examples of the main problems detected with the observation method

Principle broken	Problem description	Context
RunKeeper		
Feedback	The user was able to set a goal, but he is not sure if the interaction was completed.	Set a goal of 5 km.
Labeling and Navigation	The user made a different way (wrong) and could not finish the task. When trying to set a goal, he ended up creating a training plan.	Planning the interaction to set a goal.
Labeling and Navigation	The user wanted to include a goal in the "Training" session (wrong way).	Set a goal of 5 km.
Nike+Runing		
Labeling, navigation and visibility	When planning the interaction, among the available options in the interface, the user selected the "Activities" section as the most suitable to set a goal - an incorrect path of interaction.	The user was trying to set a goal.
Labeling and Navigation	The “Activities” screen shows some past exercise records, with the possibility to edit the information about how the person felt during the exercise, the type of ground where the run was performed, etc. By entering this section and visualizing the records of information, the user got confused and thought that information was settings options to start a new exercise.	The user was trying to set a goal.
Labeling, navigation and visibility	The label "Add Running" did not make clear to the user that this option was related to adding a previous running record.	The user was trying to set a goal.

As it demands few interactions of the user with the interface, we analyzed task 3 (UT3 - perform a jog/run using the application) in a different way, being measured according to the aspects related to the experience of use pointed in the SAM questionnaire, which contributed to consolidate how users felt while they were performing the tasks. According to the SAM results, the first experience of use in both applications was overall positive, although users were anxious during the tests. Tables 4 and 5 show the results of SAM evaluations according to the amount of participants. We evaluated each criterion of SAM in three aspects: positive, negative or neutral. The numbers in the cells represent the amount of users who claimed to have felt the corresponding sensation. Users reported their feelings in each activity, and the overall experience of using the MFAs.

Table 4. Summary of SAM results for RunKeeper

	RunKeeper								
	Pleasure			**Arousal**			**Dominance**		
	+	**0**	**-**	**+**	**0**	**-**	**+**	**0**	**-**
First Experience	**6**	0	0	**4**	0	2	**5**	1	0
Task 1	**3**	0	3	1	**3**	2	2	2	2
Task 2	4	1	1	**4**	2	0	**6**	0	0
Task 3	2	1	**3**	**3**	1	2	**3**	2	1
Overall Experience	5	0	1	**4**	0	2	5	0	1

Table 5. Summary of SAM results for Nike+Running

	Nike+Running								
	Pleasure			Arousal			Dominance		
	+	0	-	+	0	-	+	0	-
First Experience	**4**	1	1	**4**	1	1	**3**	0	3
Task 1	1	2	**3**	1	**3**	2	1	0	**5**
Task 2	**4**	0	2	**3**	1	2	**3**	0	3
Task 3	**5**	0	1	**4**	1	1	**4**	1	1
Overall Experience	**3**	2	1	**3**	1	2	**3**	1	2

According to the user's general evaluation, RunKeeper gave more satisfaction in the first contact. The level of satisfaction (pleasure), motivation (arousal), and domain (dominance) of the application varied according to the level of difficulty of each task. In tasks T2 (UT2) e T3 (UT3), the users did not feel in control as they use RunKeeper, what can be credited to the information architecture issues aggravated by the neglected usability aspects, especially recognition and use of interface elements and feedback issues caused this variation. We expected this consequence due to the usability evaluation and the cognitive walkthrough results.

While using Nike+Running, the participants frequently mentioned the interface esthetic and showed enthusiasm for it. During the test and the interview post-test, we observed that, in agreement with [14], the beauty of the interface changed the user's perception of the system behavior and increased her tolerance to errors. RunKeeper surprised the users in a positive way in relation to its architecture, organization and for having very specific labels, almost "embodying" a personal trainer. Although, the use of ambiguous or misleading labels (present in both applications), were the main responsible for leading the user through wrong ways. The users felt frustrated, anxious and losing control.

6. DISCUSSION

We discuss the summarized results presented in the article according to the two main objectives of the study.

6.1 The experience of use of the MFAs

In general, users considered the experience of use of the analyzed applications, in the first use, satisfactory. However, the continued of the experience was irregular, marked by unwanted interruptions caused by usability problems. It is interesting to note that the problems identified by the inspections (conducted exclusively with evaluators, with no users present) were also detected in the evaluation with users, in which the problems become more noticeable, once the attention to the utility of the offered tools, during the use, is diverted to the solution of difficulties related to the comprehension of its functioning.

As the evaluation consider the first experience of use, there is a learning curve and, because of that, difficulties related to the learning are expected. These difficulties may harm the quality of the experience, but it is up to the application to show the user its purpose and function, guiding the user in a way he is able to overcome the difficulties easily.

In the specific case of the two applications evaluated, we also observed that the users have difficulties in notice and interpret the information architecture, the functionalities, intentions and feedbacks given by the apps. During the execution of all the activities, there were moments of insecurity and mistaken actions, making the users anxious. For example, to complete the activity UT1, users needed five touches more than the necessary to finish the task, in both applications. In this activity, according to SAM (Tables 5 and 6), users did not feel in control or excited. It shows that, despite they were tolerant to the errors in the first use, it is likely that the application itself, which objective is to motivate the user to commit to the exercise, decrease the motivation over the time, due to the complex and problematic interactions.

The audience that uses MFAs is very heterogeneous. It raises the developers' difficulty in communicating labels and icons that are understandable to all kinds of users. Since the beginning of the interaction, it is necessary to make clear the purpose of the application and the audience it was designed for. Thus, the user will have the necessary information to evaluate if that specific application is adequate or not to her profile and objective, as well as to explore the offered resources in the best way.

We agree with [9] when they state that MFAs need to improve their usability, avoiding unnecessary interactions that could be automatically detected by sensors. We emphasize the need for a better arrangement, especially of labels and interface elements, according to the mental model of the user. The presentation of a minimalist interface could help to emphasize the relevant information.

6.2 Are the motivational resources offered by the MFAs according to the users' needs?

MFA's developers must be aware of the relation between the motivations of the beginners and practitioners and the MFA resources. The MFA resources should help to increase the intrinsic motivation, turning the activity into something enjoyable and important by itself. At the same time, it is necessary to give support to the extrinsic motivations, once they are predominant in the initial moments of adherence to physical activity.

Therefore, we verified with the users that in sports practice, music has a significant role as a motivator agent. The function PowerSongs offered by Nike+Running stands out as an intrinsic motivator, allowing the user to create a playlist of exciting songs for the moments of discouragement.

An important resource offered by Nike+Running is social network integration and gamification. These features make the user's training routine more dynamic. Nike+Running explores data about the results obtained (extrinsic motivation) in a playful approach, using prizes, records and challenges between friends. These elements contribute for increasing the pleasure of the activity (intrinsic motivation). Social interaction happens inside an intern network of practitioners or by synchronizing an open social network, like Facebook. This feature showed adequate to a collective motivation of the practitioners. Social interaction by itself gives to the practitioner a strong level of motivation, however, if allied to humorous features, it makes the motivational resources more exciting and interesting, increasing the will to use the application. Other prominent features of Nike+Running are

training planner, with clear indications of goals; performance reports; schedule of activities.

Under the motivational point of view Nike+Running takes the user to the stage of Maintenance, so it can be a good example of "ideal application" for beginners, since it works as a support to the transitions from the stage of action to the maintenance one.

RunKeeper does not offer as many resources to support this transition as Nike+Running. Nevertheless, users in the maintenance stage prioritize the improvement of their performance, trying to challenge themselves and beat increasing goals. They acclaimed RunKeeper for offering many features to support this type of motivation (as Training Planner, Profile and Activity Records) and for giving complete information and different visualization modes.

Under the point of view of context of use, the two main aspects remarked by users were the sonorous feedback and the performance monitoring offered by the application during the activity, informing regularly the duration of the exercise. In both applications the performance feedback was a point highlighted positively. However, users criticized the voice intonation, especially RunKeeper's, for being extremely robotic and impersonal, getting to annoy some users. The second aspect was music integration: Nike+Running offered native integration with music player controls, what surprised positively the participants during the run. RunKeeper does not offer this level of integration, frustrating the users, for it was the most used feature – right after the monitoring of run stats.

7. CONCLUSION

This research comprises three phases, and this paper reports the initial one: analyzing the first experiences of use of MFAs that support activities of jogging/running. Our focus was to verify the user experience and the main resources that impact on the sports practice of jogging/running accompanied by the MFAs Nike+Running and RunKeeper.

The evaluations showed a good experience of use. However, we found some significant problematic points, as information architecture and usability, which impact the experience of use in a negative way, especially in the continued use. It is important to notice that factors such as motivation (intrinsic and extrinsic) and emotions during the use are relevant variables that affect directly the experience of use and that they can be impaired by a MFA that overloads the user. Thus, we can note that the applications offer features that meet the users' needs, yet these features need to be more carefully presented, in accordance with the mental model of the users, also showing motivations according to the practitioner's level.

In the second phase, the analysis will be expanded (in relation to the target audience and the applications), and the results will be organized as guidelines for designing MFAs. Finally, in the third phase, an instrument for evaluation of the degree of motivation triggered by MFAs will be developed and validated. The final goal is to analyze how the MFAs increase the motivation among young adults to evolving on exercises. Our limitations in this research are the relatively small sample of users analyzed in a regional context. It is important to verify the results in a more general context. Even though, it shows that MFAs need a more specific approach to motivating their audience. It is also necessary to use cleaner interfaces and improve its usability. This area is an opportunity to the HCI community to help people by providing them with a unique user experience and leading to a healthier and more enjoyable life.

8. REFERENCES

[1] Bert, F., Giacometti, M., Gualano, M.R., Siliquini, R. (2013) Smartphones and Health Promotion: A Review of the Evidence. Journal of Medical Systems, p. 38.

[2] Bonifácio, B., Fernandes, P., Oliveira, H. A. B. F., Conte, T. UBICUA: A customizable usability inspection approach for web mobile applications. In Proceedings of the IADIS Internacional Conference on WWW/Internet, 2011.

[3] Chen, Y. and Pu, P. (2014) HealthyTogether: exploring social incentives for mobile fitness applications. In Proceedings of the Second International Symposium of Chinese CHI (Chinese CHI '14). ACM, New York, NY, USA p. 25-34.

[4] Consolvo,S., Everitt, K. Smith, I. and Landay,J.A. (2006) Design requirements for technologies that encourage physical activity. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '06). ACM, New York, NY, USA p. 457-466.

[5] Ellis, C. S., & Bochner, A. (2000) Autoethnography, personal narrative, reflexivity: Researcher as subject. In (Eds.), Handbook of qualitative research, Second edition. Thousand Oaks, CA: Sage Publications Inc, p. 733-768.

[6] Hasman L. An introduction to consumer health apps for the iPhone. Journal of Consumer Health On the Internet, 2011.

[7] Ingledew, D. K., Markland, D. A., & Medley, A. R. (1998) Exercise motives and stages of change. Journal of Health Psychology, 3, p. 477-489.

[8] Kaye, J. 'J'., and Taylor, A. What Does Science Know about Experience? Alternatives Approaches to Evaluating User Experience, NordiCHI 2006.

[9] Kranz, M., MöLler A., Hammerla, N., Diewald, S., PlöTz, T., Olivier, P. and Roalter, L. (2013) The mobile fitness coach: Towards individualized skill assessment using personalized mobile devices. Pervasive Mob. Comput. 9, 2, p. 203-215.

[10] Morris, J. Observations: SAM: the Self Assessment Manikin An Efficient Cross-Cultural Measurement of Emotional Response. Journal of Advertisement Research, 1995.

[11] Neuendorf, K. A. The content analysis guidebook (Vol. 300). Thousand Oaks, CA: Sage Publications, 2002.

[12] Nielsen, J. Usability engineering. Elsevier, 1994.

[13] Nielsen, J., Clemmensen, T., Yssing, C . Getting access to what goes on in people's heads? Reflections on the think-aloud technique, Proceedings of the second Nordic conference on Human-computer interaction, October 19-23, 2002, Aarhus, Denmark.

[14] Norman, A. D. Emotional Design: why we love (or hate) everyday things: Basic Books, 2005.

[15] Rosenfeld, L., & Morville, P. Information architecture for the world wide web. O'Reilly Media, Inc, 2002.

[16] Sharp, H.; Rogers, Y.; Preece, J.; Interaction Design: beyond human-computer interaction, 2nd edition. New York, NY: John Wiley & Sons, 2007.

[17] Silva, P. A., Holden, K., & Jordan, P. Towards a List of Heuristics to Evaluate Smartphone Apps Targeted at Older Adults: A Study with Apps that Aim at Promoting Health and Well-being. 48th Hawaii International Conference on System Sciences 2015, Grand Hyatt, Kauai, Hawaii, USA.

[18] Stragier J, Mechant P. Mobile fitness apps for promoting physical activity on Twitter: the #RunKeeper case. Etmaal van de communicatiewetenschappen, 2015, Proceedings.

[19] Temir, Elizaveta. User Experience of mobile physical activity applications: contextual, motivational and experiential factors. UCL Interaction Center, 2012.

[20] West, J. H., Hanson, C. L., Barnes, M. D., Carrier-Giraud, C., Barret, J. "There's an App for That: Content Analysis of Paid Health and Fitness Apps." Ed. Gunther Eysenbach. Journal of Medical Internet Research 14.3 (2012): e72. PMC. Web. 23 Dec. 2014.

[21] Wharton, C., Rieman, J., Lewis, C., and Polson, P. (1994) The cognitive walkthrough method: a practitioner's guide. In Usability inspection methods, Jakob Nielsen and Robert L. Mack (Eds.). John Wiley & Sons, Inc., New York, NY, USA, p. 105-140.

[22] Xu, Q., Ibrahim,G., Zheng,R. and Archer, N. Toward automated categorization of mobile health and fitness applications. In Proceedings of the 4th ACM MobiHoc workshop on Pervasive wireless healthcare MobileHealth 2014.