PERIÓDICO TCHÊ QUÍMICA
ARTIGO ORIGINAL

# AVALIAÇÃO DE MARKETING DAS PREFERÊNCIAS DO CONSUMIDOR NO USO DE APLICATIVOS MÓVEIS PARA CUIDADOS DE SAÚDE PARA APOIAR A ADERÊNCIA AO MEDICAMENTO

# MARKETING EVALUATION OF CONSUMER PREFERENCES IN USING MOBILE APPS FOR HEALTHCARE TO SUPPORT DRUG ADHERENCE

# МАРКЕТИНГОВАЯ ОЦЕНКА ПОТРЕБИТЕЛЬСКИХ ПРЕДПОЧТЕНИЙ ИСПОЛЬЗОВАНИЯ МОБИЛЬНЫХ ПРИЛОЖЕНИЙ ЗДРАВООХРАНЕНИЯ ДЛЯ ПОДДЕРЖКИ ПРИВЕРЖЕННОСТИ К ЛЕКАРСТВЕННЫМ ПРЕПАРАТАМ

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## RESUMO

O objetivo do estudo foi realizar uma pesquisa de mercado e uma avaliação das preferências do consumidor relacionadas ao uso de aplicativos móveis de saúde (mHealth) na Rússia para apoiar e promover a adesão dos pacientes aos medicamentos. Materiais e métodos. A pesquisa envolveu 1.099 consumidores de saúde móvel de dois segmentos-alvo. O primeiro segmento (S1) incluía consumidores intermediários: real (264 farmacêuticos de 22 regiões da Rússia) e potencial (293 estudantes com especialização em Farmácia). O segundo segmento (S2) incluiu 542 consumidores finais, ou membros do público em geral, de 28 regiões da Rússia. Os estudos de campo foram conduzidos usando os métodos de pesquisa oral (27%) e pesquisa baseada na web (73%) com um questionário estruturado. O método qualitativo com um gráfico de percepção bidimensional e o método quantitativo de estimativas pontuais individuais com o cálculo de indicadores integrais foram utilizados para o posicionamento. Resultados e discussão. O estudo de marketing da adesão a medicamentos revelou que mais de 50% dos entrevistados no S2 têm baixo grau de adesão. As formas mais comuns de apoiar a adesão foram tomar medicamentos como parte da rotina diária normal (87,1%) e usar aplicativos móveis de saúde (66,4%). De acordo com 98,2% dos farmacêuticos e estudantes (S1), os aplicativos mHealth poderiam ser mais amplamente recomendados para uso. As dificuldades técnicas foram a principal barreira para sua implementação (32,5% para o S1 e 59,8% para o S2). Os líderes entre aplicativos móveis para controle de drogas na Rússia foram estabelecidos como resultado do posicionamento usando métodos qualitativos e quantitativos. Foi proposto um mecanismo para promover a saúde móvel, a fim de satisfazer mais plenamente as preferências dos consumidores. Conclusão. Os resultados obtidos fornecem a base para o desenvolvimento de um conjunto de medidas estratégicas para o desenvolvimento adicional do segmento básico do mercado de aplicativos móveis de assistência médica para apoiar a adesão a medicamentos e aumentar as vantagens competitivas do mHealth, que contribuirão para o tratamento eficaz e prevenção de doenças crônicas na Rússia.

**Palavras-chave**: *mHealth, adesão a medicamentos, preferências do consumidor, aplicativos móveis, marketing.*

## ABSTRACT

The goal of the study is to conduct a market research and an evaluation of the consumer preferences related to the use of mobile healthcare apps (mHealth) in Russia to support and promote patients' adherence to drugs. Materials and methods. The survey involved 1,099 mHealth consumers from two target segments. The first segment (S1) included intermediate consumers: real (264 pharmacists from 22 regions of Russia) and potential (293 students with major in Pharmacy). The second segment (S2) included 542 final consumers, or members of the general public, from 28 regions of Russia. Field studies were conducted using the oral survey (27 %) and web-based survey (73 %) methods with a structured questionnaire. The qualitative method with a two-dimensional perception chart and the quantitative method of individual point estimates with the calculation of integral indicators were used for positioning. Results and discussion. The marketing study of drug adherence has revealed that over 50 % of the respondents in S2 have low degree of adherence. The most common ways to

support adherence were to take medications as part of the normal daily routine (87.1 %) and to use mobile healthcare apps (66.4 %). According to 98.2 % of the pharmacists and students (S1), mHealth apps could be more widely recommended for use. The leaders among mobile apps for drug control in Russia have been established as a result of positioning using qualitative and quantitative methods. A mechanism for promoting mHealth has been proposed in order to more fully satisfy consumer preferences. Conclusion. The obtained results provide the basis for the development of a set of strategic measures for the further development of the basic segment of the mobile healthcare app market to support drug adherence and to increase the competitive advantages of mHealth, which will contribute to the effective treatment and prevention of chronic diseases in Russia.

**Keywords**: *mHealth, drug adherence, consumer preferences, mobile apps, marketing*.

## АННОТАЦИЯ

Цель – провести маркетинговое исследование и оценку потребительских предпочтений использования мобильных приложений здравоохранения (mHealth) в России для поддержки и продвижения приверженности пациентов к лекарственным препаратам. Материалы и методы. В опросе участвовали 1099 потребителей mHealth из двух целевых сегментов. Первый сегмент (S1) включал промежуточных потребителей: реальных (264 фармацевта из 22 регионов России) и потенциальных (293 студента, обучающихся по направлению подготовки «Фармация»). Ко второму сегменту (S2) были отнесены 542 конечных потребителей, или представителей широкой общественности, из 28 регионов России. Полевые исследования проводили методом устного опроса (27%) и web-опроса (73%) с использованием структурированной анкеты. Позиционирование осуществляли качественным методом с использованием двумерной карты-схемы восприятия и количественным методом индивидуальных балльных оценок с расчетом интегральных показателей. Результаты и обсуждение. Маркетинговое исследование приверженности к лекарственным препаратам показало, что более 50% респондентов сегмента S2 имеют невысокую степень приверженности. Наиболее распространенными способами поддержки приверженности являлись прием лекарств в рамках обычного ежедневного режима (87.1%) и использование мобильных приложений здравоохранения (66.4%). По мнению 98.2% фармацевтов и студентов (сегмент S1) приложения mHealth могли быть более широко рекомендованы к применению. В результате позиционирования качественным и количественным методами были установлены лидеры среди мобильных приложений по контролю приема лекарств в России. Предложен механизм продвижения mHealth с целью более полного удовлетворения потребительских предпочтений. Выводы. Полученные результаты дают основание для разработки комплекса стратегических мероприятий по дальнейшему развитию базового сегмента рынка мобильных приложений здравоохранения для поддержки приверженности к лекарственным препаратам, повышению конкурентных преимуществ mHealth, что будет способствовать эффективному лечению и профилактике хронических заболеваний в России.

**Ключевые слова**: *mHealth, приверженность к лекарственным препаратам, потребительские предпочтения, мобильные приложения, маркетинг*.

## 1. INTRODUCTION

The problem of insufficient patient adherence to therapy is among the most urgent ones in the modern medicine and society. This problem is especially acute in the treatment of chronic diseases that require a long (often lifelong) intake of drugs and compliance with a list of medical recommendations (McCabe *et al*., 2017; Nikishchenkova and Nikiforov, 2018; Norberg and Gustafsson, 2018; Rosenberg *et al*., 2020; Salimzadeh *et al*., 2019; Schinköthe, 2019). It is believed that low adherence is the main reason for reducing the manifested therapeutic effect, it significantly increases the likelihood of complications of the underlying disease, and leads to a decrease in the living standards of patients and to an increase in treatment costs (Babaskin *et al*., 2019a; Lukina *et al*., 2017).

Today, there is no single effective strategy for increasing adherence to therapy; no method is absolutely reliable. The most common ways to support patients' adherence to medication regimens are reminder systems, including tips through written notes, diaries, special packages, smart watches, smart patches, and daily routines (Davies *et al*., 2015; Henriksen *et al*., 2018; Skrzypecki *et al*., 2019). The use of mobile healthcare apps has significantly increased for these purposes in recent years (Bachiri *et al*., 2016; Brzan *et al*., 2016; Haase *et al*., 2017; Sharp and O'Sullivan, 2017). According to analysts of Research and Markets and Research2Guidance, the global market for these apps annually increases by 25 % on average (Sydow, 2019). Mobile apps can give consumers a notification about taking a specific drug at a certain time, its dosage, a reminder to purchase a new drug

package, information on its use, and are also able to control physiological parameters (García *et al*., 2019; Hansen *et al*., 2018; Helbostad *et al*., 2017; Hristoforova *et al*., 2019; Istepanian and Al-Anzi, 2018; Jeffrey *et al*., 2019; Jogova *et al*., 2019; Kagen and Garland, 2019; Nikolaou and Lean, 2017; Peake *et al*., 2018; Mariblanca and Cano de la Cuerda, 2017; Santo and Redfern, 2019; Stubberud and Linde, 2018). However, they are not able to solve such issues as educational barriers and medical literacy of the population. These barriers can be overcome with the support of patients by pharmacists as the most accessible public health workers (Spears *et al*., 2020). Pharmacists play a key role in integrating mobile apps in this area. New technologies of mobile apps in healthcare can both increase patients' commitment to therapy and improve the pharmacists' work – make it more automated and effective.

It is necessary to focus primarily on meeting the needs of the population in order to successfully advance patient adherence to drugs and increase the competitiveness of mobile healthcare apps. This requires to conduct research on consumer preferences for using mobile apps to control the administration of drugs and the factors that shape these preferences.

The purpose of the study is to conduct a market research and an evaluation of the consumer preferences related to the use of mobile healthcare apps (mHealth) in Russia in order to support and promote patients' adherence to medication regimens.

## 2. MATERIALS AND METHODS

The objects of research were mHealth apps popular in Russia and used for supporting and promoting drug adherence: Course Pill - medicine intakes, Dosecast - Medication Reminder, Med Helper Pill Reminder, Medisafe Pill Reminder, Mr. Pillster - pill reminder, My pill reminder, MyTherapy Pill Reminder, Pill in Time - reminder and drug take schedule, Pill Reminder and Health Tracker, RX2 - Meds and Pill Reminder L.

A descriptive marketing research – a survey involving 1,099 mHealth consumers – was conducted to support and promote drug adherence from two target segments. The first target segment (S1) included intermediate mHealth consumers: real (264 pharmacists from 22 regions of Russia and 235 business entities with various forms of ownership) and potential (293 students with major in Pharmacy from the I. M. Sechenov First Moscow State Medical University). It is generally accepted in pharmaceutical marketing that the intermediate consumers are persons who prescribe or recommend medicines (doctors or pharmacists, accordingly) (Skorobogatykh *et al*., 2018; Smith *et al*., 2002). The second target segment (S2) included 542 mHealth end users, or members of the general public, from 28 regions of Russia. Real and potential mHealth consumers older than 18 who were ready to participate in the survey, with the exception of pharmaceutical workers and medical students, were included in S2. The participation was anonymous and voluntary, and respondents were fully aware of the purpose, nature, potential benefits, and risks of the survey. The study was conducted in accordance with the principles stipulated by the Helsinki Declaration and the ICC/ESOMAR International Code on Market, Opinion and Social Research and Data Analytics (ICC and ESOMAR, 2016). The sample size of each target segment was determined by time and resource constraints.

The field study was carried out in March – June 2019 by the personal oral interview (27.2 %) and web-based survey (72.8 %) methods using a structured questionnaire (Appendix 1). The questionnaire contained 20 questions regarding the characteristics of respondents, their consumer preferences in using mobile apps to support drug adherence, factors that shaped those preferences, and evaluation of the need satisfaction. Some questions were focused only on the S1 or S2 consumers. This was due, for example, to the professional activities of pharmacists (work experience in the specialty) or the training of students (training course). In the questionnaire, such questions were noted with the words: "If you are a pharmaceutical worker ..." or "If you are a representative of the general public ...". A cover letter with information for the survey participants was attached to the questionnaire (Appendix 2). All questionnaires were coded for tracking purposes, the codes were securely stored.

The questionnaire included questions from the Morisky-Green MMAS-4 test (Morisky *et al*., 1986) for a general evaluation of the survey participants' adherence to medication regimens: "Do you ever forget to take medications?", "Do you sometimes not pay attention to the hours of the drugs administration?"," Do you skip taking medications if you feel well?", "If you feel unwell after taking medications, do you miss the next dose?". Each negative response was rated at one point. The respondents who scored four points

were considered highly adherent to drugs, three points were medium adhered, and two points or less were low adhered.

The Likert scale was used in responses to some questions of the questionnaire: strongly agree, agree, find it difficult to respond, disagree, strongly disagree, and the “option text” field was used to better understand the opinions of the respondents.

A qualitative method with a two-dimensional perception chart (Malhotra and Birks, 1999) and a quantitative method of individual point estimates with the calculation of integral indicators (Babaskin *et al*., 2018) were used for positioning.

The statistical data processing was performed using the SPSS.Statistics.v17.Multilingual-EQUiNOX (SPSS Inc) software. The characteristics of the respondents of the studied target segments were expressed either in absolute and relative values, or in metric units, such as the median, lower (25 %) and upper (75 %) quartiles (IQR), or the mean ± standard deviation (SD). Cross tabulations, Mann-Whitney and Kruskal-Wallis tests were used to evaluate differences between the individual groups. The critical level of significance in testing statistical hypotheses in the study was taken equal to 0.05.

## 3. RESULTS AND DISCUSSION

### 3.1. Characteristics of the survey participants

Women predominated among 557 respondents in S1 (81.5 %). There were 229 women (86.7 %) in the cohort group of specialists in the field of pharmaceutical activity and 225 women (76.8 %) in the group of students. Their average age was 37.8 ± 10.2 years (median was 38, IQR was 29 – 47) and 21.3 ± 3.1 years (median was 21, IQR was 19 – 23), respectively. Of those surveyed in the group of pharmaceutical workers, 166 people had experience in their field of up to ten years (62.9 %) and 98 respondents had ten years of experience or more (37.1 %). The cohort group of students was approximately evenly distributed among the courses of study: 19.5 % for the first year, 20.1 % for the second year, 20.1 % for the third year, 19.8 % for the fourth year, and 20.5 % for the fifth year.

There were 330 women (60.9 %) and 212 men (39.1 %) among the 542 respondents in S2. Their average age corresponded to 45.1 ± 11.6 years (median was 45, IQR was 34 – 56). Without any prejudice, the survey participants in S2 were divided into age groups: 18 to 40 years old, or “young” (43.0 %); 40 to 60 years old, or “middle-aged”, (35.1 %); and 60 years old and older, or “elderly” (21.9 %). According to their social status, most of the respondents in S2 were employees and workers (64.9 %), while pensioners made up only 7.9 %. It must be noted that the workers from other countries (guest workers) made up a small part of the respondent workers – 2.3 %. The predominant number of mHealth consumers in S2 had higher professional education: specialist’s degree (26.2 %), master's degree (12.0 %), and bachelor's degree (32.8 %). The share of S2 respondents with secondary vocational education was 22.5 %, the share without professional training was 6.5 %. The majority of participants in the S2 survey had an average monthly income per family member (57.0 %). The ratio of the respondents from various sociodemographic groups in S2 corresponded to the consumer structure of the Russian pharmaceutical market.

### 3.2. Consumer preferences in supporting the drug adherence

The results of a general evaluation of the survey participants' adherence to medication regimens using the Morisky-Green test indicated that 71.3 % of the respondents from pharmaceutical workers and students (S1) had high degree of drug adherence (Figure 1). This indicator amounted to 46.1 % among the members of the general public (S2). It must be noted that 83.1 % of the participants in the survey in S1 and only 37.1 % of the participants in S2 observed the regimen of taking medications, regardless of their state of health.

Various methods to support patient adherence to drug regimens are currently known. The results of the survey of the respondents in S1 and S2 about the methods that they would use or would recommend to support drug adherence are presented in Table 1.

The survey results indicated that 98.2 % of the respondents in S1 would recommend using mHealth to support and promote drug adherence. This was equally expressed both in the cohort group of pharmaceutical workers and in the group of students ($p > 0.05$). The external devices (smart patches, smart watches) ranked second (67.3 %) with a slight advantage in the preferences of the student cohort group ($p = 0.047$). This was followed by the methods that helped not forget about taking medications: special packaging and observance of the daily routine (42.7 % each),

according to the equivalent opinion of pharmaceutical workers and students ($p > 0.05$).

The respondents in S2 gave their preference for taking medications as part of the usual daily routine (87.1 %). It must be noted that the most common methods of supporting adherence to prescribed treatment regimens among pharmacists and students (S1) were not widely used among the members of the general public (S2). For example, only 25.6 % of the respondents in S2 used external devices (smart patches, smart watches) to control the intake of drugs. mHealth apps were in demand among 66.4 % of the respondents in S2. The rest of the survey participants (33.6 %) were willing to use this method of supporting drug adherence. The young cohort group in S2 was more willing to acquire mobile apps for adherence to drug regimens compared to the middle-aged group ($p = 0.032$) and the elderly one ($p = 0.017$). In this regard, the respondents in S1 were asked to consider whether patients over 40 years old could use mHealth to support drug adherence. The pharmacists suggested that they completely agreed or rather agreed with a positive response (41.7 %), found it difficult to respond (33.3 %), and rather disagreed or completely disagreed (25.0 %). The data obtained suggested the need for mandatory separation of consumers into age groups for acceptance and the ability to use mHealth to support drug adherence. The opinions in the group of students were divided into exactly the opposite. For example, 36.9 % of the respondents strongly agreed or rather agreed with the capabilities of patients over 40 years old to use mobile apps to control the intake of medications, and 36.5 % of the students were more likely to disagree or completely disagree. Moreover, 43.3 % of the students enrolled in the fifth year and 41.4 % of the fourth-year students indicated that middle-aged and elderly patients could use mHealth. This indicator was reduced to 30 % in the students of the first two years ($p < 0.05$). It can be assumed that there are age and educational gaps between the students with major in Pharmacy regarding their opinions on the possibility of using mobile apps by people over 40 years old to support drug adherence.

### 3.3. Barriers to using mobile apps

To identify barriers to using mHealth, the respondents in each segment were asked to answer the following question: “What factors, in your opinion, make it difficult to use mobile apps to control drug intake?”. The survey results are presented in Table 2.

It was found that the current and future pharmacists (S1) considered technical difficulties (32.5 %), unreliable information (28.7 %), and limited content (27.5 %) as the main problems for using mHealth. The statements of the members of the general public (S2) were similar. Technical difficulties were a key problem in using mobile apps (59.8 %). This was especially expressed in the cohort of elderly people (72.3 %, $p < 0.05$). It must be noted that the data on the most significant factors in the group of students in S1 were approximately the same: 31.1 % for technical difficulties, and 30.7 % for both unreliable information and insufficient mobile content.

### 3.4. Positioning consumer preferences in using mobile apps (qualitative method)

The consumer preferences in using mHealth were positioned by compiling two-dimensional perception charts according to two indicators: awareness and popularity (Figure 2).

The results indicated that Medisafe Pill Reminder and MyTherapy Pill Reminder apps were the most recognizable and preferred mHealth apps in S1 and S2. Mobile drug control apps were better known in the cohort group of pharmaceutical workers and students (S1) compared with the group of the members of the general public (S2). The opinions of respondents from S1 and S2 were approximately the same by the Popularity indicator. In this regard, the participants in S2 were asked to answer the question of who advised them to acquire a mobile app. The answers were distributed as follows: doctor advice – 19.6 % (mainly from the group of elderly people, $p < 0.01$), pharmaceutical worker advice – 21.8 % (mainly middle-aged and elderly members of the general public, $p < 0.05$), friend advice – 14.0 %, family tradition – 6.4 %, personal experience – 8.1 %, information on the Internet and reference books – 18.5 %, advertising – 11.1 %, and spontaneously – 0.5 %. It can be assumed that the leading position of pharmacists in the promotion of mHealth explains the comparability of the opinions of respondents in S1 and S2 on the popularity of mobile apps to some extent.

It is known that the level of knowledge about products largely depends on the amount of their advertising. In this case, a directly proportional dependence of the awareness and popularity of mobile apps on the level of their advertising was also observed. Although the value of advertising when choosing mHealth was low (11.1 %), according to the survey, the positioning results revealed that effective advertising support

made mobile apps recognizable and preferred by most Russian consumers.

### 3.5. Factors shaping consumer preferences in using mobile apps

Simplicity and ease of use were the main factors shaping consumer preferences in using mHealth for more than 40 % of the survey participants (ranks 11 and 12, Table 3) ($p > 0.05$, S1 and S2). Accessibility, reliability, and security of mobile apps were crucial for almost 30 % of the respondents (ranks 9 and 10, Table 3) ($p > 0.05$, S1 and S2). The leading factor in acquiring the app was mHealth quality for 10.1 % of the survey participants in S2, the volume of mobile content for 7.6 %, and 6.3 % of the respondents primarily paid attention to the purchase price. The relationship with the attending physician and/or pharmacist, as well as additional monitoring of physiological parameters were decisive when choosing mHealth for 3.1 % and 1.3 % of the consumers in S2, respectively.

### 3.6. Positioning consumer preferences in using mobile apps (quantitative method)

The positioning of consumer preferences in using mHealth using the quantitative method revealed that mobile apps Medisafe Pill Reminder ($P_n$ = 4.9, S1; $P_n$ = 4.8, S2), MyTherapy Pill Reminder ($P_n$ = 4.8, S1; $P_n$ = 4.7, S2), and Mr. Pillster – pill reminder ($P_n$ = 4.7, S1; $P_n$ = 4.6, S2) had higher competitive advantages (Figure 3). The factors that shaped consumer preferences were used as parameters for comparison (Table 3). The evaluation was carried out on a five-point scale. The significance of factors was taken into account when calculating the integral indicators (Table 3).

### 3.7. Overall satisfaction evaluation

The question “Are you satisfied with the use of the mobile app?” was answered by the respondents in S2 as follows: 46.5 % were completely satisfied or rather satisfied, 40.4 % found it difficult to respond, and 13.1 % were rather not satisfied. The young cohort group in S2 was more satisfied with the use of mHealth to control drug intake compared with the middle-aged group ($p$ = 0.035) and the elderly one ($p$ = 0.022).

When asked whether the respondent would use mHealth apps in the future to support drug adherence, the overwhelming majority of the respondents in S2 (73.4 %) responded “definitely will” and “rather will”, 19.0 % responded “I find it difficult to respond”, and 7.6 % responded "probably not." None of the survey participants was “completely dissatisfied” with the use of the mobile app and responded the question as “definitely not” about the future use of mHealth apps.

Despite the successes achieved in medicine in Russia, the main tasks of the treatment and prevention of certain chronic diseases and their complications remain unresolved (Babaskin *et al*., 2019b; Ministry of Health of Russian Federation, 2020). This is partly due to the low patients’ adherence to drugs. For example, more than 50 % of the respondents in S2 in this study had low and medium adherence (Figure 1). The increasing use of mobile healthcare apps can be a way to support and promote drug adherence. According to IMS mHealth, their global market currently exceeds 165 thous. offers, but only 36 apps account for 50 % of the market (Upatov, 2016). Research2Guidance conducted a survey of 5,000 medical app development firms from around the world (R2G, 2017). Only 2 % of the apps have been downloaded one million times or more, while 62 % have less than five thous. downloads. According to this study, only 66.4 % of the respondents in S2 were real consumers of mobile apps, while 33.6 % would like to use mHealth (Table 1). Technical difficulties were the main barrier to the implementation of mobile apps (59.8 %, S2). This factor was also key in the formation of consumer preferences in using mHealth (24.3 %, S2). Inadequate consumer awareness of mobile drug control apps was another constraint (Figure 2). The authors believe that individuals can be educated to use mobile apps in order to solve these problems in promoting adherence to drugs. This is especially relevant for the “elderly” age cohort group. Adherence to drug regimens is a very important problem for the representatives of this group, and the market capacity of this segment should be the largest. However, only 21.9 % of the respondents in this study were targeted mHealth consumers among the people aged 60 or older (S2). Only about 50 % of them were real consumers of apps. Older people can be taught how to use mHealth by pharmacists leading the way in promoting mobile drug control apps (21.8 %). In this regard, a group of pharmaceutical workers (S1) was asked to consider whether they would agree to help educate these people in using mHealth. 72.3 % of the pharmacists responded positively (“strongly agree” and “rather agree”). 75.1% of respondents from the elderly and middle-aged groups, target segment S2, indicated that they “completely agreed” or “rather agreed” to

receive training in using mobile apps to support drug adherence. They indicated that they “strongly agreed” or “rather agreed” to be educated in using mobile apps to support compliance with prescribed treatment regimens. This can be implemented in Russia at the present time as part of the Concept of Active Longevity Policy under development (TASS, 2019). A cohort group of students in S1 was asked to answer the question of whether they wanted to take an elective course at the university in order to increase their knowledge of mobile healthcare apps. In the long run, they could educate real and potential mHealth users to support drug adherence themselves. The positive response was given by 72.3 % of the students in the third to fifth year of study (“strongly agree” and “rather agree”). Junior students (69.0 %) would like to attend such a course in senior years.

## 4. CONCLUSION:

1. The marketing study of patient adherence to drug regimens in Russia has revealed that more than 50 % of the respondents in S2 had low degree of adherence. The most common ways to support adherence were to take medications as part of the normal daily routine (87.1 %) and to use mobile health apps (66.4 %). According to 98.2 % of the pharmacists and students (S1), mHealth apps could be more widely recommended for use. The main barriers to their implementation were technical difficulties (32.5 % in S1 and 59.8 % in S2), limited mobile content (27.5 % in S1 and 53.9 % in S2), and unreliable information (28.7% in S1 and 50.2% in S2).

2. The factors shaping consumer preferences in using mobile apps have been identified. Convenience and ease of use were of decisive importance for more than 40 % of the survey participants. Accessibility, reliability, and security of mobile apps were preferred by almost 30 % of the respondents. This was followed by the quality of mHealth (10.1 %), the volume of mobile content (7.6 %), the purchase price (6.3 %), etc. The ranking of the factors allowed to calculate their weight and use these data when positioning consumer preferences.

3. The results of positioning consumer preferences in using mHealth apps using the qualitative method have revealed that mobile apps from Medisafe Pill Reminder and MyTherapy Pill Reminder are the most recognizable and preferred. The data obtained were confirmed by the method of quantitative assessment with the calculation of integral indicators. Medisafe Pill Reminder ($P_n$ = 4.9, S1; $P_n$ = 4.8, S2), MyTherapy Pill Reminder ($P_n$ = 4.8, S1; $P_n$ = 4.7, S2), and Mr. Pillster – pill reminder ($P_n$ = 4.7, S1; $P_n$ = 4.6, S2) were the leaders among mobile apps. A mechanism has been proposed for promoting mobile apps to control drug intake in order to better satisfy consumer preferences.

The obtained results provide the basis for creating a set of strategic measures for the further development of the basic segment of the mobile healthcare app market to support drug adherence and increase the competitive advantages of mHealth, which will contribute to the effective treatment and prevention of chronic diseases in Russia.

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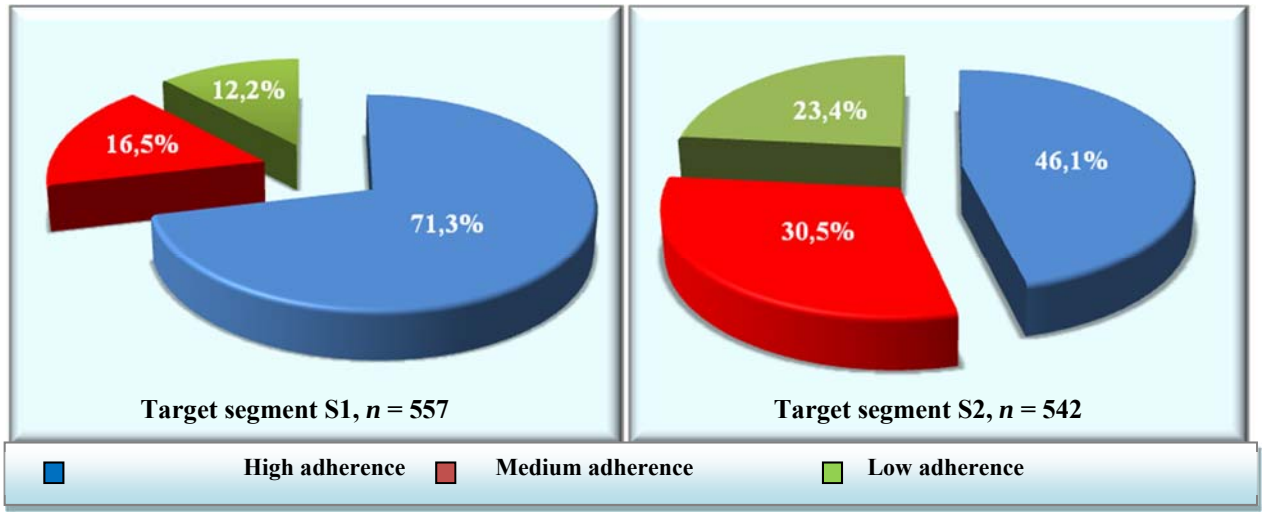



***Figure 1**. General evaluation of the respondents' adherence to drug administration in the two target segments*

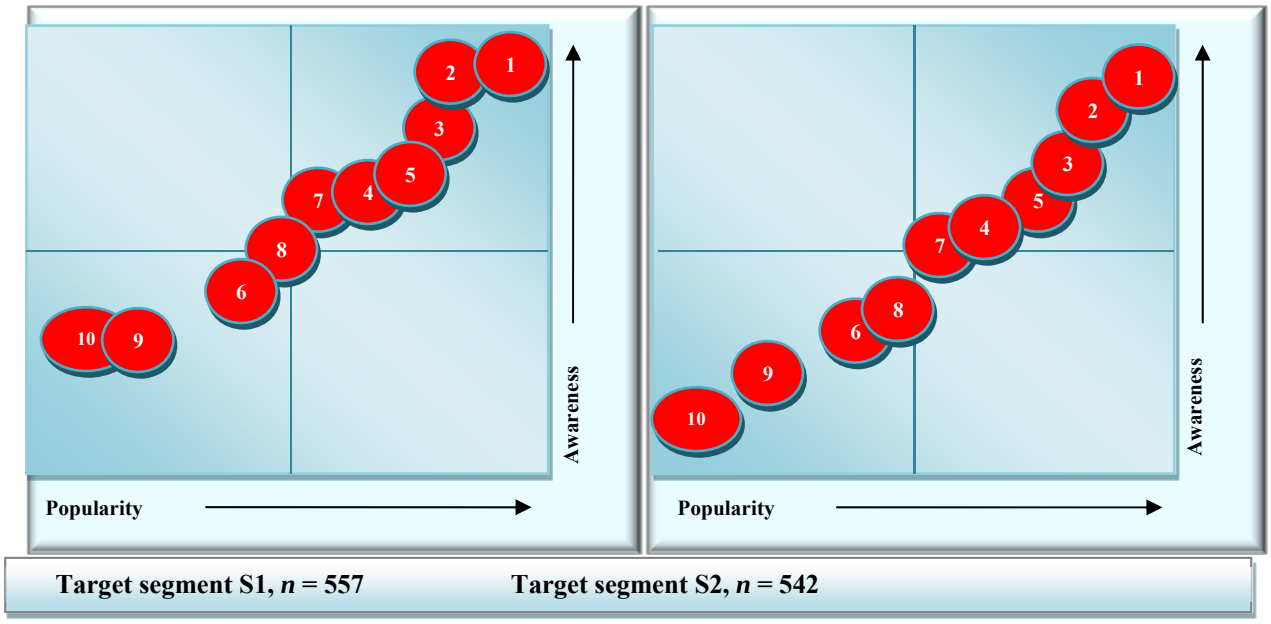



***Figure 2**. Two-dimensional charts of positioning consumer preferences in using mobile apps to support drug adherence among intermediate (S1) and final (S2) consumers in Russia (qualitative method)*

Mobile apps: 1 – Medisafe Pill Reminder, 2 – MyTherapy Pill Reminder, 3 – Course Pill – medicine intakes, 4 – RX2 – Meds and Pill Reminder L, 5 – My pill reminder, 6 – Pill Reminder and Health Tracker, 7 – Mr. Pillster – pill reminder, 8 – Pill in Time – reminder and drug take schedule, 9 – Dosecast – Medication Reminder, 10 – Med Helper Pill Reminder

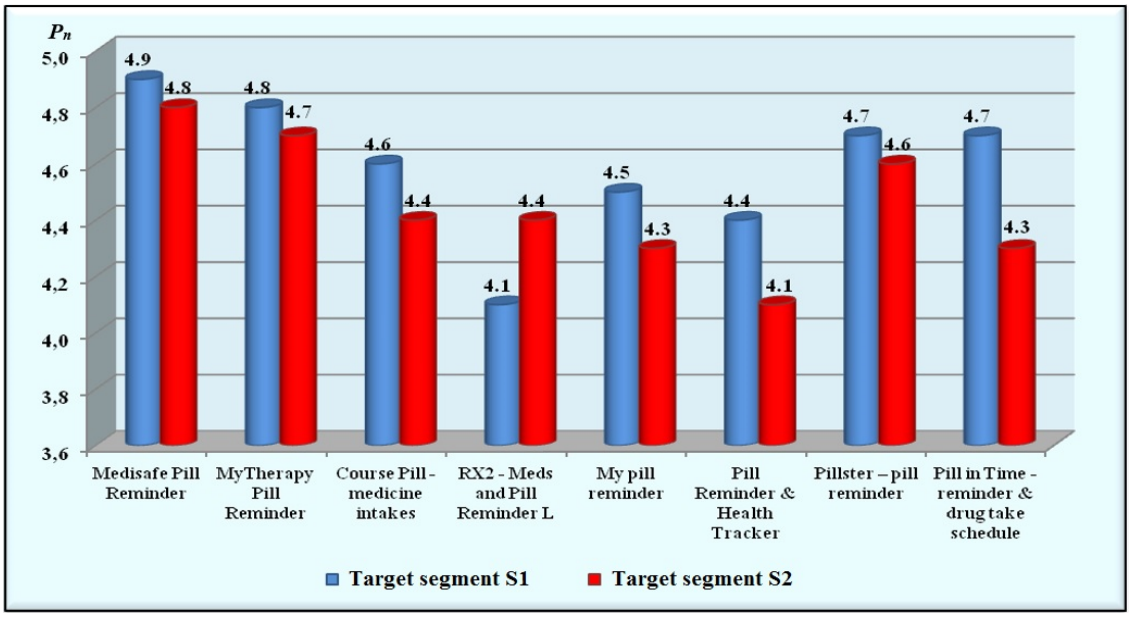



***Figure 3***. *Fragment of the chart of positioning the consumer preferences in using mobile apps to support drug adherence among intermediate (S1) and final (S2) consumers in Russia (quantitative method, $P_n$ is a composite parametric index)*

***Table 1***. *Consumer preferences in using various methods of supporting drug adherence among intermediate (S1) and final (S2) consumers in Russia*

| Methods of supporting drug adherence | Share of respondents, % (one or several answer options) | |
|---|---|---|
| | S1 (*n* = 557) | S2 (*n* = 542) |
| Written reminder or self-monitoring diary | 24.1 | 34.5 |
| Normal daily routine | 42.7 | 87.1 |
| Health impairment | 4.5 | 18.6 |
| Reminders from family members or colleagues | 13.5 | 10.5 |
| Special packaging for drug control (with or without timer) | 42.7 | 21.0 |
| External devices (smart patches, smart watches) | 67.3 | 25.6 |
| Mobile apps (mHealth) | 98.2 | 66.4 |
| Phone alarm | 1.8 | 0.9 |

***Table 2***. *Barriers to using mHealth to support drug adherence among intermediate (S1) and final (S2) consumers in Russia*

| Barriers to using mHealth to support drug adherence | Share of respondents, % (one or several answer options) | |
|---|---|---|
| | S1 (*n* = 557) | S2 (*n* = 542) |
| Technical difficulties | 32.5 | 59.8 |
| Inadequate security | 24.1 | 30.4 |
| Unreliable information | 28.7 | 50.2 |
| High price | 12.4 | 19.2 |
| Inadequate regulation by professional bodies | 15.3 | 22.3 |
| Limited mobile content | 27.5 | 53.9 |
| Low availability | 15.6 | 16.6 |
| Lack of usability | 8.4 | 11.6 |

***Table 3**. Results of determining the significance of factors shaping consumer preferences for using mHealth to support drug adherence in two target segments (S1 and S2) in Russia*

| Factor | Rank ($R_i$)* | Rank price ($C$)** | Factor weight ($W_i$)*** |
|---|---|---|---|
| Convenience | 11 | | 0.141 |
| Reliability and security | 9 | | 0.115 |
| Availability | 10 | | 0.128 |
| Price | 6 | | 0.077 |
| Volume of the mobile content | 7 | | 0.090 |
| Developer | 1 | | 0.013 |
| Design | 2 | 0.0128 | 0.026 |
| Ease of use | 12 | | 0.154 |
| Quality | 8 | | 0.103 |
| Relationship with the attending doctor, pharmacist | 5 | | 0.064 |
| Control of physiological parameters: pressure, weight, blood glucose, etc. | 4 | | 0.051 |
| Additional reminders: buying a medicine, visiting a doctor, etc. | 3 | | 0.038 |

Note. * – direct ranking method; ** – $C = 1 / \sum R_i$; *** – $W_i = C \bullet R_i$.

## APPENDIX 1. QUESTIONNAIRE

**Dear survey participant!**
We are conducting a marketing research of consumer preferences in using mobile healthcare apps (mHealth) to control drug adherence. This will make apps more accessible, convenient and useful.
*Please answer the questions below. Choose an answer option (one or more) or specify your own.*

1. **Your gender:**
   - male
   - female
2. **Your age: _____**
3. **Your education:**
   - without vocational education
   - secondary vocational education
   - incomplete higher education
   - higher education
   - Master's degree
   - Bachelor's degree
4. **Your social status:**
   - worker
   - worker of other countries (guest worker)
   - employee
   - retiree
   - student
   - housewife
   - temporarily unemployed
   - entrepreneur
5. **Your average monthly income per family member:**
   - below average
   - average
   - above average

**6. You are:**

- □ a pharmaceutical worker
- □ a student with major in Pharmacy
- □ a representative of the general public

**7. If you are a pharmaceutical worker, then your work experience in the specialty is:**

□ up to 10 years □ 10 years and more

**8. If you are a student with major in Pharmacy, then your year of study is:**

□ 1 □ 2 □ 3 □ 4 □ 5

**9. Do you ever forget to take medications?**

□ yes □ no

**10. Do you sometimes not pay attention to the hours of drugs administration?**

□ yes □ no

**11. Do you skip taking medications if you feel well?**

□ yes □ no

**12. If you feel unwell after taking medications, do you miss the next dose?**

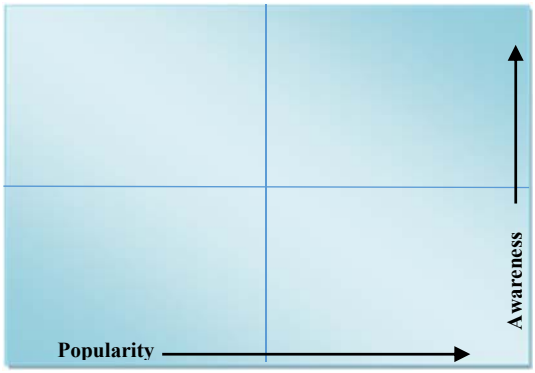
□ yes □ no

**13. The method that you use or would recommend for use to control the drug intake:**

- □ written reminder or self-control diary
- □ normal daily routine
- □ poor health
- □ reminders from family members or work colleagues
- □ special packages for control of drug intake (with or without timer)
- □ external devices (smart patches, smart watches)
- □ mHealth apps
- □ phone alarm

**14. Indicate the popularity degree of the mHealth apps that you use, would like to use or would recommend to use, using the perceptual map:**

Course Pill – medicine intakes (1)
Dosecast – Medication Reminder (2)
Med Helper Pill Reminder (3)
Medisafe Pill Reminder (4)
Mr. Pillster – pill reminder (5)
My pill reminder (6)
MyTherapy Pill Reminder (7)
Pill in Time – reminder and drug take schedule (8)
Pill Reminder and Health Tracker (9)
RX2 – Meds and Pill Reminder L (10)
Other _____ (11)




**15. How do you think what factors make it difficult to use mHealth apps to control medication intake?**

- □ technical difficulties
- □ inadequate security
- □ unreliable information
- □ high cost
- □ insufficient regulation by professional bodies
- □ limited mobile content
- □ low availability
- □ lack of usability
- □ other _____

**16. If you are a representative of general public and use mHealth apps to control drug intake, then who advised you to make a purchase**:

- □ advice of a doctor
- □ recommendation of a pharmaceutical worker
- □ advice of friends
- □ tradition in the family
- □ personal experience
- □ information on the Internet and reference literature

- advertising
- spontaneously

**17. If you are a pharmaceutical worker or a student with major in Pharmacy, indicate your opinion. Patients older than 40 years old can use mHealth apps to control medication intake:**

- totally agree
- rather agree
- difficult to answer
- rather disagree
- totally disagree

**18. Rank and evaluate (on a five-point scale) the factors that shape your preferences for use or recommendations for using mHealth apps to control drug intake (twelve is the most important factor, one is the least important factor):**

| Factor | Rank | Mobile app name (mHealth) | | |
|---|---|---|---|---|
| | | | | |
| User-friendliness | | | | |
| Reliability and safety | | | | |
| Availability | | | | |
| Cost | | | | |
| Mobile content volume | | | | |
| Developer | | | | |
| Design | | | | |
| Ease of use | | | | |
| Quality | | | | |
| Contact with the doctor, pharmacist | | | | |
| Control of physiological parameters: blood pressure, weight, glucose, etc. | | | | |
| Additional reminders: buying a medicine, visiting a doctor, etc. | | | | |

**19. Are you satisfied with the mHealth app?**

- completely satisfied
- rather satisfied
- difficult to answer
- rather unsatisfied
- completely unsatisfied

**20. Will you use mHealth apps in the future to control medication intake?**

- definitely yes
- rather yes
- difficult to answer
- rather no
- definitely no

## APPENDIX 2. INFORMATION FOR THE SURVEY PARTICIPANT

**Dear survey participant!**

**Research title:** MARKETING EVALUATION OF CONSUMER PREFERENCES IN USING MOBILE APPS FOR HEALTHCARE TO SUPPORT DRUG ADHERENCE

**The research is aimed at** studying and analyzing consumer preferences in using mobile healthcare applications (mHealth) to support and promote patients' adherence to drugs in Russia.

**Research objectives**: to establish the degree of patients' drug adherence in Russia and ways to support it; to show the main barriers to the introduction of mHealth apps for drug intake control; to identify the factors that shape consumer preferences in using mobile apps; to conduct positioning of consumer preferences in using mHealth apps popular in Russia.

**The research duration:** the field phase lasts for 4 months: March-June 2019.

**Sample size:** 1,100 people. The sample size is stipulated by time and resource constraints.

**Research methods:** personal oral survey and web-based survey using a structured questionnaire.

**Survey participation:** anonymous, voluntary.

**Characteristics of survey participants**
All respondents are divided into two target segments.
Target segment 1 (550 people) - pharmaceutical workers and students with major in Pharmacy.
Target segment 2 (550 people) - mHealth apps consumers, or members of the general public.

**Possible benefits for respondents from participating in the survey.** Survey participants can obtain additional information on the possible benefits of supporting drug adherence, on existing methods for controlling drug intake, on modern mobile healthcare apps and their characteristics, which will contribute to the effective treatment and prevention of chronic diseases.

**Possible risks associated with the survey.** The risks associated with the confidentiality of the information obtained during the survey can be mitigated by assigning a code to each profile, which will be securely stored.

**Inconvenience and additional burdens when participating in the survey.** The survey may take 20-30 minutes. Issues of ranking factors and their evaluation can present certain difficulties requiring additional clarification and assistance.

**Responsibilities of the survey participant in the course of the survey:** participation in the full volume of the survey, sincere and honest answers.

**Information on the confidentiality of survey participants' data.** Interviewers participating in the survey will be further warned of the obligation to keep the information about respondents confidential. A market researcher is required to monitor the confidentiality of information about the participants in the survey.