Fullscript

Behavioral change in integrative medicine:

Key insights and strategies for supporting long-lasting healthy behaviors

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Preface

As part of its mission to change how health is prescribed and help people get better, Fullscript developed this report as an extension of its report on Treatment Adherence in Integrative Medicine. In that report, the authors identified behavioral factors and interventions as key contributors to treatment adherence. Thus, the Behavioral Change (BC) Project was initiated to delve further into these factors to better support practitioners and their patients in changing and maintaining healthy behaviors.

Similar to Fullscript's treatment adherence report, this BC white paper is composed of a literature review and a patient survey and focuses on the context of integrative medicine. It provides an account of the methodology, as well as findings of the literature review and patient survey conducted by Fullscript's Integrative Medical Advisory team (IMAT) and Insights team.

A note on medical care terminology

For clarity, it is worth defining the terms "conventional medicine" and "integrative medicine" as found throughout this white paper. Several different variations of these terms are used within the literature and medicine; they are continuously evolving and may be used differently depending on the context. Typically, conventional medical care refers to mainstream approaches to healthcare commonly used in North American or Western settings. This may also be described as "allopathic care" and often centers on organ-, symptom-, or disease-focused solutions using evidence-based interventions such as pharmaceutical medications and surgery.

The term “integrative medicine” is used to describe an approach where conventional and non-conventional (e.g., complementary, alternative, naturopathic, or functional) interventions are used together in a harmonized way. Examples of complementary interventions may include, but are certainly not limited to, nutritional (dietary) therapies, dietary supplements, psychological or mind-body therapies (e.g., stress management, mindfulness, cognitive behavioral therapy (CBT)), and physical therapies (e.g., acupuncture, manual therapy). (NCCIH 2021) Typically, integrative medicine emphasizes multimodal interventions, where two or more interventions are used, which may or may not include a conventional intervention. The focus is on whole-person care—individualized care that considers all states of health on a physical, mental, emotional, social, and environmental level. (NCCIH 2021) An integrative treatment plan often includes a combination of nutritional, lifestyle, supplement, and physical activity components.

In this report, we use the terms “conventional” and “integrative” to broadly categorize the evidence according to the medical approach or philosophy. We recognize that there may be overlap between the fields or that interpretation of these terms may vary.

It is also worth noting that most BC research tends to focus on conventional audiences. As such, many of the recommendations and conclusions drawn in this white paper may vary slightly from their original context. However, as integrative medicine regularly incorporates aspects of conventional care, we believe that many of the learnings derived from conventional research can, for the most part, still apply in integrative care.

Acknowledgements

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Fullscript would also like to thank Dr. Robert Luby, MD (Director of Medical Education Initiatives at The Institute for Functional Medicine) for providing a clinical review of this white paper.

Conflicts of interest

The authors of this report are employed by Fullscript as part of the IMAT and Insights team. They received no additional compensation for the production of this report and are not affiliated with any particular brands, products, or institutions. The authors aimed to provide an unbiased review of the literature in this area with the ultimate goal of providing practitioners with the knowledge and tools to help improve treatment adherence through BC and subsequent outcomes for their patients. Our hope is that this report supports the continued development of research in the area of treatment adherence and BC, particularly as it pertains to integrative medicine.

About Fullscript

Fullscript is an industry-leading health technology platform that facilitates virtual dispensing for practitioner-grade supplements and develops evidence-based clinical research and medical education content to contribute to the rapidly emerging field of integrative medicine.

Executive summary

Purpose

The goal of this white paper is to support integrative practitioners in making treatment recommendations by advancing the scientific understanding of BC. BC is the process of adopting and adhering to a behavior long term (minimum six months), ideally with the gradual withdrawal of practitioner involvement.

This report summarizes current topics in BC literature and adds primary research to the field through a survey conducted with patients working with integrative medicine practitioners.

Key findings

1. There are clear benefits to adopting multiple health behaviors, but long-term adherence to these behaviors remains a challenge. **Integrative medicine, is well poised to address these challenges** through regular engagement, by increasing motivation, and by incorporating lifestyle-based support.
2. Lifestyle-based behaviors and treatments (e.g., diet, exercise, mindfulness/sleep, etc.) are harder to follow than other behaviors. **Barriers influence BC success to different degrees and vary across practitioner types, pointing to the value of cross-modality collaboration**.
3. The most common **barriers** to adherence and BC for patients working with integrative practitioners are **cost, time, and motivation**. Practitioners may use tools such as motivational interviewing or other measurement tools such as the URICA to determine which barriers are most impactful to a patient or the areas where they may need extra support (e.g., readiness to change, feeling empowered, etc.).
4. The most important strategies to facilitate BC for patients working with integrative practitioners are **education** and **treatment plan simplification; receiving practitioner monitoring and feedback**; and setting up **goals, plans, and commitments.** However, some strategies may be more effective for specific behaviors.
5. **Patients** working with integrative practitioners tend to **indicate their willingness to use technology to support their BC journeys**. The use of evidence-based technologies may be a cost-effective means for practitioners to deliver successful BC support.

Introduction

In 2021, we published a comprehensive report on Treatment Adherence in Integrative Medicine, which highlighted that only 50% of individuals remain adherent to treatment recommendations beyond six months. (Bulaj 2016)(Kleinsinger 2018)(Sabate 2003) Despite the implementation of adherence interventions, treatment adherence tends to gradually decline, (Demonceau 2013) (Wiecek 2019) suggesting that certain factors may limit adherence over long periods of time and especially in cases of chronic disease.

When prolonged, lifestyle and behavior factors with negative health implications include tobacco use, lack of sleep, poor diet, physical inactivity, excessive body weight, and alcohol overconsumption. These all contribute to increasing chronic disease rates (CDC 2021) (Liu 2016) and may lead to 40 to 50% of deaths in the United States. (McGinnis 1993) (Mokdad 2004)

Given that 18% of Americans are smokers, 36% get less than seven hours of sleep, 37% report moderate to severe alcohol consumption, 50% do not meet the recommended physical activity guidelines, and 77% do not have a healthy body mass index (BMI), (Liu 2016) the modification of lifestyle behaviors may be one of the most important strategies for preventing poor health outcomes associated with chronic disease.

Fortunately, evidence shows the benefit of adopting healthy behaviors in reducing high mortality rates. As shown in Figure 1, maintaining even just one healthy behavior can reduce relative risk of all-cause mortality by up to 28%; adopting four behaviors can reduce this to as much as 66%. (Loef 2012)

Figure 1. The relative risk of all-cause mortality when adopting healthy behaviors (Loef 2012)

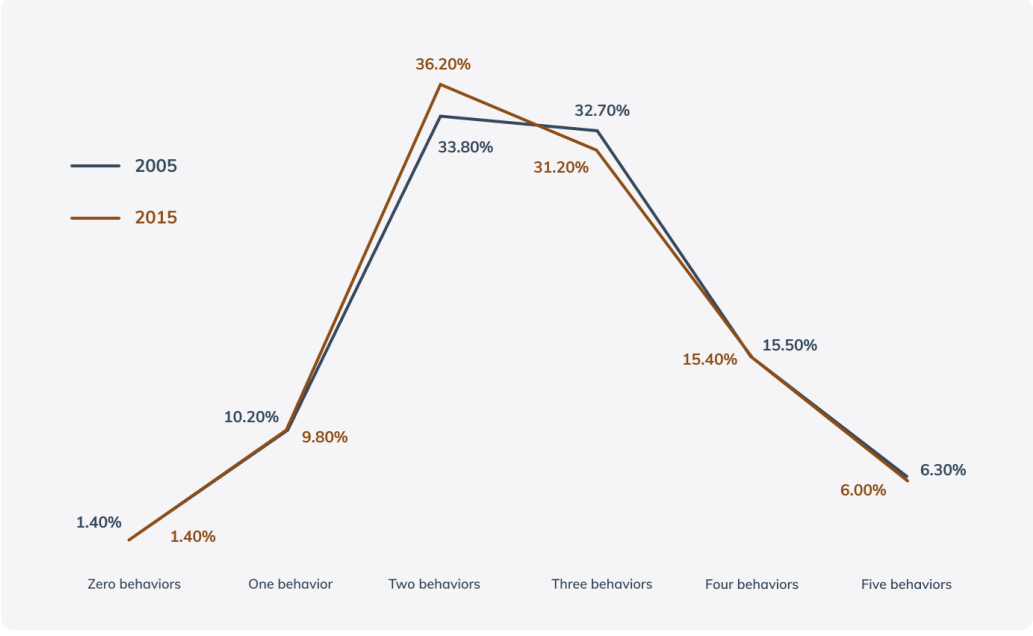
Moreover, the adoption of five low-risk health behaviors (i.e., never smoking, maintaining a BMI of 18.5 to 24.9 kg/m2, engaging in at least 30 minutes per day of moderate to vigorous physical activity, consuming a moderate alcohol intake, and having a high diet-quality score) has been associated with an average increase in life expectancy of 14 years in American women and 12.2 years in American men after the age of 50. (Li 2018) Similar improvements (7.4 to 15.7 years) were reported in European countries. (O'Doherty 2016)

Adopting and maintaining healthy behaviors can also benefit individuals living with a chronic disease. For example, engaging in one or more healthy behaviors reduced the risk of mortality from cancer (13 to 55%), cardiovascular disease (CVD) (7 to 60%), and type II diabetes (18 to 74%). (Li 2020)

The key takeaway is that greater adherence to healthy behaviors generally improves health outcomes in the general population and in patients already living with a chronic disease.

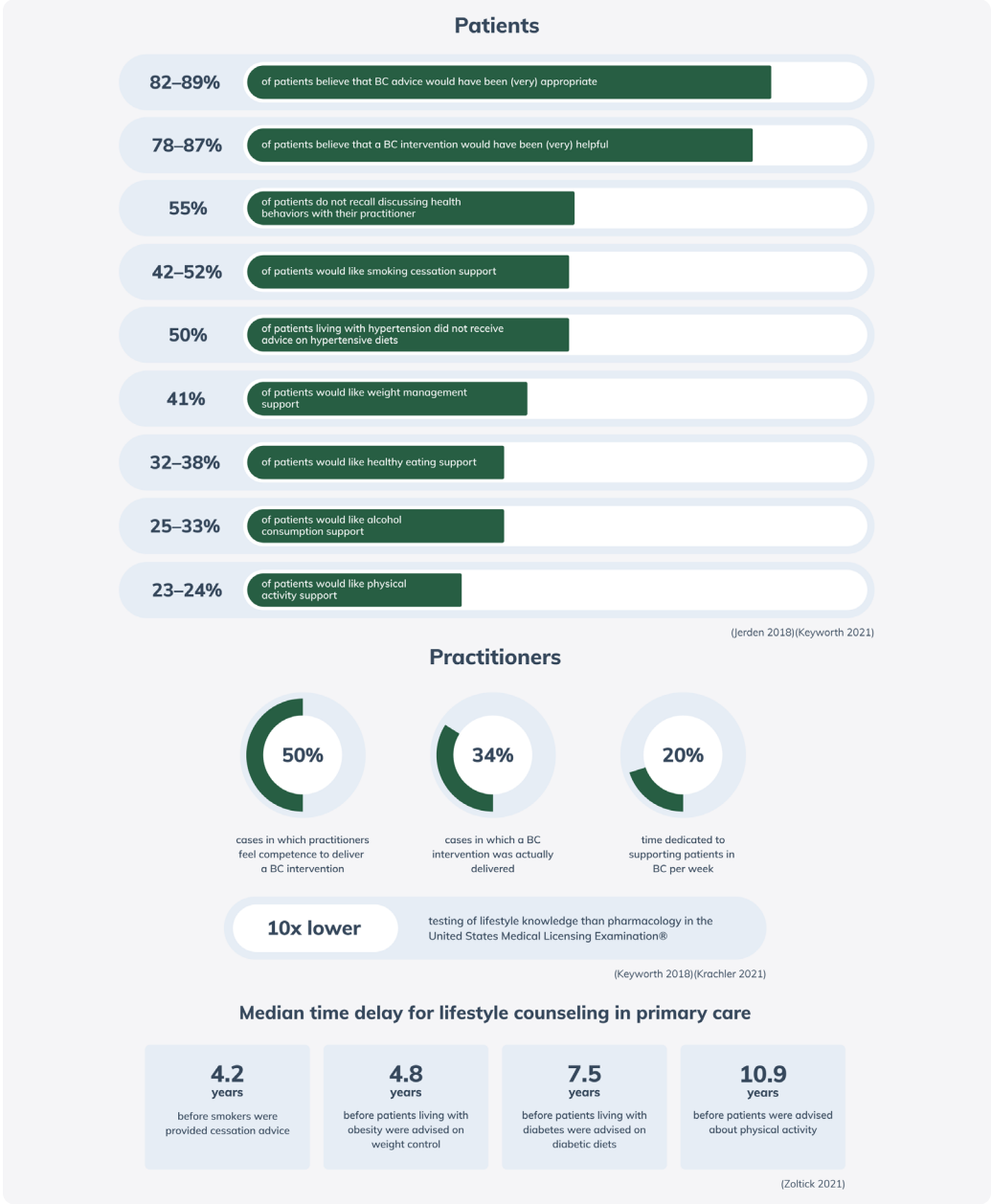
Unfortunately, only just over half of the American population report engaging in three or more healthy behaviors, whereas only 20% of American adults engage in four or more. (Hecht 2020) In comparison, 24% of Americans reported using three or more prescription medications over the previous 30 days and 13% used five or more from 2015 to 2018. (CDC 2021) The adoption of these behaviors has not improved over recent years (as shown in Figure 2). (Hecht 2020)

Figure 2. Percentage of Americans engaging in health behaviors in 2005 and 2015 (Hecht 2020)



For practitioners, a salient goal in providing high-quality care may be to help patients adopt and maintain healthy behaviors, especially because patients tend to indicate that they would like to receive support in this area. Figure 3 highlights some key statistics on patient preferences for BC support and the challenges often faced in conventional medicine.

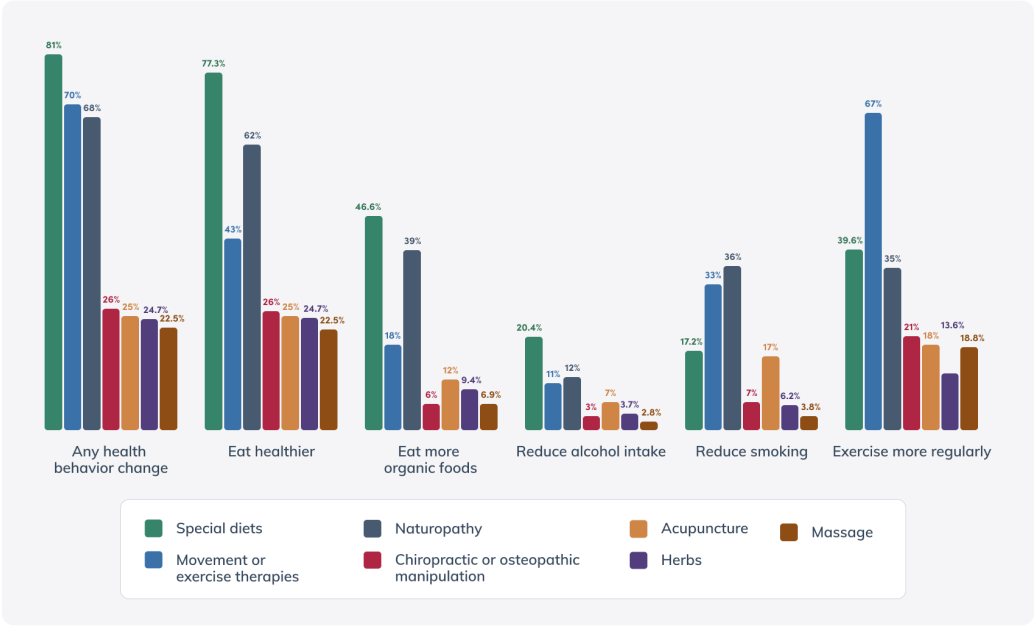
Figure 3. Needs for and challenges of behavioral change support



Why integrative medicine supports behavioral change

As integrative medicine (see page 3 for a full description) has a foundation in lifestyle medicine (in contrast to conventional medicine), it has been proposed that incorporating integrative approaches into conventional care may be beneficial for BC. (Wolever 2017) Approximately 45% of respondents to a survey including 10,201 individuals indicated that engaging with complementary and alternative medicine (CAM) modalities motivated them to start at least one new healthy behavior. (Bishop 2019) Specifically, they reported greater inspiration for exercise (35%), healthier food choices (31%), organic food consumption (17%), smoking reduction or cessation (17%), and reduction or elimination of alcohol intake (9%). Figure 4 provides the breakdown of motivation for new health behaviors based on engagement with select CAM modalities.

Figure 4. Percentage of respondents motivated for healthy behavioral change when using various CAM therapies (Bishop 2019)

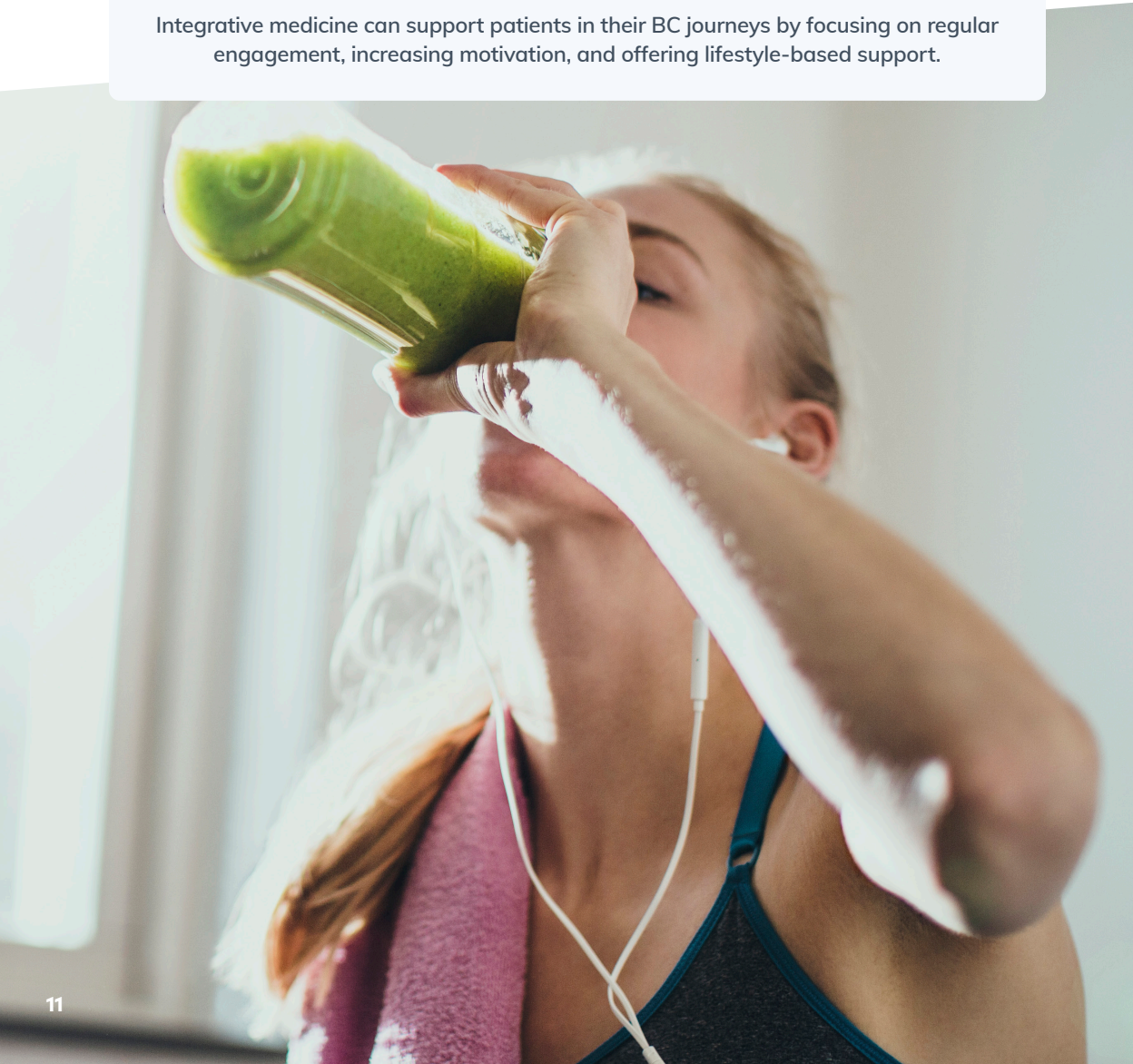


Using supplements motivated 16% of adults to exercise more frequently, 22% to eat healthier, 4.6% to reduce alcohol intake, and 5.6% to reduce smoking. (Stussman 2015)

Engagement with CAMs can also lead to a greater number of touchpoints with patients per year than with primary care. (Hawk 2012) In our report on Treatment Adherence in Integrative Medicine, 93.5% of practitioners described that booking follow-up appointments was a key strategy to facilitate adherence (i.e., through more regular touchpoints).

Respondents of the 2007 National Health Interview Survey (NHIS) reported visiting CAM practitioners (e.g., chiropractors, osteopathic physicians, massage therapists, acupuncturists, or naturopathic doctors) two to five times per year, (Hawk 2012) whereas other data shows that Americans visit their primary care physician an average of 1.5 times per year. (Petterson 2012)(Rui 2016)

Integrative medicine can support patients in their BC journeys by focusing on regular engagement, increasing motivation, and offering lifestyle-based support.



How this white paper contributes to supporting behavioral change

Regardless of the healthcare approach or philosophy, supporting BC is challenging. A 2020 umbrella review highlighted factors (Figure 5) that contribute to a practitioner's ability to provide BC support.

Figure 5. Factors contributing to a practitioner's ability to provide BC support (Keyworth 2020)

Based on these key factors, a goal of this white paper is to improve practitioner knowledge, skills, and confidence in providing BC support within an integrative healthcare setting. From the lens of integrative medicine, it will provide educational information on select BC topics including patient insights on adherence and BC, measures of change, barriers and strategies that influence change, and how technology can play a beneficial role in supporting BC.

Methodology

This project was composed of two complementary components: a literature review and a patient survey.

Literature review

An initial scoping review was conducted to gain a basic understanding of the existing BC literature, how it is being discussed, current limitations, and future directions based on systematic reviews, narrative reviews, and other key studies.

Example scoping review of PubMed search results include:

- *Behavior change: 703,499 (6,269 systematic reviews (SR) / meta-analyses (MA))*
- *Health AND behavior change: 214,836 (4,838 SR/MA)*
- *Behavior change AND ("functional med*" OR "integrative med*"): 652 (13 SR/MA)*

Key publications were reviewed and themes were identified, which helped in the creation of a rough outline of topics to explore. More specific searches were then conducted using relevant keywords based on our proposed outline (e.g., readiness to change, CAM, technology, etc.). Findings were drafted into a comprehensive literature review (written separately) and were used in developing the questions for the survey.

Patient survey

The purpose of this survey was to assess the specific BC barriers, needs, and preferences of our patient users. Some of the key research questions included:

1. Are certain patient characteristics, such as sociodemographics, type of practitioner seen, or self-rated health status, associated with self-perceived adherence or BC?
2. Are patients ready to change behaviors and is this related to their self-perceived adherence?
3. Does a patient's readiness to change or adherence to a treatment plan vary based on treatment plan components (e.g., supplements, nutrition, physical activity, etc.)?
4. What are the behavioral barriers or factors impacting BC, and what strategies do patients find helpful for optimizing BC?
5. Are there specific strategies or interventions (e.g., tools, apps, devices) that practitioners might be able to provide to patients to support BC?

To acquire a representative sample, 70% of invitation emails were sent to patients seeing naturopathic doctors (NDs), medical doctors (MDs), doctors of osteopathy (DOs), chiropractors (DCs), and nurse practitioners (NPs). The remaining 30% of invitations were sent to patients of other practitioner modalities. Patients were not required to have placed an order through Fullscript to have been eligible, but were required to have received a treatment plan in the last 12 months.

Consent was implied through voluntary participation in the survey. The incentive for participating was being entered in a sweepstakes draw for a USD $200 gift card to Amazon.com (first place) or five free priority shipping credits to Fullscript (second and third place winners).

Data was collected and analyzed using the SurveyMonkey software. All responses were anonymous and no personal or health-related data was collected. Using Google Sheets, several secondary stratification analyses were conducted to determine whether there were any associated links between sociodemographic-, treatment plan-, practitioner-, or health status/belief-related factors and how patients answered adherence and BC questions.

Findings

Before providing the findings of the literature review and survey, it is worthwhile to describe the patients that responded to the survey to contextualize the findings of this white paper.

In general, respondent characteristics were similar to previously reported data, allowing the authors of this white paper to be fairly confident that the conclusions drawn from the results may be applicable to other patients.

Patient information

A total of 605 patients completed the survey, but the number of answers for each question varied as all responses were optional. The demographic details are provided in Table 1.

Table 1. Demographic information (Q1–9)

Demographic	Answers	
Sex (n = 605)	Male	12.23%
	Female	87.27%
	Other	0.17%
	Prefer not to say	0.33%
Age, years (n = 600)	Mean	50.23 (19-89)
Average annual household income, $USD (n = 601)	< $49,999	15.8%
	$50,000–74,999	17.8%
	$75,000–100,000	17.3%
	$100,000–124,999	10.65%
	$125,000–199,999	12.98%
	> $200,000	8.65%
	Prefer not to say	16.81%

Table 1. Demographic information (Q1–9) cont.

Demographic	Answers	
Highest level of completed education (n = 601)	Some high school	1.00%
	High school	13.14%
	Trade school	8.65%
	Bachelor's degree	44.93%
	Master's degree	22.63%
	Ph.D. or higher	3.66%
	Prefer not to say	5.99%
First language (n = 604)	English	93.54%
	Spanish	2.65%
	French	0.17%
	Other (please specify)	3.64%
Self-identified disability (n = 603)	Yes	7.46%
	No	87.89%
	Prefer not to say	2.16%
	I am unsure at this time	2.49%
Nature of the disability (n = 508)	Sensory (seeing, hearing, etc.)	1.38%
	Physical (mobility, flexibility, dexterity, pain, etc.)	4.33%
	Cognitive (learning, developmental, memory, etc.)	1.18%
	Mental health-related	3.35%
	Other (please specify if desired)	2.95%
	I do not self-identify as a person with a disability	83.27%
	Prefer not to say	3.54%

Table 1. Demographic information (Q1–9) cont.

Demographic	Answers	
Ethnicity (n = 598)	Black (Caribbean, African, Black Canadian/ American, etc.)	3.49%
	East, West, South Asian	2.43%
	Indigenous (Aboriginal, First Nations, Inuit, Metis, Native American, Alaska Native, Multiple Indigenous Identities, etc.)	1.5%
	Latin American (Peruvian, Brazilian, Argentinian, Hispanic, Latino, Mexican, etc.)	6.82%
	White (European descent)	75.54%
	Prefer not to say	5.66%
	Other	7.51%
Self-perceived health status (n = 604)	Poor	1.32%
	Fair	19.21%
	Good	62.91%
	Excellent	16.53%

The majority of respondents were female (87%), completed a bachelor's degree or higher (71%), spoke English as their first language (94%), did not indicate that they were/are living with a disability (88%), and were of White ethnicity (76%). The mean and median ages were 50. Most respondents reported an average household income of USD $50,000 to USD $100,000 (35%) and indicated that their health was either good or excellent (80%).

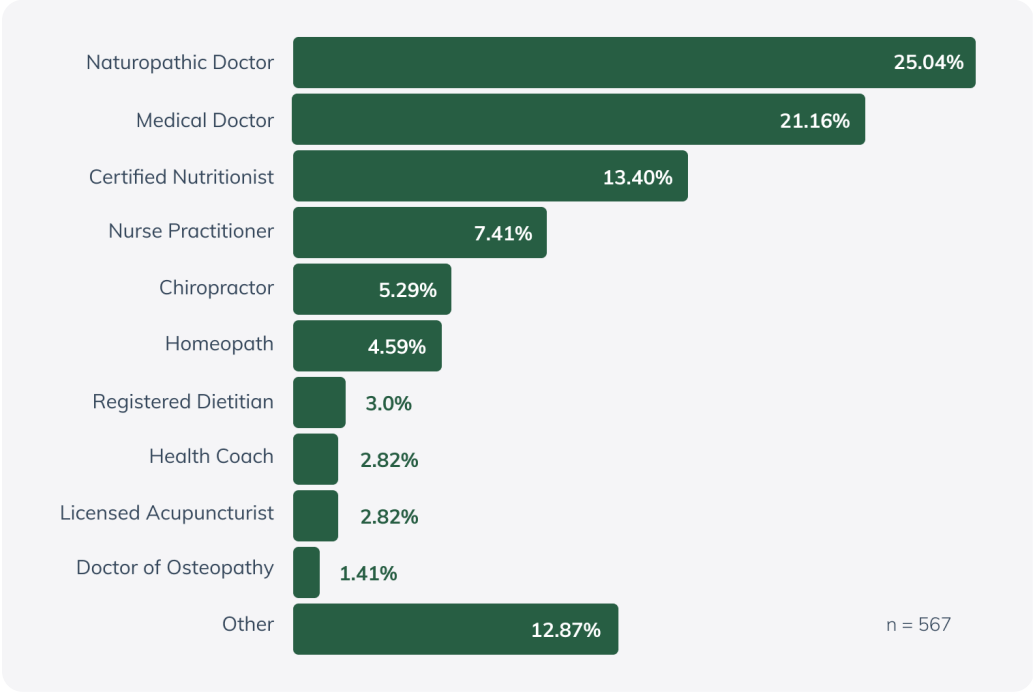
These responses were similar to results of previous Fullscript patient surveys. In the last survey, (Internal Data 2021) 90% of the respondents were female, the average age was 53, 80% were White, and they typically fell within the USD $50,000 to USD $100,000 household income range.

These data were also relatively consistent with previously reported characteristics of CAM users in the United States, who tend to be female, be middle-aged, be of White ethnicity, and have completed a higher level of education. (Alwhaibi 2019)(Alwhaibi 2016) (Bishop 2010)(Chamberlin 2014)(Clarke 2015) (Laiyemo 2015)(Steel 2020)(Zhang 2017)

Practitioner and treatment plan information

Figures 6 and 7, respectively, provide a breakdown of the types of practitioners that respondents (n = 567) engage with through Fullscript and the types of recommendations provided (n = 577).

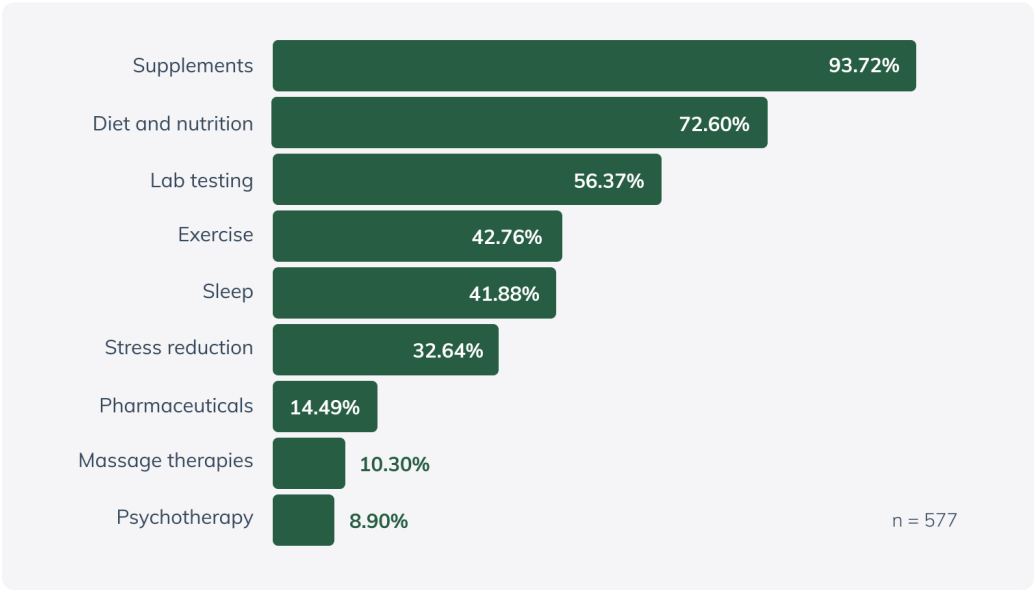
Figure 6. Practitioner types seen through Fullscript (Q10)



Around 25% of patients indicated their practitioners were naturopathic doctors, 21% were medical doctors, 13% were certified nutritionists, 7% were nurse practitioners, and 5% were chiropractors. These results were similar to Fullscript's last patient survey. The majority of patients were engaged with their current practitioner for more than 12 months (47%); this was even higher in the previous survey (59%). (Internal Data 2021) Most patients (77.7%) reported seeing their practitioner to either help manage a chronic condition or for general wellness and health promotion.

47% of patients have been working with their practitioner for more than 12 months.

Figure 7. Frequency of aspects included in current or past treatment plans (Q13)



Upon further analysis, approximately 75% of respondents indicated that they had been recommended at least three different components as part of their treatment plan. Most often, these components were supplements (94%), diet and nutrition (73%), and lab testing recommendations (56%). Interestingly, 43% of practitioners recommend at least five different components, but this decreases to only 29% of practitioners recommending six or more. The number of components is in line with previous Fullscript survey data (Internal Data 2021) and other studies in which an average of three to four components were typically part of integrative recommendations. (Maiers 2010)(Steel 2020)

Among patients using dietary supplements, most used three to five (39%) or five to ten types (43%). Most patients also reported taking supplements for more than 12 months (63%).

Treatment plans typically had at least three different components, most commonly including dietary supplements, nutritional modification, and lab testing.

Unsurprisingly, our results showed that the type of treatment recommendation provided differed by practitioner type. This might be related to practitioner attitudes, beliefs, personal use, knowledge, prescription legalities, scope of practice, and more. (Sewitch 2008) Table 2 provides an overview of some trends.

Table 2. Distribution of treatment components recommended by practitioners

	Certified Nutritionist	Chiropractor	Health Coach	Licensed Acupuncturist	Medical Doctor	Naturopathic Doctor	Nurse Practitioner	Registered Dietitian
Acupuncture	7%	**13%**	6%	**88%**	6%	**13%**	2%	0%
Counseling	9%	0%	6%	6%	**11%**	**10%**	7%	**12%**
Diet/nutrition	**89%**	63%	**75%**	63%	68%	74%	69%	**88%**
Exercise	**46%**	43%	**56%**	38%	39%	**46%**	31%	41%
Labs/testing	49%	23%	50%	31%	**65%**	**63%**	**74%**	53%
Manual therapies	12%	**37%**	**19%**	**19%**	11%	18%	5%	0%
Mindfulness	41%	17%	**81%**	38%	**43%**	**46%**	29%	29%
Pharmaceuticals	11%	0%	0%	0%	**67%**	**26%**	**57%**	12%
Sleep	43%	23%	**56%**	38%	40%	**46%**	45%	**47%**
Supplements	**96%**	90%	88%	88%	90%	**96%**	**95%**	88%

Naturopathic Doctors (n = 142); Medical Doctors (n = 120); Nutritionists (n = 73); Nurse Practitioners (n = 42); Chiropractors (n = 30); Registered Dietitians (n = 17); Health Coaches (n = 16); Licensed Acupuncturists (n = 16)

The likelihood of recommending certain treatment types varies by practitioner modality.

Overall, only 7% of patients indicated that there was “little to no change required” when asked about their belief in how much BC they would need to undertake to improve their health. In contrast, 49% of patients believed that they would need at least “some change” and 44% believed that “a great deal of change would be required.”

93% of patients believed that at least some change was needed to improve their health.

Defining behavioral change

An individual’s “behavior” may be defined as an action that can be (in)directly observed as a consequence of an internal or external cause. (Davis 2015) Behavioral change is defined as the (in)voluntary modification of this (health) behavior that ultimately alters a person’s actions. (American Psychological Association Dictionary of Psychology 2021) (Psychology Dictionary 2013) Maintaining BC is the sustained performance of the behavior over a specified time frame. (Kwasnicka 2016)

In the context of health promotion and medicine, BC typically implies some kind of sustained positive effect on the well-being of the individual without further practitioner support. (Ory 2010)

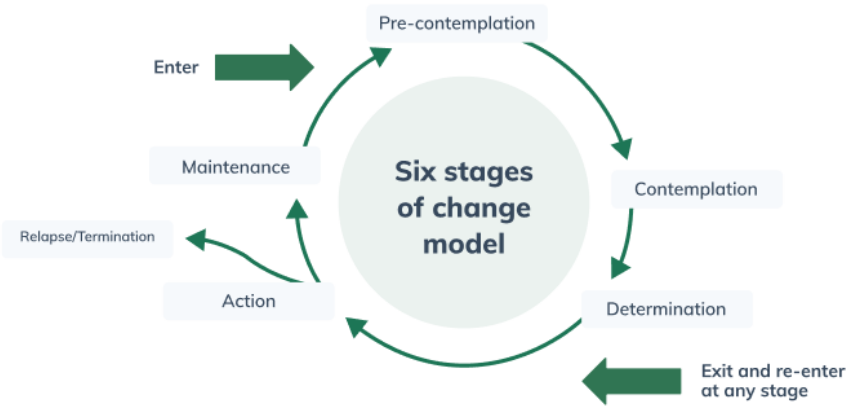
The concept of time is thus a key element of BC. Over time, behaviors shift positively or negatively. The Transtheoretical Model of Change (Prochaska 1997) has become one of the most well-referenced models to describe this process. It has been applied across many health behaviors (Raihan 2021) and is central to how BC is defined in this white paper.

The Transtheoretical Model of Change

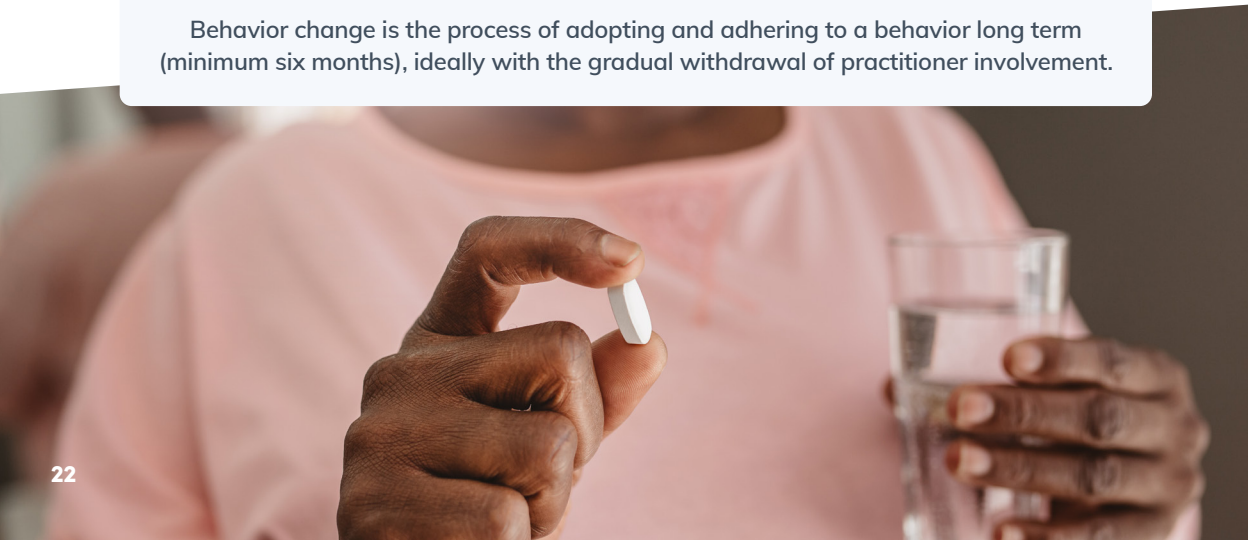
The Transtheoretical Model of Change (TTM; Figure 8) outlines that BC is made up of six stages:

1. **Pre-contemplation:** The individual is (un)aware of a problematic health behavior or is not yet considering change.
2. **Contemplation:** The individual is considering change.
3. **Preparation (determination):** The individual is planning to make change.
4. **Action:** The individual initiates change by performing the behavior, usually within six months.
5. **Maintenance:** The behavior is continuously performed, usually past six months.
6. **Relapse:** The individual regresses back into any one of the prior stages, which can occur at any point in time (or not at all). (Prochaska 1997)

Figure 8. The Transtheoretical Model of Change (Prochaska 1997)



Behavior change is the process of adopting and adhering to a behavior long term (minimum six months), ideally with the gradual withdrawal of practitioner involvement.



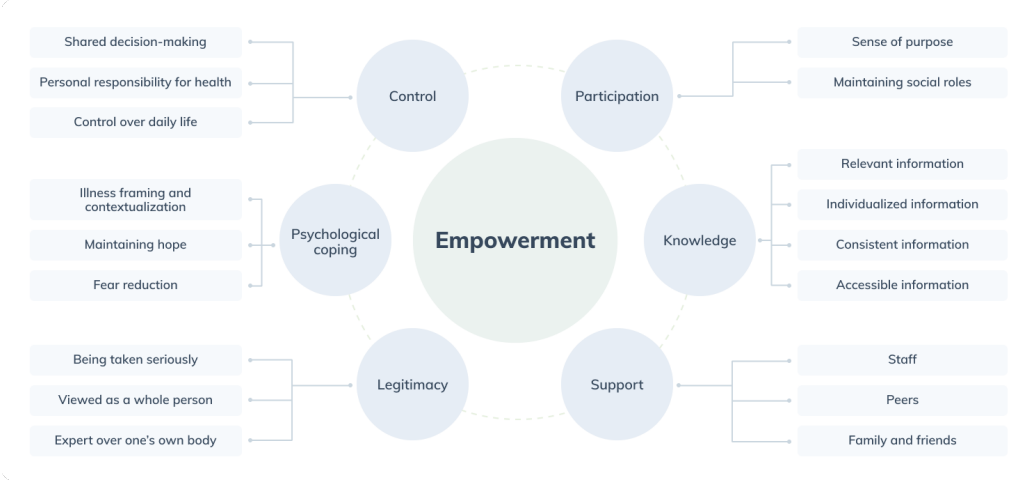
Measuring behavioral change

A key consideration for practitioners is that BC can be measured. Typically, practitioners use subjective and objective tools that measure adherence (i.e., engagement) to a specific behavior such as dashboards of refill rates, pedometers, nutrition diaries, and questionnaires. (Bailey 2021a)(Bailey 2021b)

However, other measures have also been developed in order to better understand and predict the BC process or elements from BC theories. The National Institutes of Health (NIH), for example, initiated a major Science of Behavior Change program to provide a database of validated measures of BC constructs, such as self-control, impulsivity, cognitive flexibility, threat perception, self-affirmation, and self-identity. (Nielsen 2018)

Other examples of constructs with validated measures include scales to measure patient empowerment (Agner 2018)(Eskildsen 2017)(Pekonen 2020) and motivation. (Carter 2002)(Shankar 2019) Patient empowerment involves providing information to make informed choices and takes a patient-centered approach to boost autonomy (i.e., the patient's ability to manage their own health), (Werbrouck 2018) common aspects of integrative medicine. A comprehensive conceptualization of empowerment is shown in Figure 9.

Figure 9. The conceptualization of empowerment (Agner 2018)



To help practitioners measure patient empowerment, we recommend using the validated and reliable (Azcurra 2014)(Contreras-Yanez 2018)(Karabulutlu 2021)(Park 2013) Health Empowerment Scale (Azcurra 2014). It can be found here.

BC is measured with tools that indicate if the patient is engaging in the behavior; however, several measures exist to measure behavioral constructs that may lead to BC.

Measuring readiness to change

Readiness to change is based on the Transtheoretical Model of Change. (Prochaska 1997) Many tools exist to measure readiness to change (or stage of change), but the University of Rhode Island Change Assessment Scale (URICA) (DiClement 2004)(McConnaughy 1983) is regularly described as one of the measures most widely applied to change "problem behaviors." (Ceccarini 2015)(Krebs 2018) It is available in many languages other than English. (Chen 2019)(Hasler 2003)(Khalil 2011)(Lerdal 2009)(Pietrabissa 2017)

The University of Rhode Island Change Assessment Scale

The URICA scale is a 32-item questionnaire (shortened versions available) that takes approximately five to ten minutes to complete. (Ceccarini 2015) It was originally used as a method to measure stages of change in psychotherapy, (McConnaughy 1989) (McConnaughy 1983) but has demonstrated validity and reliability for use in alcoholism and substance use, (DiClemente 1990)(Field 2009) (Henderson 2004)(Pantalon 2002)(Willoughby 1996) smoking cessation, (Munson 2018) anxiety, (Dozois 2004) nutrition programs for weight management, (Pietrabissa 2017) and exercise. (Chen 2019)(Lerdal 2009)

Each question is ranked using a five-point Likert scale and ultimately provides a readiness score based on the TTM stages. Researchers at the University of Maryland Habits Lab explain how to calculate and interpret the final score here. A printable version of the questionnaire and calculation table can be viewed and downloaded here.

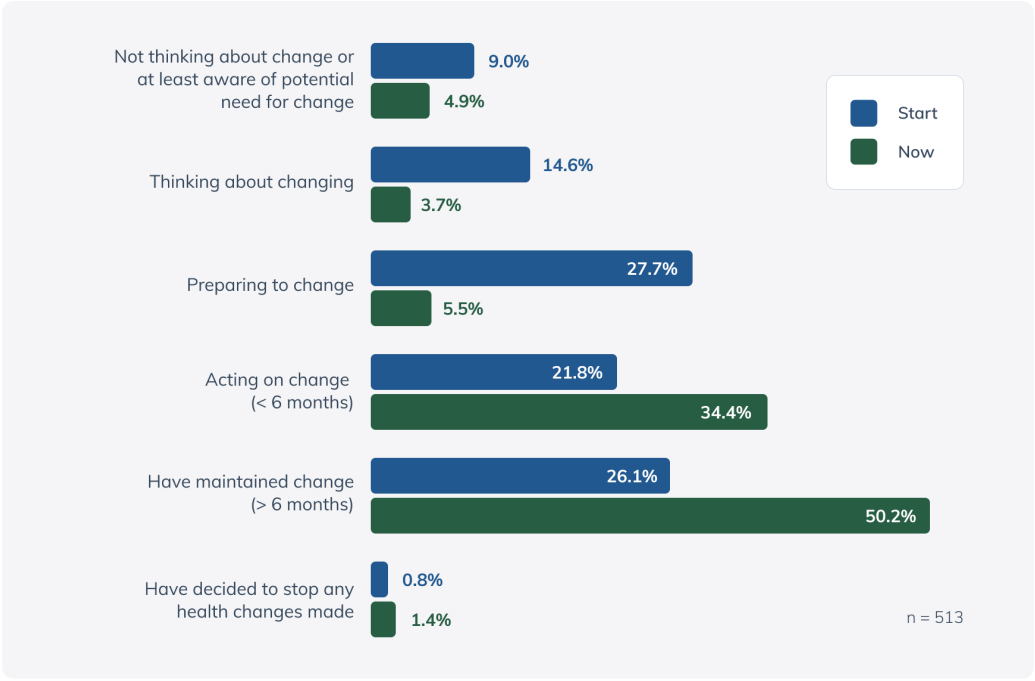
By measuring an individual's readiness to change, a clinician can categorically classify an individual within one of the stages of change and then tailor an intervention for the patient based on their readiness. (Prochaska 1997)

The application of measures and the development of tailored interventions are both useful for advancing the patient through the stages of change (which can help to predict behaviors), (Carvalho de Menezes 2016) (Jimenez-Zazo 2020)(Nakabayashi 2020) but may also help to improve medication adherence, (Imeri 2021) diet, (Carvalho de Menezes 2016) (Mastellos 2014)(Nakabayashi 2020) physical activity, (Carvalho de Menezes 2016)(Jimenez-Zazo 2020)(Mastellos 2014)(Spencer 2006) and smoking cessation. (Cahill 2010)

Readiness to change in an integrative setting

For reasons of feasibility, our survey did not specifically use the URICA measurement scale to determine readiness to change for the patient respondents. However, questions were still oriented to determine readiness based on the TTM's stages when patients first started seeing their practitioner and where patients felt they were currently in their health journey. Figure 10 (n = 513) shows the distribution of these responses.

Figure 10. Shift in percentage of readiness to change over time (Q20–21)



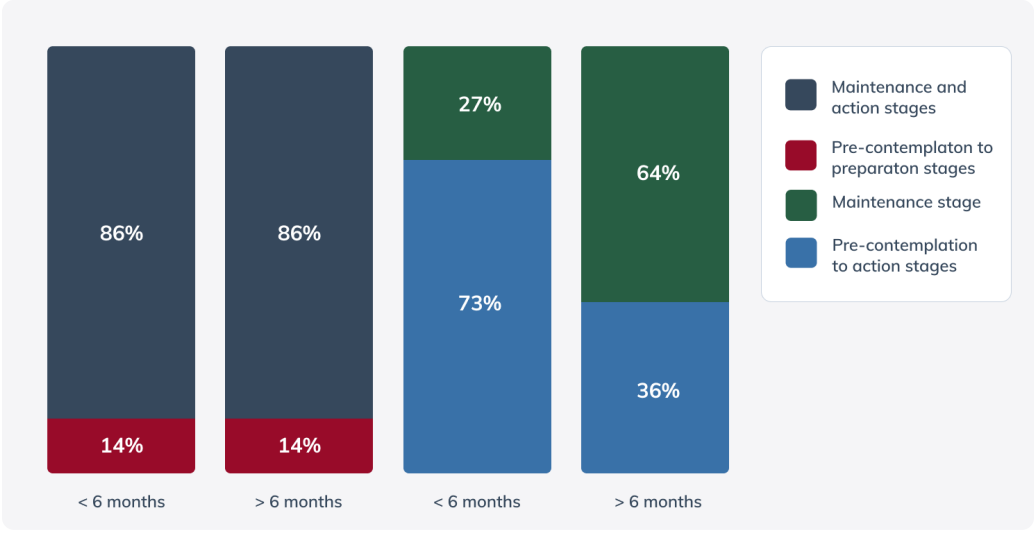
Compared to when patients first started working with their practitioners, a greater proportion shifted from the "pre-contemplation," "contemplation," and "preparation" phases towards "acting" or "maintaining" change in their current states of their health journeys.

Stratification analysis on the responses to the readiness to change questions and the length of time that patients have seen their practitioner helped to support these observations (Figure 11). The six-month mark appears to be the threshold at which patients feel like they have been able to maintain healthy behaviors.

As patients engage with their practitioner over time, their behaviors tend to shift from thinking about and preparing to change to acting and maintaining change.

The left side of Figure 11 shows that an equal proportion of patients indicated that they were either in the maintenance or action stages regardless of whether they were working with their practitioner for less or more than six months. As the TTM describes that six months is typically needed for patients to move from “action” to “maintenance,” we then isolated patients who had indicated they were only in the maintenance phase (i.e., performing the behavior for more than six months according to the TTM). As can be seen on the right side of Figure 11, a greater proportion of patients had been working with their practitioner for more than six months when they also indicated they were now maintaining their healthy behaviors.

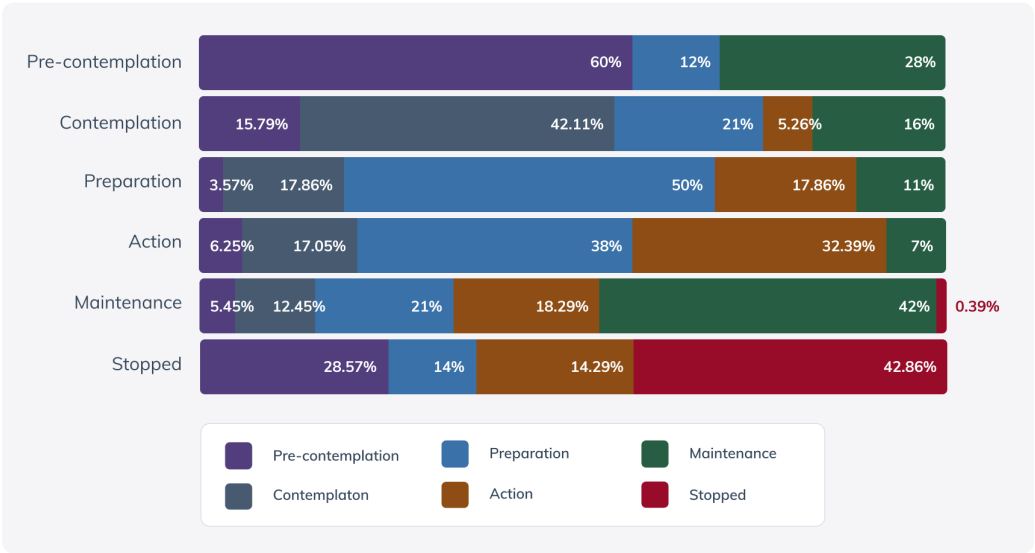
Figure 11. Proportion of patients indicating they were either in the pre-contemplation to preparation stages or in the pre-contemplation to action stages, compared to those in the maintenance and action stages or maintenance stage only, based on time spent with their current practitioner (Q11 and Q21)



A minimum six months of engaging in health behaviors may be required for patients to feel that they have moved to an active or maintenance stage of their health journey.

Similarly to what has been previously found in the literature, (Cahill 2010)(Kleis 2020) secondary analysis also revealed that a patient's baseline readiness to change could modify the likelihood that they would progress or regress through the stages of change over time. In our survey, patients tended to indicate that they were in the same stage of change as they were initially, progressed if they were in a lower stage of change, or regressed when they were in higher stages (Figure 12). For example, 60% of patients who indicated that they were initially in the (lower) pre-contemplation stage were still in this stage after an undetermined amount of time with their practitioner, whereas 12% progressed to the preparation stage and 28% progressed to the maintenance stage. In contrast, only 42% of patients who initially indicated that they were in the (higher) maintenance phase remained in this stage, while the remainder regressed to a prior stage (e.g., preparation or action).

Figure 12. Stratification of initial readiness to change by readiness to change now (Q20 and Q21)



In contrast to a previous analysis of American adults (n= 19,266) where, on average, 25% of individuals were "pre-contemplators" (i.e., 25% of the general population may not have been ready for change), (Nigg 1999) only 5% or 9% of patients in our survey initially or currently indicated that they were in the pre-contemplation stage, respectively. One potential explanation for this is that the patients in our survey had already taken the first step in actively working with a practitioner, which may reflect that patients working with an integrative practitioner may have greater intentions for BC.

A key aspect of being ready for BC when moving from the pre-contemplation to contemplation stage is the intention to perform the behavior. (Prochaska 1997) Intention is defined as the motivation and conscious decision to perform a behavior (Azjen 1991) and has been observed to predict the performance of 39 to 46% of behaviors. (Armitage 2001)(Rhodes 2013) Moderate to strong intent can be a small to moderate predictor of healthy behaviors, (Adriaanse 2011)(Carrero 2019)(Cooke 2008) (Rich 2015)(Riebl 2015)(Webb 2006) though some analyses suggest that intent may be a moderate to strong predictor of behavior. (Cooke 2016)(McEachan 2016)(Sutton 2016)

CAM users tend to be more aware of the need for healthy behaviors (Furnham 1994)(Sirois 2002) and may practice these behaviors more often than the general population. (Wolever 2012) As previously described, engagement with one CAM type can motivate individuals to engage in other healthy behaviors. (Bishop 2019) In our survey, a higher motivation for engagement could have shifted the likelihood of successfully progressing to the action and maintenance phases of change. Individuals who are in higher stages of change for one health behavior may also be more likely to be in a higher stage for another. (Lippke 2012)

Patients seeking integrative care may be more likely to change their health behaviors compared to the general population.

Patients often report turning to CAMs for their perceived benefits, safety, cost, and dissatisfaction with conventional medical models. (Tangkiatkumjai 2020) This may shift patients' perceived importance away from solely relying on conventional (i.e., pharmaceutical care) to support their health towards engaging in healthy lifestyles (McCaffrey 2007) and thus their readiness to change.

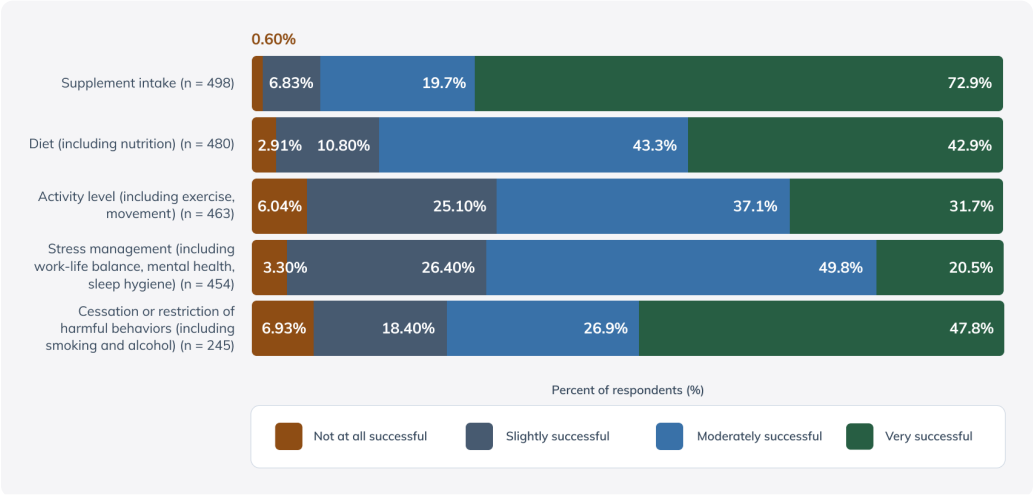
Though practitioners often perceive that patients have a lack of interest in change, (Keyworth 2020) or identify that low readiness to change are barriers to adhering to treatment or changing behaviors, (Bailey 2021a)(Bailey 2021b) practitioners and patients do not always perceive barriers as equally impactful. (Peyrot 2012)(Siddiqui 2017) Based on our survey, patients of integrative practitioners tended to indicate that they were more ready to change, perhaps more so than their practitioners believe.

Ultimately, while patients using integrative medicine may have a higher readiness to change, they may still require BC support. Intentions do not always lead to the actual performance of a behavior; some analyses show that regardless of the degree of intent, there was no meaningful relationship for predicting behavior. (McDermott 2016)(Rhodes 2012)(Sweeney 2015) This is described as the "intention-behavior gap."

Success with behavioral change in an integrative setting

In general, patients in our survey reported being “very” or “moderately” successful in changing their health behaviors and adhering to the individual aspects of their treatment plans (Figure 13). However, the extent of success was dependent on the type of behavior or treatment.

Figure 13. Success in changing health behaviors after receiving a treatment plan (Q23)



After excluding responses of “not applicable” for each health behavior, 73% and 20% of patients reported being “very successful” or “moderately successful,” respectively, with changing their supplement intake. Diet and nutrition changes were split evenly between “very” and “moderately” successful at 43%. Changing physical activity level was also relatively evenly split; 32% indicated that they were “very successful” and 37% indicated that they were “moderately successful.”

However, compared to supplement (7%) and diet (11%) changes, a higher proportion of patients (25%) reported being only “slightly successful” in changing their physical activity levels. Similar findings were observed with patients reporting only slight success in changing stress management behaviors (26%); however, a smaller percentage (21%) indicated being “very successful” versus the other behaviors.

For cessation or restriction of smoking or excessive alcohol intake, 48% indicated they were "very successful," 27% were "moderately successful," 18% were "slightly successful," and 7% were "not successful."

As 93% of patients felt that at least "some" change would be required to improve their health, we conducted secondary analyses to determine if perceived effort required would alter the likelihood of reporting success with BC (Table 3).

Table 3. Likelihood of being successful in changing health behaviors among patients who indicated a great deal of effort was required (n = 226)(Q22 and Q23)

	Not or slightly successful	Moderately or very successful	Relative risk of being not or slightly successful
Supplement intake	43%	45%	-4%
Diet and nutrition	56%	44%	26%
Physical activity	51%	43%	19%
Stress management	53%	44%	19%
Cessation or reduction in harmful behaviors (e.g., alcohol, smoking)	53%	51%	4%

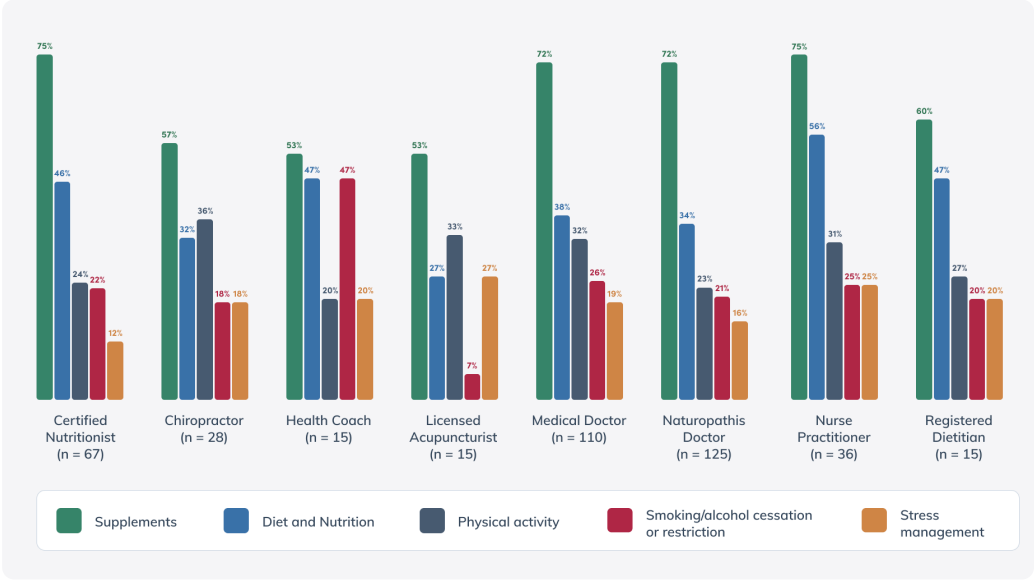
Overall, the level of perceived effort to change did not predict the likelihood of change for supplement intake (-4%) or harmful behaviors (e.g., alcohol or smoking use)(+4%). However, patients were more likely to indicate that they had little success (either "not successful" or only "slightly successful") in changing diet and nutrition (+26%), physical activity (+19%), or stress management behaviors (+19%) when they also reported that a high degree of effort would be required to change.

Patients felt that lifestyle-based treatments (i.e., nutrition, physical activity, and stress management) were harder to follow than other behaviors, such as supplement intake.

Stratification analyses also revealed that the likelihood that patients would feel that they were "very successful" in changing their health behaviors was modified by the type of practitioner with which they engaged (Figure 14).

Patients of nutritionists, medical doctors, naturopathic doctors, and nurse practitioners tended to indicate that they were the most successful with changing their supplement intake. Patients of nurse practitioners, health coaches, registered dietitians, and nutritionists were most successful in changing their diet and nutrition habits. Patients tended to rate their success in changing physical activity behaviors relatively consistently across designations, though ratings of patients of health coaches, naturopathic doctors, nutritionists, and dietitians were slightly lower. In contrast, patients of health coaches were rated much higher than other modalities for reducing or ceasing harmful behaviors such as smoking or alcohol intake, while patients of acupuncturists or nurse practitioners tended to indicate greatest success in changing stress management behaviors.

Figure 14. Proportion of patients who reported being "very successful" in changing health behaviors, according to practitioner type (Q10 and Q23)



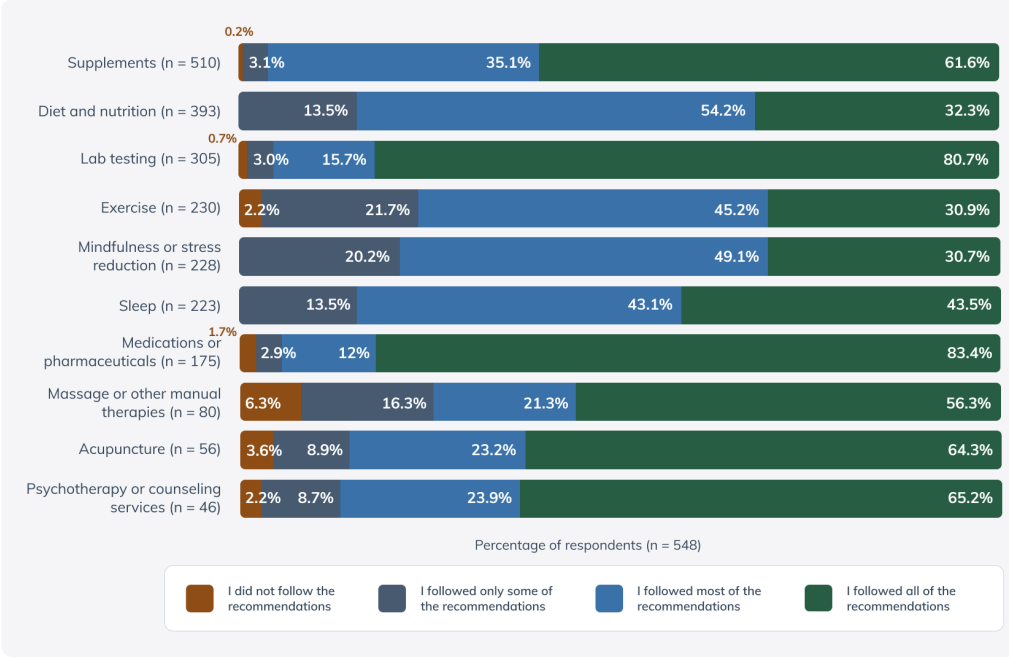
Notwithstanding potential limitations from lower n-values across practitioner modalities, these data highlight the potential benefits of having collaborative practitioner approaches to supporting BC. (Chauhan 2017)

There is value in a collaborative, multi-disciplinary approach to BC given that the likelihood of success for following different treatment components may vary based on the practitioner seen.

Adherence to integrative treatment recommendations

In general, patients tended to report high levels of adherence to the individual components of their treatment plans (Figure 15).

Figure 15. Patient self-perceived level of treatment adherence (proportion of patients indicating how closely they followed treatment plan recommendations, by type) (Q17)



Combining responses for those following "most" or "all" of the treatment recommendations, adherence was highest for supplements (97%), labs and assessments (96%), and pharmaceuticals (95%). The proportion of patients reporting following only "some" or "none" of the recommendations (low adherence) was highest for diet and nutrition (13%), sleep (13%), mindfulness (20%), and exercise (24%). Overall, these results imply that patients believe some treatment types are easier to implement and maintain than others.

Patients may believe that some treatment types are easier to adhere to than others.

Interestingly, the proportion of patients reporting complete adherence (following 'all' of the recommendations) was much higher for psychotherapy/counseling services, massage or other manual therapy, and acupuncture—all treatment components primarily led by a practitioner—compared to aspects such as diet and nutrition, sleep, mindfulness or stress reduction, and exercise, which are all predominantly led or initiated by the patient themselves, suggesting patients may require more support in these areas.

A note on self-reporting adherence and BC success

Our survey's adherence rates (and thus the trueness of the patients' self-rated BC success) are likely inflated. While the possibility that the adherence rates in our survey are accurate cannot be discounted, it is highly unlikely.

Taking the average self-rated adherence percentage across treatments, 87% of patients indicated they followed "all" or "most" of the recommendations. This may be closer to reported non-adherence rates of ~15% for initiation of a medication, for example, (Cheen 2019) but is not consistent with long-term findings.

Self-reported measures tend to overestimate adherence, leading to inaccuracies in reporting on engaging in health behaviors such as medication adherence, (Lam 2015) physical activity, (Dowd 2018)(Prince 2008) and diet compared to objective measures. (McKenzie 2021) Patients reporting high adherence typically overestimate the extent, while those who indicate they are not adherent are typically more accurate. Practitioners also tend to overestimate their patient's adherence with subjective measures. (Lam 2015)

In our survey, as 64% of patients indicated that they have been engaged with their practitioner for seven months or more, it might have been expected that the distribution of patients indicating that they either did not follow or only followed some of the recommendations would have been higher. Broad estimates of treatment adherence to therapies that have been ongoing for more than six months typically hovers around 50%. (Sabate 2003)

It could also be suggested that various forms of bias might inflate the reported adherence rates in this survey. For example, self-selection bias (also known as volunteer bias) occurs as individuals are more likely to choose to respond to surveys on topics that are of interest to them or that they are invested in. (Eysenbach 2002) Since health conscientiousness has been shown to be associated with adherence, (Molloy 2014) it could be suggested that the health-invested respondents of this survey may have been more likely to report higher adherence rates. Other forms of bias such as social desirability and memory biases can also inflate self-reported adherence rates. (Stirratt 2015)

Barriers to adherence and behavioral change in an integrative setting

The factors that influence adherence also apply to BC as BC can be considered as a long-term form of adherence. Several hundred factors, categorized into five domains (Figure 16) by the World Health Organization (WHO), can influence treatment adherence (including the adoption and maintenance of health behaviors as "treatments"). (Sabate 2003)

Figure 16. The WHO's influencers of adherence (Sabate 2003)

The following list provides specific examples of recurring barriers and facilitators for the uptake and maintenance of healthy behaviors for healthy aging in middle-age adults:

- Environmental restrictions (e.g., distance, location, safety)
- Financial cost
- Firmly established attitudes and behaviors
- Lack of access (e.g., transport, facilities, resources)
- Lack of knowledge
- Lack of time (e.g., due to life responsibilities)
- Low socioeconomic status (Kelly 2016)

As highlighted by responses of patients from this BC survey in Figure 17 and Figure 18, barriers are described to affect patients' abilities to adhere to treatment or BC to varying degrees.

Figure 17. Commonly reported barriers to overall treatment adherence (Q18)

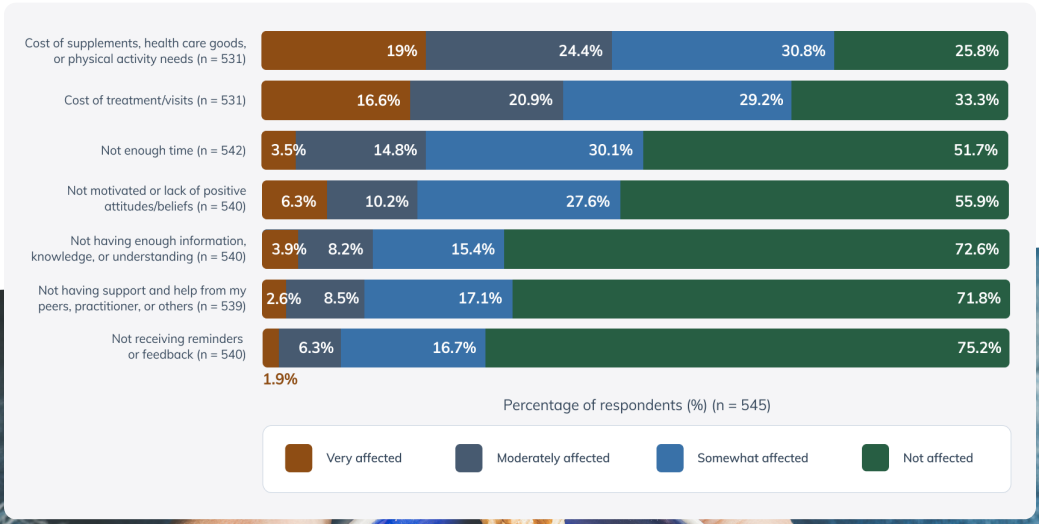
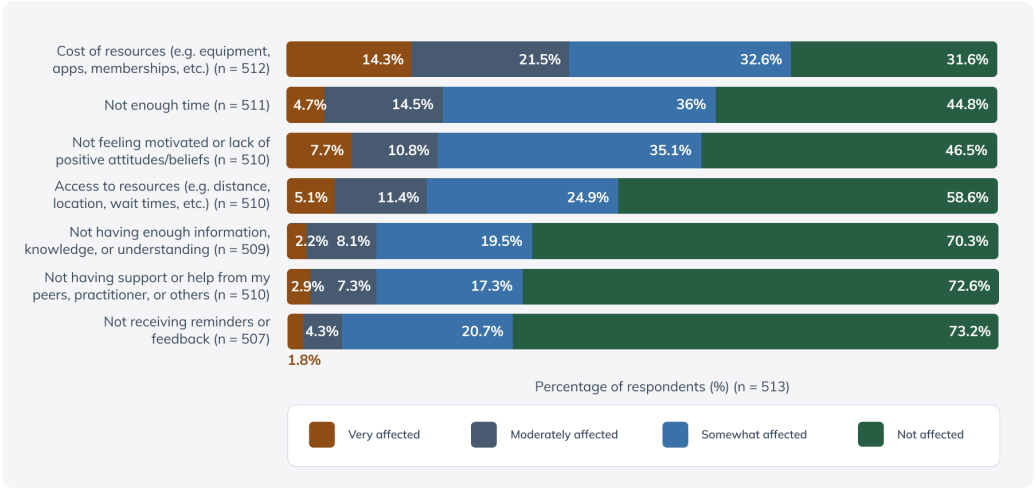


Figure 18. Commonly reported barriers to behavioral change (Q24)



Most patients did not indicate that barriers had moderate or strong effects on their ability to adhere to treatment or to undertake BC. Nonetheless, the top three barriers to both adherence and BC were cost (i.e., visits/appointments and treatment-related goods; 36 to 43%), lack of time (18 to 19%), and lack of motivation or positive attitudes towards change (16 to 18%).

Cost, time, and lack of motivation or positive attitudes towards change were the three most impactful barriers to adherence and BC.

Stratification for barriers of cost, time, motivation, and information/knowledge by treatment aspect (e.g., supplements, diet and nutrition, etc.) did not lead to tendencies for one barrier to be more common than another. It is possible that the reason for this lack of relationship was because most patients (75%) indicated that they had engaged in three or more types of treatments and that when answering the question pertaining to barriers, all treatment types were combined in their responses. In other words, the relative effect of adherence barriers was broadly applied across all components of their treatment as there was no treatment component-specific question on adherence barriers.

However, it would be reasonable to assume that certain health behaviors may be affected more by specific barriers compared to others. Financial barriers are regularly described as one of the major reasons for non-adherence to medications, (Brundisini 2015)(McHorney 2011) (Ofori-Asenso 2018) organized physical activity programs or gym memberships, (Kelly 2016) and healthy eating. (Bisogni 2012) It was also rated as the top barrier to non-adherence in Fullscript's Treatment Adherence in Integrative Medicine report. (Bailey 2021a)(Bailey 2021b)

Lack of time is another example of a more prevalent barrier to adherence for certain behaviors over others. In one survey, a greater proportion of patients indicated that time was a more significant barrier to exercise than to engaging in low-fat diets or smoking cessation. (Nielsen 2017) It might be reasonable to expect that these lifestyle-based behaviors may also lead to the perception of time as a barrier over more simple behaviors such as taking medication or supplements, although there is limited evidence to support this.

Adherence barriers stratified by demographic and health status

Overall, patients did not have strong tendencies to indicate that they would be affected by certain adherence barriers over others. However, there were a few barrier-specific trends for disability status, income, primary language, and self-reported health status.

Disability

When stratifying self-reported disability status by the "cost of treatment/visits," individuals who do not live with a disability were less likely to indicate that they were "moderately" or "very affected" (37%; n = 172/469) compared to individuals who live with a disability (47%; n = 17/36). Similar observations were made for the "costs of supplements and other health goods." Patients not living with a disability were more likely to have been "moderately" or "very" affected (41%; n = 196/477) compared to patients with a disability (61%; n = 23/38).

These observations were in line with what is observed in the literature. A recent meta-analysis containing 56 million Medicare beneficiaries indicated that individuals living with one or two limitations in activities of daily living (37%) or three to six limitations (43%) were more likely to be non-adherent to their prescription medications due to high costs compared to individuals without limitations (28.8%). (Nekui 2021)

Cost is also one of the most frequently recurring barriers to physical activity in populations with intellectual or physical disabilities. (Bodde 2009) (Ginis 2016) Moreover, individuals living with disabilities are at heightened risk of household food insecurity (Schwartz 2019) and face cost challenges when it comes to nutrition-related health promotion. (Hall 2003)

Income

The extent to which patients reported being "not affected" or "very affected" by the "cost of treatment/visits" or "cost of supplements/health goods" was closely associated with reported income (Figures 19 and 20).

Figure 19. Whether patients are “not affected” or “very affected” by treatment costs (visits/appointments), stratified by income (Q3 and Q18)

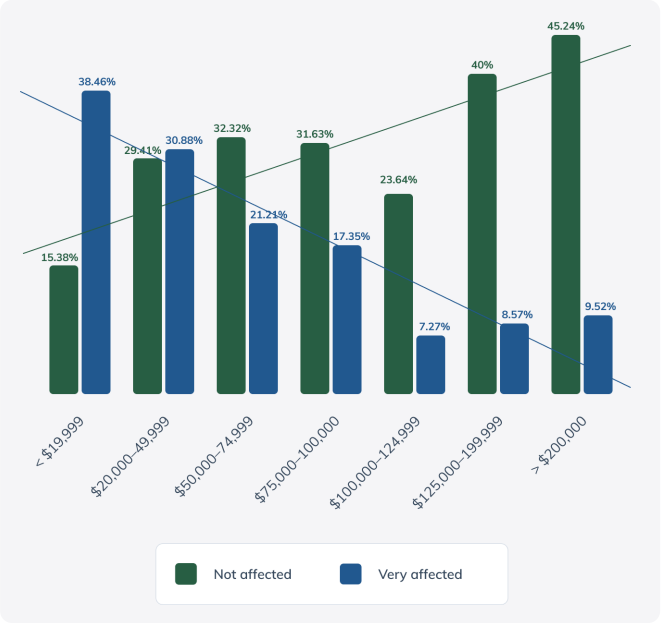
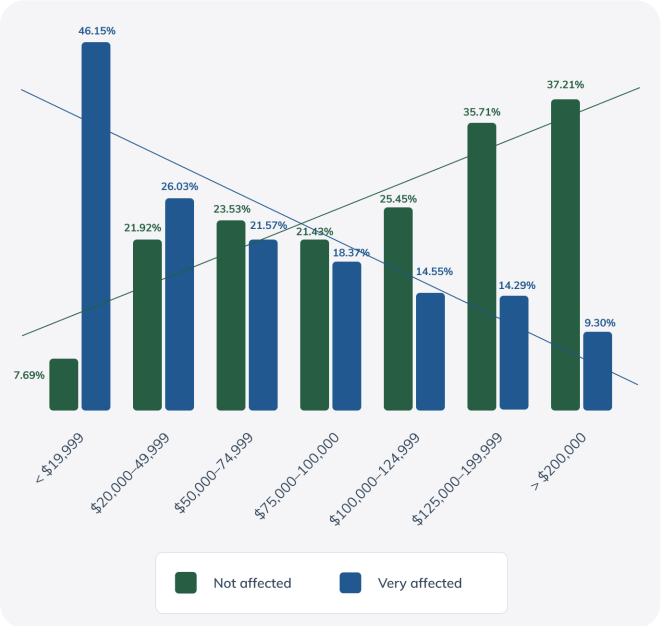


Figure 20. Whether patients are “not affected” or “very affected” by cost of supplements or health goods, stratified by income (Q3 and Q18)



This relationship is unsurprising given that finances play a key role in a patient's ability to purchase the treatments needed for their treatment plan. Previous analyses have shown that as total household income increases, the likelihood of reporting cost-related non-adherence decreases, (Khera 2019)(Zivin 2010) particularly in cases where out-of-pocket expenditures on treatment are higher in lower-income patients. (Piette 2011)

It is interesting to note that the intersection of the trendlines is in a higher income bracket for the cost of supplements/health goods compared to the intersection for treatment costs of visits/appointments. Since the intersections indicate the points (in terms of income) at which a greater proportion of patients start to shift from being "very affected" to "not affected" by cost, it could be implied that patients are more accepting of the costs associated with visits/appointments than they would be for supplements at lower incomes.

Language

Table 4 summarizes some of the adherence barrier tendencies for respondents whose first language was "English," "Spanish," or "Other." Patients who do not speak English as their first language may have been more likely to indicate that they were "moderately" or "very" affected by "lack of information, knowledge, or understanding of their treatment plan or condition" or "not receiving reminders and feedback" to follow the treatment plan.

Table 4. Language and adherence barriers (Q5 and Q18)

Question	Language	Answers
Not having enough information, knowledge, or understanding about your treatment plan or condition	*Moderately or very affected*	
	English	7% (n = 56/502)
	Spanish	25% (n = 4/16)
	Other	23% (n = 4/17)
Not receiving reminders or feedback to help in following the treatment plan	*Moderately or very affected*	
	English	7% (n = 36/503)
	Spanish	27% (n = 4/15)
	Other	18% (n = 3/17)

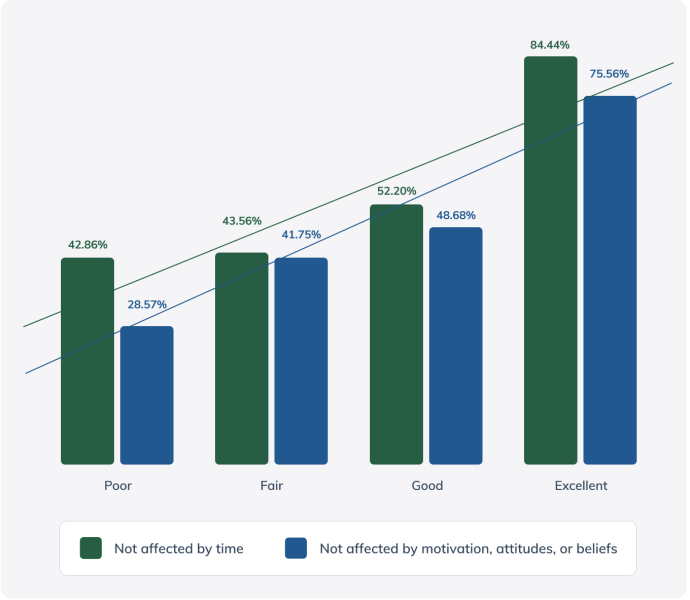
From these two barriers, it can be hypothesized that the facilitation of communication between patients and practitioners may be particularly important for individuals who do not speak English as their first language. Language barriers have been shown to impair patient-practitioner communication and adherence. (Lanouette 2009) They can lead to poorer quality of care through a number of factors including limitations in understanding diagnoses and treatment (de Moissac 2019) or not receiving as much information about their condition or treatment plan compared to English-speaking patients. (Thornton 2009) Providing feedback may improve treatment communication and adherence, (Hill 2020) and reminders are widely considered as effective communication strategies to improve medication adherence. (Kashgary 2017)(Tao 2015)(Thakkar 2016)

Overall, however, our survey cannot draw strong conclusions about the role of education, knowledge, and communication barriers in relation to adherence in populations that speak languages other than English due to low sample sizes.

Health status

For most adherence barriers, there were no strong relationships that were established with health status. However, we observed that patients reporting lower health status were more likely to indicate that "time" and "motivations, attitudes, or beliefs" would affect their abilities to follow their treatment plans (Figure 21).

Figure 21. Self-reported health status and lack of perceived adherence barriers (Q9 and Q18)



Key adherence barriers associated with patient characteristics

Patients living with disability or lower socioeconomic status	Patients whose first language is not English	Patients with lower health status
Cost of treatment, resources	Lack of information, knowledge, or understanding	Lack of time
	Lack of reminders and feedback	Lack of motivation, attitudes, or positive beliefs

Overall, we noted a connection between self-reported adherence rates (i.e., they were generally high) and the importance of barriers (i.e., they were more often not likely or only somewhat likely to affect adherence or BC success), yet patients with certain health characteristics still felt more impacted by particular barriers.

Given that in reality more patients are likely to be partially adherent to their treatment or partially successful with BC than observed in our survey, strategies that seek to reduce barriers become important considerations for practitioners looking to optimize their patients' wellness journeys. Before describing these strategies, it is first worthwhile to contextualize them under new research movements for studying evidence-based behavior change.

The science of behavior change

Through the field of health education in particular, exploring the skills required to replace unhealthy behaviors with new healthy behaviors has become a major research focus, (Heimlich 2008) most significantly within the past 60 years.

Behavioral change theories have been proposed to understand and explain BC as well as develop BC interventions to improve patient health. (Davis 2015) Many of the most prominent theories were published in the late 1900s including the Theory of Planned Behavior (Figure 22), (Ajzen 1985) the Transtheoretical Model of Change (Figure 8), (Prochaska 1997) Social Cognitive Theory (Figure 23), (Bandura 1986), and Self-determination Theory (Figure 24). (Ryan & Deci 2000) Approximately 100 different BC theories now exist. (Davis 2015)(Kwasnicka 2016)

Figure 22. The Theory of Planned Behavior (Ajzen 1985)

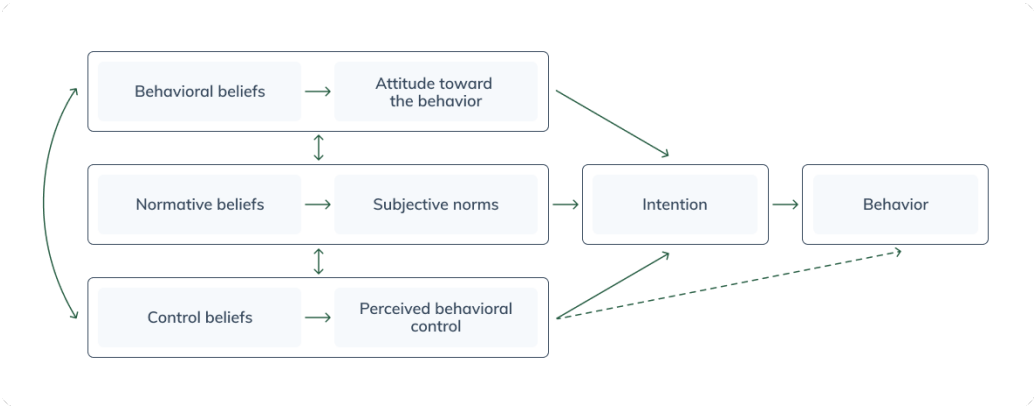


Figure 23. The Social Cognitive Theory (Bandura 1986)

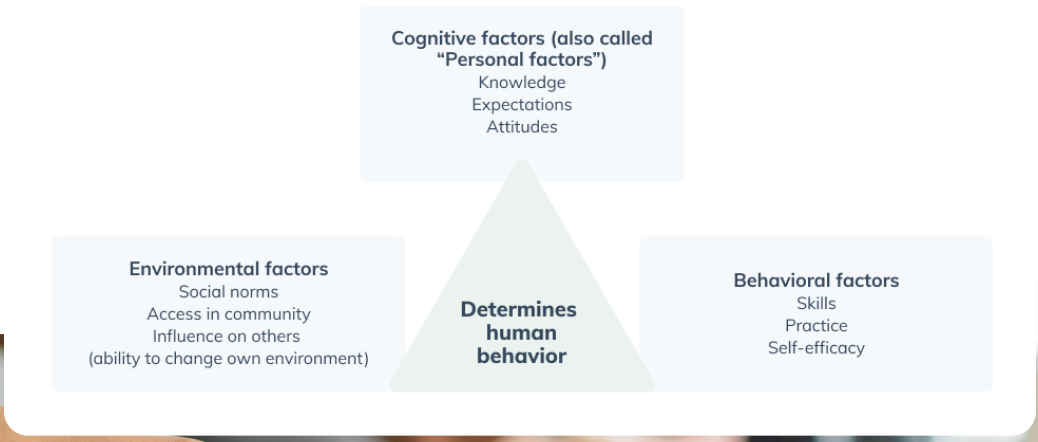
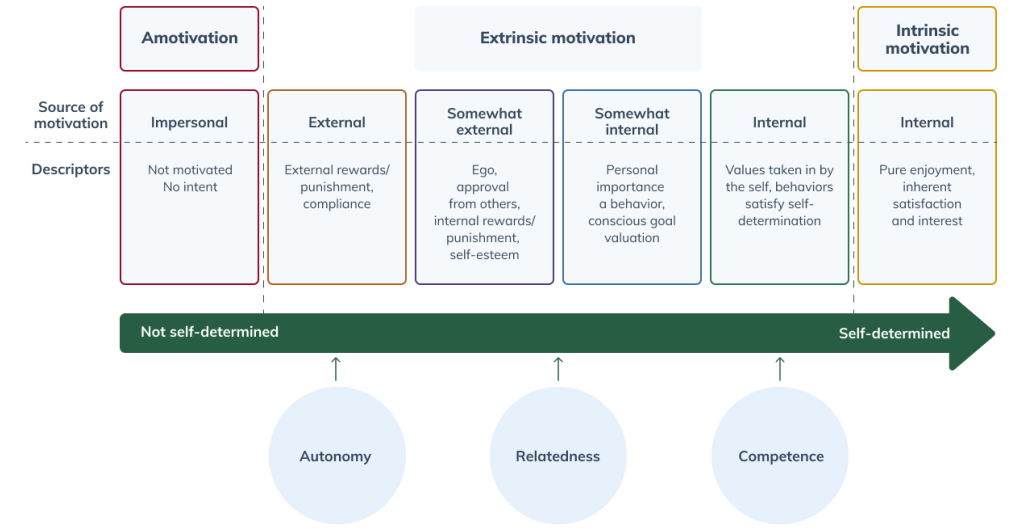


Figure 24. Self-determination Theory (Ryan & Deci 2000)



The Theory of Planned Behavior (Ajzen 1985) and Social Cognitive Theory (Bandura 1986) both emphasize how a patient's personal and social beliefs, as well as their ability to feel in control of their behavior, lead to the performance of the behavior. The Self-determination Theory (Ryan & Deci 2000) is more focused on how different sources of motivation may or may not lead to BC. Although each theory may emphasize certain constructs as key predictors of behaviors, many constructs overlap between theories and are used in the development of BC interventions.

However, until recently, there was little understanding of how certain interventions may produce positive benefits. (Byrne 2020)

Research now focuses on identifying the specific techniques that most effectively target underlying mechanisms and barriers to BC.

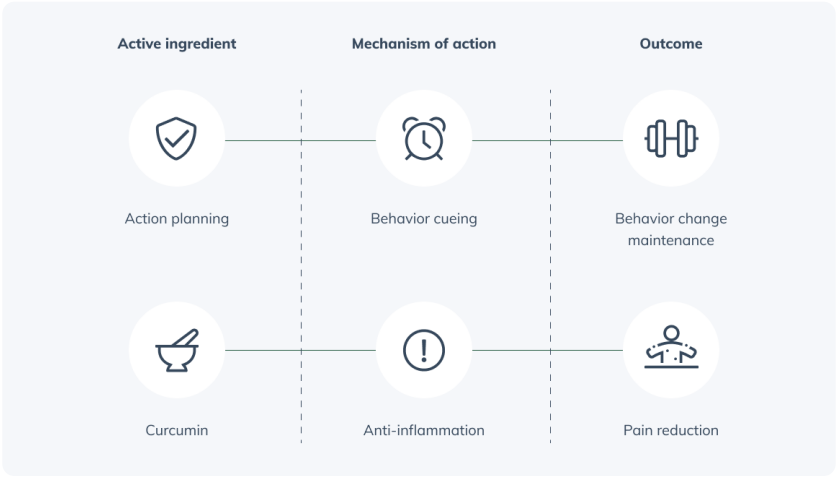
(Davidson 2020) Research now centers on the use of behavioral change techniques (BCTs) found in research interventions (e.g., goal setting, graded tasks, self-monitoring, etc.) (Michie 2013) to understand how to effectively target theoretical constructs, including BC barriers, in order to induce change. (Hagger 2020)

Some of the most comprehensive research linking mechanisms of BC with specific BCTs has been published as an interactive tool (based on systematic literature reviews and expert consensus studies). (Carey 2019) (Connell 2019)(Johnstone 2021)

The tool links 74 BCTs to 26 BC constructs (Michie 2013) and shows which constructs (i.e., mechanisms) either may be targeted or are not likely to improve with specific BCTs and which still need further evidence to clarify whether a BCT will influence them or not.

The tool defines the mechanisms and links to scales that measure each construct. It also provides an overview of what an intervention would entail when using a BCT. Though there are too many links to cover in this guide, Figure 25 illustrates a basic example for how a BCT may influence BC through a specific mechanism using an analogy to supplementation.

Figure 25. An example of the mechanistic basis of how behavior change techniques improve the adoption and maintenance of healthy behaviors



Ultimately, referring to evidence-based tools that highlight which BCTs (e.g., providing instructions on how to perform the behavior) may be most useful given a behavioral construct (e.g., lack of knowledge) is key when practitioners seek to support their patients in BC (see Figure 26). (Atkins 2017)(Michie 2013)(Michie 2011)(Presseau 2021)

Figure 26. Steps to providing behavioral change support

Using open-ended questions derived from motivational interviewing (MI) techniques can be useful in eliciting what needs to occur to best support a patient with BC. (Miller 1983)(Miller 2013) MI has four key processes that guide conversations between practitioner and patient:

- **Engaging** in a working relationship that emphasizes the patient's perspectives, strengths, and autonomy
- **Focusing** on negotiating and agreeing on the behavior to change
- **Evoking** the underlying reasons and motivations for the change
- **Planning** with the patient (based on their own perspectives and knowledge) on how to implement BC (Miller 2013)

A recent umbrella review found that MI may be most beneficial for changing or preventing behaviors such as alcohol consumption, smoking, substance abuse, and potentially gambling and physical inactivity (small effect). (Frost 2018) Other systematic reviews have also demonstrated efficacy in improving medication adherence, (Aubeeluck 2021) physical activity, (Barrett 2018)(Nuss 2021) dietary intake, (Stallings 2018) weight management, (Galvez Espinoza 2019) (Suire 2021) self-management of conditions, (Chew 2019)(Dorstyn 2020)(Ghizzardi 2021) (McDaniel 2021)(Sokalski 2020) screening for diseases, (Chan 2021) and returning to work in patients with musculoskeletal disorders. (Aanesen 2021)

For an official directory for MI resources and training, please refer to the MINT website.

Strategies to facilitate behavioral change in an integrative setting

Though BC is a challenge, research suggests that interventions can provide modest effects for improving the performance of health behaviors. Interpretation of Cohen's d (or SMD, an effect size used to estimate the standardized mean difference between two groups) is often used to understand the degree of an effect in meta-analyses. Effect sizes using Cohen's d can be summarized as follows:

- Small effect size: d= 0.20
- Medium effect size: d= 0.50
- Large effect size: d= 0.80 (Cohen 1988)(Faraone 2008)

In a 2010 meta-synthesis of 62 meta-analyses, BC interventions were shown to produce small effects on improving behaviors (d= 0.21). (Johnson 2010) However, even small effects can translate into meaningful outcomes. For instance, a small effect size (d= 0.32) produced post-intervention improvements (i.e., using heart rate monitors for biofeedback, demonstrating exercises, helping practicing physical activity through supervised exercise classes, and progressively increasing exercise intensity and duration) in physical activity time (31 to 247 minutes per week) and steps (606 to 1,849 per day). Smaller effects (d= 0.21) still provided improvements to physical activity time (up to 95 minutes per week) and steps (421 to 1,370 per day) more than six months after the intervention's finalization. (Howlett 2019)

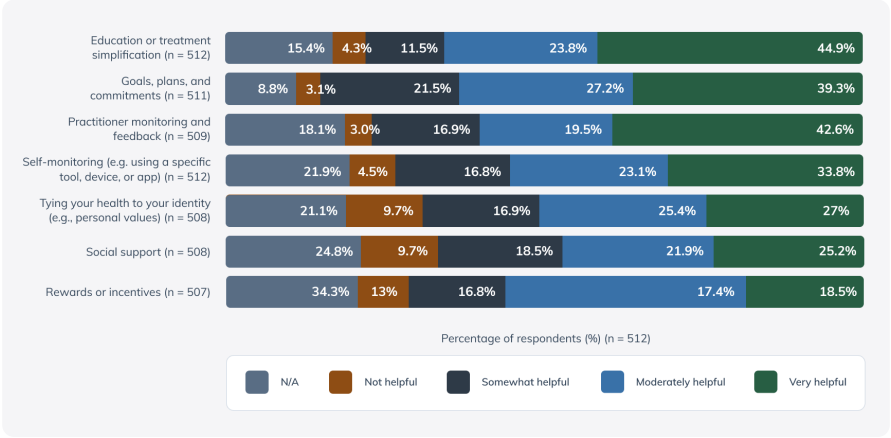
Behavioral change interventions may only lead to small effects on changing healthy behaviors, but even small effects can lead to clinically meaningful changes.

In our survey, patients were prompted to list any specific tools or strategies that they have found particularly helpful for BC. There were 360 open-text responses, which were consolidated into the following themes:

- Access to resources/equipment
- Accountability, trackers
- Avoidance of stimuli and fear of health consequences
- Biofeedback, receiving and providing feedback
- Boosting motivation, self-esteem
- Counseling
- Direct, regular communication and check-ins
- Goal-setting
- Graded tasks, simple instructions
- Habit formation, planners, organizers, reminders
- Meditation/mindfulness/self-awareness
- Ongoing education
- Open to change and new treatments, changing attitudes, belief in treatment
- Personalization
- Positive reinforcement, rewards
- Social and emotional support, vicarious experience (success stories)
- Specific exercise or diets
- Technology and apps
- Thinking of others more than self

Patients were also asked to indicate the degree to which many of the more widely adopted strategies were helpful in supporting BC. Figure 27 provides this breakdown.

Figure 27. Extent to which patients feel different strategies are helpful in changing behaviors (Q25)



When combining responses for "very helpful" and "moderately helpful," the most preferred strategies for patients in our survey were:

1. Education or treatment plan simplification: 68.7%
2. Goals, plans, and commitments: 66.5%
3. Practitioner monitoring and feedback: 62.1%
4. Self-monitoring: 56.9%
5. Tying health to your identity: 52.4%
6. Social support: 47.1%
7. Rewards/incentives: 35.9%

The "lack of knowledge or understanding of how or what to change" barrier was ranked relatively low (only 10% were "very" or "moderately" affected), yet the most preferred strategy was "education or treatment plan simplification" (69% indicated this strategy was "very" or "moderately" helpful).

Goal setting, planning, and making commitments to BC were also ranked as highly useful techniques and might be effectively applied as blanket strategies across behaviors. Goal setting and planning (e.g., action planning, problem solving, etc.) in particular tend to have good evidence across various BC constructs/barriers such as for having issues with setting intentions or goals, behavioral regulation or cueing, self-efficacy (i.e., belief about capabilities), and motivation. (Carey 2019)(Connell 2019) (Johnstone 2021) However, it is also important to consider that blanket approaches may not always work for each individual and that some strategies might even be more relevant for particular behaviors over others.

Given that some behaviors may require more effort, it is reasonable to assume that some BC strategies might be considered more effective than others for a particular behavior.

Behavioral change strategies for specific behaviors

In order to determine whether certain BC strategies were considered more useful for certain behaviors, stratification analyses were separately performed between strategies that were "very" and "moderately helpful" for the type of treatment used and being successful at changing behaviors. However, there were no striking tendencies found in either analysis.

No one strategy was more helpful for certain treatments or behaviors. However, based on the literature review, it would have been expected.

A possible explanation for a lack of relationship between strategies and specific behaviors or treatment types was that patients could select more than one behavior or treatment type for which to provide answers. A large proportion of patients had three to four components in their treatment plans, and thus, we cannot presume to know to which of those types patients might have been primarily referring when considering the utility of each strategy. This could be useful information to establish in a future study.

Nonetheless, meta-analyses comparing effect sizes have found that certain BCTs may be more effective for BC in some behaviors over others. For example, the most effective BCTs for encouraging physical activity include promoting "self-monitoring" (d= 0.11–1.46), use of "prompts/cues" (d= 0.23–0.52), and "biofeedback" (d= 0.49). (Compernolle 2019) (Michie 2009)(Murray 2017)

For diet or nutrition modification, "self-monitoring" (d= 0.17–0.30) and "prompts/cues" (d= 0.10–0.30) may also be particularly effective. (Bull 2018)(Michie 2009)(Teasdale 2018)

When simultaneously engaging in physical activity and diet plans, "goal-setting" (d= 0.23–0.48) becomes more important, though "self-monitoring" (d= 0.16–0.42) and "receiving feedback on the outcome" (d= 0.25) of the behaviors were still ranked highly. (Samdal 2017)

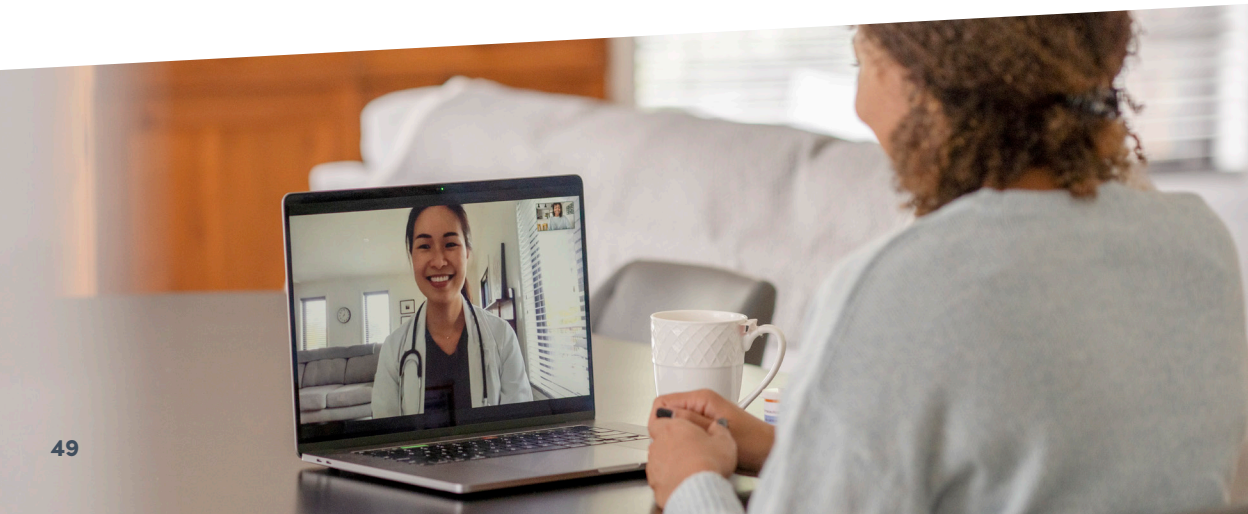
"Monitoring by others" (d= 1.32) may be more important for improving smoking behaviors, followed by providing "options for additional support" (d= 0.74–0.85) and "information about health consequences" (d= 0.69–0.80). (Prestwich 2017) "Receiving feedback" (d= 0.24–0.57) or "moderation" strategies (d= 0.57) may be more effective for alcohol or substance use. (Scott-Sheldon 2014)

Few studies point to a greater efficacy for certain BCTs to improve medication adherence behaviors; (Denford 2014)(Zomahoun 2015) however, many (non-directly comparative) studies show benefits to medication adherence through BCT delivery and could be reasonably applied to dietary supplement-taking behaviors. Some of these effects are shown in Table 5.

Table 5. The effect of behavioral change techniques on medication and supplement adherence

Behavioral change intervention/technique	Effect on medication and supplement adherence
Conserving mental resources*	↑ 21% by simplifying treatment plans by using combination pills (Fuller 2018) ↑ 10–13% by simplifying treatment plans by using combination pills (Hutchins 2011)
Graded tasks*	↑ 13–44% by starting out with one daily dose (versus 2–3 doses per day) (Saini 2009)
Material rewards	↑ 20% by providing financial rewards (DeFulio 2012) ↑ adherence with a moderate effect (d= 0.77), though benefits may not be sustained past the period of incentivization (Petry 2012)
Motivational interviewing	↑ likelihood of adherence by 17%, or with moderate effect (d= 0.70) (Palacio 2016) ↑ adherence with small effect (d= 0.12) (Zomahoun 2017) ↑ adherence in 78% of studies (Kahwati 2016)
Prompting/cueing	↑ 11% with packaging that provides reminders (Mahtani 2011) ↑ 52% with the use of text messages (Fuller 2018)
Providing decision aids*	↑ relative likelihood of initiating medication by 65% by improving Px knowledge, attitudes, and beliefs about diabetes (Stacey 2017)
Providing feedback	↑ 10–20% when provided to patients (Demonceau 2013)(Seewoodharry 2017) No effect on patient adherence when feedback is provided to practitioners (Zaugg 2018)
Self-monitoring	↑ adherence with small effect in hypertension (d= 0.21) (Fletcher 2015)

*Note: These techniques are most closely related to providing education and treatment plan simplification, which was the top-rated BC strategy in our survey.



One qualitative comparative analysis highlighted that interventions that incorporated techniques that target knowledge, self-efficacy, and attitudes were generally more successful for improving medication adherence than other techniques that focus on building awareness, intention formation, action control, maintenance, or facilitation. (Kahwati 2016)

It should be noted that on its own, knowledge provision was not as consistently found to improve adherence, despite how many studies used it to successfully improve adherence. (Kahwati 2016) This is consistent with Fullscript's Treatment Adherence in Integrative Medicine report, which found that knowledge/education should be combined with other intervention types to more consistently improve adherence. (Cross 2020)(Dean 2010)(Viswanathan 2012)(Wiecek 2019) To reiterate, our survey found that 69% of patients felt that receiving more education would be helpful in their BC journeys and that it could improve the success of any treatment plan.

Overall, interventions that include a cognitive-educational element may improve adherence by an additional 6% over interventions that do not include an educational component. (Demonceau 2013) Combining intervention types (including educational with others such as behavioral) may improve the sustainability of improvements in adherence past the six-month mark. (Wiecek 2019) Table 6 provides a summary of a few key BCTs in relation to common BC mechanisms/constructs.

Regardless of the behavior, providing education and ways to simplify treatment plans should be incorporated in all BC strategies.

Table 6. Examples of effective behavioral change techniques when supporting constructs of change (Carey 2019)

Mechanism	Applicable BCTs	Applicable BCTs
Belief about capabilities (self-efficacy)	Graded tasks	Over time, gradually increase the number of dietary supplements used or times throughout the day for the supplement to be taken.
Skills	Demonstration of behavior	Advise on sources that demonstrate how to perform specific exercises (e.g., personal trainers, apps with functions to demonstrate movements, etc.).
Behavioral regulation	Self-monitoring of the behavior	Provide patients with a diet diary in which they can record the foods they are eating.
Beliefs about consequences	Pros and cons	Provide patients with a worksheet that highlights the benefits and drawbacks of reducing alcohol intake behaviors.
Subjective norms	Information about other's approval	Capture and provide feedback or reviews from other patients that have used a stress management app, highlighting that it is not out of the norm to seek therapies to benefit mental health.

A note on BC strategy delivery

The efficacy of BCTs can be dependent on the method of delivery. (Ashford 2010)(Black 2020) (Knittle 2018)(Sheeran 2019)(Tang 2019) This includes whether the BCT is delivered through more traditional (e.g., in-person) methods or through technological applications. For instance, the strongest effects for improving behaviors for physical activity were observed when "behavioral practice/rehearsal" was delivered face-to-face, but "social reward," "goal setting (behavior)," "graded tasks," and "goal setting (outcome)" were delivered through digital methods. (Carraca 2021)

Thus, when recommending a particular BC strategy to their patients, practitioners should also be aware of whether they will be delivering BC support through technological means.

The use of technology for behavioral change in an integrative setting

Whereas traditional BC interventions have been mainly conducted face-to-face, allowing observation of a patient's physical cues and the benefits of in-person social dynamics, technological interventions may provide other benefits. These benefits include accessibility, cost efficiency, and elimination of barriers that prevent patients from disengaging as a result of the need to be physically present for a consultation or intervention. (Arigo 2019)

Considering cost is consistently regarded as a top barrier to adherence and BC, the use of technology to deliver BC support may become a preferred mode of BC support.

The field of using technology to influence BC was first solidified in 1998. Over the last two decades, research on BC technologies has grown exponentially, particularly after the introduction of the smartphone in 2009 (Figure 28). Over the years, research on how technologies (e.g., computers, desktop apps, smartphones (mobile apps and SMS (mHealth)), the internet, email, wearable sensors, games, social media, and patient portals) can deliver BCTs to influence BC has been major areas of focus. (Taj 2019)

Figure 28. Growth of research articles on using technology for behavioral change

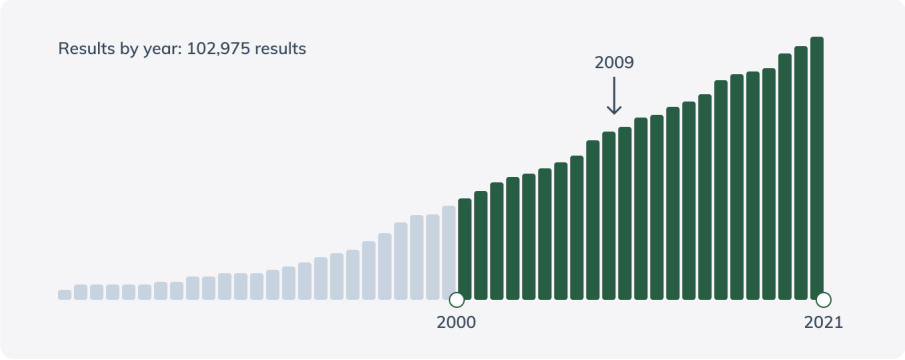
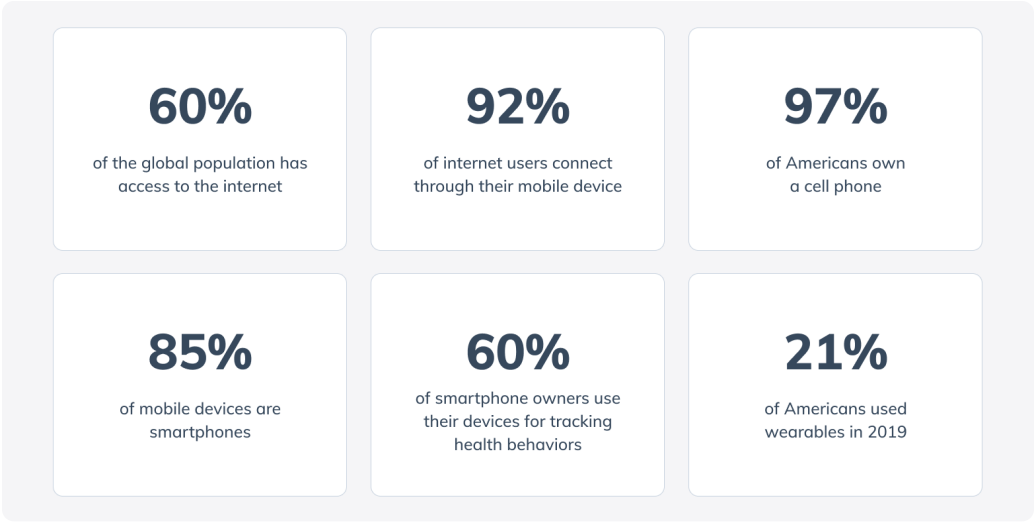


Figure 29 shows that the use of digital interventions for BC has become a topic of extreme interest and a key mode of delivering BC support:

Figure 29. Trends in the use of technology
(Arigo 2019)(Pew Research Center 2021)(Pew Research Center 2020)(Statista 2021)



In our survey, 27% of patients indicated that they would be "extremely likely" to turn to technological-based tools for BC support, followed by 55% who would be "somewhat likely" and 18% who would be "not at all likely."

Around 82% of patients using integrative medicine would consider using technology to support their BC wellness journeys.

Secondary analyses were performed to determine if patients' reported "readiness to change" or "degree of change needed to improve health" were associated with likelihood of turning to technology for BC support.

Patients who were "extremely likely" to turn to technology more often reported being in the "preparation" (36% vs. 7%), "action" (27% vs. 15%) or "maintenance" (28% vs. 14%) stages than the "pre-contemplation" (18% vs. 45%) and "contemplation" (10% vs. 32%) stages when compared to patients who indicated that they were "not at all likely" to use technology. They were also more likely to indicate that there was "a great deal" of change required to improve their health (33% vs. 13%) than having "little to no" change required (15% vs. 50%) when compared with patients indicating that they were "not at all likely" to use technology.

Patients might be more willing to use technology to support BC when they are at least preparing to change or when perceiving that change may require significant effort.

Key technological considerations for practitioners

Given the influence of engagement with a digital platform as a potential requisite for BC, it is important to highlight the kinds of factors and features that may be most important for practitioners to consider when selecting a technological platform to support BC journeys.

Practitioners should consider three main aspects:

1. The technological quality of the platform
2. The use of features designed for patient engagement
3. The evidence for use of the technological platform for BC

1) Assessing quality of the technology

Given that over 50,000 mobile health apps can be found on Apple and Google Play stores, (Statista 2022a)(Statista 2022b) the immense availability can make it challenging for practitioners to recommend one app over another. Thus, measuring quality can be a means of filtering down the number of platforms to be considered.

Literature reviews often indicate that the quality of commercially available apps needs to be improved. (Choi 2018)(Gong 2020) (Lu 2021)(Mohammadzadeh 2021)(Myers 2021)(Schoeppe 2017)(Simoes 2018)(Tofighi 2019) Tools that assess the quality of mobile applications have also been developed and used to assess the quality of numerous apps focusing on improving health behaviors and chronic conditions.

For instance, the Mobile App Rating Scale (MARS) was developed to provide a mean score from 23 items capturing data on five-point Likert scales for measures of engagement, functionality, aesthetics, information quality, and overall app quality. (Stoyanov 2015) An adapted and reliable version that expands the scale's use beyond apps to include other e-tools also exists. (Roberts 2021)

Overall, practitioners might consider using the following protocol to evaluate the quality of a digital platform prior to recommending it to their patients. (Roberts 2021) It specifies:

1. Scoping out available platforms through app stores, professional associations, etc.
2. Creating a shortlist within the specific health domain (e.g., medication adherence)
3. Evaluating the shortlist using the adapted MARS
4. Creating criteria to include in recommendations:
    - What features would be key to the patients in this domain?
    - Has the platform been created by a trustworthy organization?
    - Did the platform meet or pass a minimum pre-determined MARS score?

Practitioners can follow protocols to help them distinguish high-quality BC platforms.

Though this process may be time consuming and may require the development of new skills, this protocol (using the adapted MARS) may provide a feasible means to validly rate the quality of digital platforms prior to recommending them. (Roberts 2021)

From a list of 50 apps reviewed in a systematic review of studies conducted from 2000 to 2013, the top five apps with the highest MARS score (and that are still available in an app store) are provided in Table 7. (Stoyanov 2015)

Table 7. Examples of apps with higher MARS scores (Stoyanov 2015)

App	Areas of focus	Google Play	Apple
Headspace	Stress management and sleep via meditation	Link	Link
In Flow ADHD	Improve focus, organization, and procrastination through CBT	Link	Link
Bloom	Improve mental health through self-guided therapy	-	Link
Humana Go365 (formerly Humana fit)	Improve physical activity through personalization and rewards	Link	Link
We Breathe	Stress management through breathing exercises	-	Link

2) Features designed for patient engagement

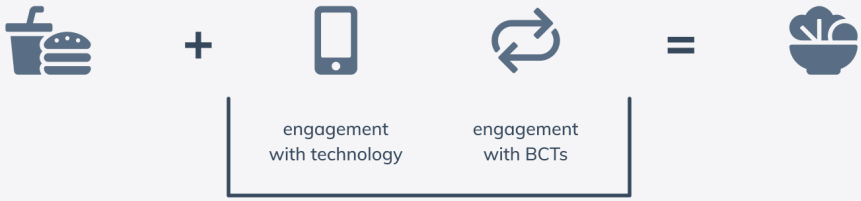
The second consideration when selecting a technological platform is understanding how engaging the platform is. One of the most important predictors of a patient's willingness to adopt and use technology to support their BC journeys is the extent to which the digital platform can engage the patient in its supportive interventions (Figure 30). (Fernandez 2021)(Martinez-Millana 2018) (Tighe 2020)(Xie 2020)

Engagement can be defined as a process in which a patient may initially engage, use, disengage, and re-engage with a digital platform. (Yardley 2016) It is measured through subjective measures such as self-report questionnaires (e.g., eHealth Engagement Scale (Lefebvre 2010)and the Digital Behavior Change Intervention Engagement Scale) (Perski 2020).

The frequency of logins, time spent in the platform, and the amount or type of content/ actions used by the patient in the platform are examples of key objective engagement indicators. (Mclaughlin 2021)(Perski 2017)(Short 2018)(Yardley 2016) Subjective experience measures may include factors such as attention, interest, and affect. (Perski 2017)

Increased engagement with a digital platform has been associated with improvements in BC for physical activity, (Mclaughlin 2021) fruit and vegetable intake, (Alexander 2010) smoking cessation, (Cobb 2005) and medication adherence. (Ream 2017)

Figure 30. Engagement requirements for behavioral change through technology

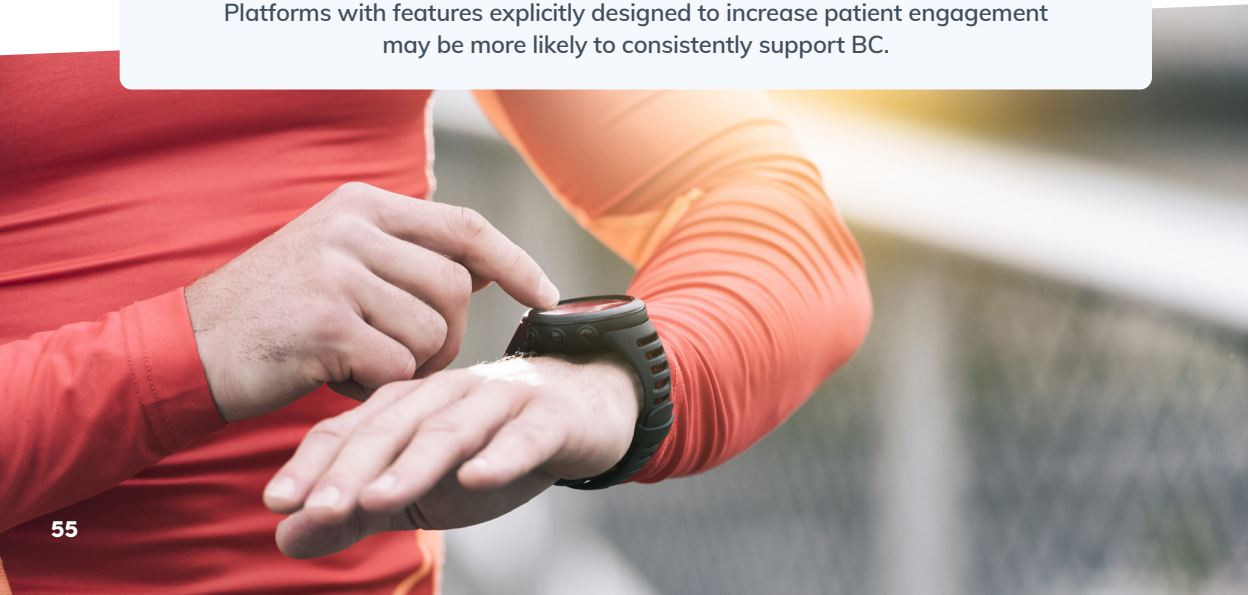


Practitioners can use the following checklist to identify specific features and factors that influence patient uptake and engagement when selecting digital platforms for their patients:

- ☐ Available user guidance
- ☐ Embedded practitioner support
- ☐ Features to reduce cognitive load
- ☐ Goal setting
- ☐ Low cost
- ☐ Patient app literacy skills
- ☐ Patient awareness of the app
- ☐ Perceived utility of the app
- ☐ Personalization
- ☐ Positive feedback
- ☐ Positive tone
- ☐ Health information availability
- ☐ Reminders
- ☐ Stats on progress
- ☐ Rewards
- ☐ Self-monitoring functionality
- ☐ Social support/networking features

(Dounavi 2019)(Sharpe 2017)(Szinay 2020)

Platforms with features explicitly designed to increase patient engagement may be more likely to consistently support BC.



3) Effectiveness of digital interventions

While many reviews capture the frequencies of BC strategies found in digital interventions and may report on the success rate of interventions containing specific techniques (vs. no change), they do not often determine the relative efficacy of these techniques across various behaviors, (Simeon 2020)(Tsoli 2018) including addictive behaviors (e.g., alcohol consumption, binge eating, gambling) (Humphreys 2021) physical activity, (Sekhon 2021)(Schoeppe 2016) (Simoes 2018)(Stockwell 2019)(Van Rhoon 2020) healthy nutritional behaviors, (Hsu 2018) (Van Rhoon 2020)(Villinger 2019) medication adherence, (Long 2019)(Miller 2017)(Morrissey 2016) and weight management in pregnancy. (Rhodes 2020)

Overall, digital interventions have been shown to improve diet, physical activity, obesity, tobacco, and alcohol use particularly within six months, but also for up to one year, (Afshin 2016) typically providing small positive effects on change (d= 0.16). (Webb 2010) Small effects seem to be relatively consistent across behaviors. (Akinosun 2021)(Black 2016)(Carey 2013)(Carey 2009)(Orr 2015)(Peng 2020) (Petkovic 2021)(Riper 2011)(Stockwell 2019) (Villinger 2019) When digital interventions target more than one health behavior, larger effects may occur. (Duan 2021)

Table 8 provides a summary of effects found across various digital health interventions for many of the health behaviors described in the survey.

Table 8. Examples of effects used from digital interventions for improving BC

Behavior	Effects
Physical activity (PA)	↑ time spent in moderate-vigorous PA by 13.4 minutes and steps by 2,185 in adults (Jahangiry 2017)
	↓ sedentary time by 32–41 minutes per day in adults, but effects start to diminish past the sixth-month mark (Curran 2021)(Stephenson 2017)
	↑ time spent in moderate-vigorous PA by 28 minutes and physical activity behaviors overall with small effects (d= 0.23) via social media interventions (Petkovic 2021)
	↑ amount of total PA by 10%, moderate-vigorous PA by 16%, and walking by 9% per week when owning wearable activity sensors (Yen 2021)
	↑ time spent in moderate-vigorous PA by 52 minutes; ↓ sedentary time by 58 minutes in older adults (Stockwell 2019)
	↑ time spent in moderate-vigorous PA by 41 minutes in cancer survivors (Roberts 2017)
	↑ PA behaviors with small effect (SMD= 0.23); ↓ likelihood of sedentary behavior by 46% in patients with CVD (Akinosun 2021)

Table 8. Examples of effects used from digital interventions for improving BC cont.

Behavior	Effects
Nutrition/diet	↓ likelihood of engaging in healthy eating behaviors by 30% in patients with CVD (Akinosun 2021)
	↑ healthy nutritional intake behaviors with small effects (g= 0.19) (Villinger 2019)
Smoking cessation	↑ likelihood of smoking cessation by 29% in the short term (< six months) and 19% in the long term (> six months) (McCrabb 2019)
Alcohol reduction	↓ drinking behaviors with small effect (g= 0.39–0.44) for 6–9 months post-intervention in adults (Riper 2011)
	↓ quantity, frequency, and other alcohol-related problems with small effects (d= 0.10–0.19) for up to 13 weeks post-intervention, but the effect may only be sustained after six months (d= 0.16) for reduced quantity in students (Carey 2013)(Carey 2009)
	↓ drinking by two standard American drinks per week, one less drinking day and/or binge drinking day per month, and one less drink per occasion (Kaner 2017)
Medication adherence	↑ adherence with small effect in patients with chronic disease (d= 0.17–0.42) (Jeminiwa 2019)(Peng 2020)(Rohde 2020)(Shah 2019)(Wang 2019)(Xu 2020)
	↑ likelihood of adherence by 59–111% using apps or text messaging (Al-Arkee 2021) (Armitage 2020)(Thakkar 2016)
	↑ absolute adherence by 10–17% if reminders are part of a schedule and when patients can reply to text message reminders (Akinosun 2021)(Amankwaa 2018)(Wald 2015)

Most often, digital interventions use techniques in the domains of goal setting, self-monitoring, motivation, feedback, education/information, and social support, though many other techniques are also widely used. (Taj 2019) Where available, a summary of the comparative effects of BCTs is provided in Table 9.

Table 9. Examples of comparative effects of top BCTs across technological interventions for BC

Behavior	Top performing BCTs for improving behavioral change
Various (e.g., physical activity, diet, alcohol, smoking, etc.)	Reduce negative emotions (d= 0.50) Model/demonstrate the behavior (d= 0.35) Problem solving (d= 0.32) Social comparison (d= 0.29) Goal setting (behavior) (d= 0.27) Note: other BCTs provided similar effect sizes (Webb 2010)
Physical activity	Demonstration of the behavior (only) increased likelihood of improvements in PA by 25% in children; (Brannon 2015) Behavioral contract (increased likelihood by 53%) Information on other's approval (44%) Information about health consequences (36%) Action planning (22%) Self-monitoring (22%) in adolescents (Brannon 2015)
Physical activity in patients with overweight or obesity	Social incentives (β= 2.37) Goal setting (behavior) (β= 0.89) Graded tasks (β= 0.87) Goal setting (outcome) (β= 0.76) (Carraca 2021)
Nutrition/diet	Social support (increased likelihood by 43%) Demonstration of the behavior (26%) Behavioral practice/rehearsal (21%) in children; (Brannon 2015) Social support (60%) Demonstration of the behavior (45%) in adolescents (Brannon 2015)
Smoking cessation	Problem solving (increased likelihood by 59%) Pros and cons (52%) Action planning (43%) Social support (unspecified) (38%) Pharmacological support (32%) Goal setting (behavior) (28%) Information about health consequences (28%) (McCrabb 2019)
Alcohol reduction	Commitment (d= 0.31) and review of goals (d= 0.18) for reducing total alcohol consumption; Social comparison (d= 0.22) for reducing the total quantity consumed in one session and the frequency of consumption; Provide options for additional support (d= 0.09) for reducing the frequency of heavy episodic drinking (Black 2016) Behavior substitution (reduced by 6.8 drinks per week) Problem solving (3.3 drinks per week) Credible source (2.3 drinks per week) (Garnett 2018)(Kaner 2017)
Medication adherence	Improvements in adherence were not related to any one BCT (Armitage 2020)

Cohen's d, which is an effect size used to estimate the standardized mean difference between two groups, has been explained previously in this report. (Cohen 1988)(Faraone 2008) β coefficients also estimate effect size but measure the strength of association between two groups through linear regression. (Cochrane Training 2022)

Overall, there is strong evidence for the use of technology to improve BC. As the literature continues to grow, evidence for using specific BCTs in technology-based modes of BC support delivery will become more widely known.

Practitioners should also be aware that while digital interventions and technological platforms may be broadly generalized as potentially useful for BC, not all digital platforms have studies dedicated to demonstrating their BC efficacy.

For example, only 12% of the 681 medication adherence apps in the Apple App Store and the Google Play store were developed with the involvement of a healthcare practitioner, and only 1.2% provided evidence for their efficacy. (Ahmed 2018)

Some practitioners may prefer to recommend technologies that have specifically demonstrated their BC utility in specific contexts. As such, they may turn to digital therapeutics as a viable means to support patient BC and other health outcomes.

Digital therapeutics

Unlike standard commercially available health and wellness apps or wearable health sensors, digital therapeutics (DTx) are reviewed by the U.S. Food and Drug Administration (FDA) and are marketed as a means to prevent, manage, or treat health conditions independently or alongside standard treatment. (Digital Therapeutics Alliance 2021)

DTx are considered as a subset of digital medicine wherein regulatory review and oversight of evidence-based interventions differentiate them from the broader digital health market. (Dang 2020) DTx are particularly used in chronic conditions that can be well managed through BC in lifestyle-related domains. (Dang 2020)(Patel 2020)

DTx can be made available through a physician's prescription (though not all DTx require one) and typically require a referral to fully access the software. (Patel 2020) When patients receive a prescription, they can enroll with the DTx and are provided with an access code to download an app from the Apple App Store or Google Play store for a prescribed timeframe. Practitioners can monitor patient data/progress and adherence to the software's program, (Pear Therapeutics 2019) depending on the functionality of the DTx.

Since the first DTx was approved by the FDA in 2017, 35 to 40 have now been approved. (Galvin 2021) One of the leading DTx not-for-profit organizations, Digital Therapeutics Alliance, provides a list of several DTx products that align with their standards for high-quality and evidence-based care. Characteristics of these products are highlighted in Table 10. Please note that this is not a comprehensive list of all available DTx.

Table 10. Examples of available digital therapeutics

Product	Use	Intervention description	Outcomes	Evidence and availability
BlueStar® by Welldoc®	Type 1 and type 2 diabetes	Coaching on daily medication administration, physical activity, smart food choices, and psychosocial well-being; Data sharing with practitioners using a mobile app or website	↓ HbA1c (1.7–2 points) within 3–6 months; ↑ medication adherence, glucose control	Link US and CAN Rx not required
Dario® Blood Glucose Monitor by Dario Health	Type 1 and type 2 diabetes	Self-testing and monitoring using a blood glucose measurement device and smartphone application; Feedback and coaching is tailored to the user's health and lifestyle habits; Practitioners can view data and message patients in an app through a separate service, DarioEngage.	↓ HbA1c (1.4 points) over 12 months, and hypoglycemia (50%) and glucose variability (14%) within two years	Link US and CAN Rx not required
Insulia® by Voluntis	Type 2 diabetes treated with long-acting insulin analogs	Smartphone application that coaches patients with real-time dosing information for insulin doses (i.e., insulin titration); Practitioners can monitor patient data. Note: evidence based on predecessor device called Diabeo®	↓ HbA1c (0.4 points) over 12 months; ↑ proportion of Px with < 7% HbA1c more than two-fold	(Charpentier 2011)(Franc 2019)(Franc 2020) US only Rx required
Deprexis® by Orexo	Depression	12 weeks of CBT provided through a platform accessible from any device connected to the internet; Recommended use is 30-minute sessions, once or twice per week as adjunct therapy; Practitioners do not have access to Px data unless shared.	↓ depressive symptoms (40%) as adjunct therapy, which can be maintained after six months post-therapy; ↑ likelihood of improvement 12x compared to usual therapy	Link US only Rx not required

Table 10. Examples of available digital therapeutics cont.

Product	Use	Intervention description	Outcomes	Evidence and availability
Freespira® by Freespira, Inc.	PTSD, panic disorder, or panic attacks	Patients use a tablet with the Freespira software containing 28-day breathing protocols (17-minute sessions) alongside a device used to measure breathing rate and carbon dioxide; Patients can access in-house coaches; Data is accessible to the software's in-house coaches and/or the Px's practitioner.	↓ PTSD symptoms (89% at six months post-treatment) with 50% of Px in remission ↓ proportion of Px with panic attacks (86%; 73% at 12 months post-treatment) and panic symptoms (94% at 12 months post-treatment)	Link US only Rx not required
Kaia health™	MSK pain	A mobile application that provides patients with a self-management program including guided physical exercise, relaxation techniques, and education; Connects patients to in-house health coaches	↓ pain (136%), anxiety (115%), depression (117%), and stress (200%)	Link US only Rx not required
Kaiku Health by Elekta	Cancer	A mobile, computer, or tablet application that allows patients to report symptoms and receive self-care assistance from their practitioner during cancer care	↑ symptom reporting and communication between Px and practitioner	Link US only Rx not required
Propeller®	Asthma or COPD	Patients attach a sensor to their inhaler to track medication use and symptom triggers through a smartphone application; Incorporates adherence reminders, medication refills, progress reports, and self-management education; Practitioners can access patient data and receive notifications when patients may be at higher risk of symptoms.	↑ proportion of Px achieving asthma control (72%), medication adherence (58%) ↓ rescue inhaler use (69–84% over 12 months)	Link US and CAN Rx not required

Table 10. Examples of available digital therapeutics cont.

Product	Use	Intervention description	Outcomes	Evidence and availability
reSet® by Pear Therapeutics	Substance use disorder	Provides CBT as adjunct treatment over a 12-week duration through 32 core and 30 supplemental modules (10–20 minutes each) to build behavioral change and relapse prevention skills through a smartphone application; Practitioners can view patient data.	↓ treatment dropout rate (28–34%); ↑ likelihood of abstinence (62–118%)	(Campbell 2014) US only Rx required
reSet-O® by Pear Therapeutics	Opioid use disorder	Provides CBT as adjunct treatment of 12 weeks through a smartphone application; Practitioners can view patient data such as program progress, substance use, triggers, medication adherence, and screening results.	↓ treatment dropout rate (53%); ↑ abstinence (~10 days)	(Christiensen 2014) US only Rx required

Ultimately, using technology-based tools such as digital therapeutics can provide practitioners with viable means of supporting patient BC journeys and healthy outcomes, while potentially reducing patient costs.

Strengths and limitations

In the development of this white paper, several strengths and limitations were noted.

Strengths

- There was a strong response to the survey with a total of 605 responses, providing more than 500 for each question.
- The development of survey questions was well-informed by performing an initial literature review to understand key topics to address. This can lead to evidence-based recommendations for supporting BC using specific strategies.
- Data from this white paper allows for conclusions to be drawn on BC in the context of integrative medicine, an area not as widely studied in the literature.
- Several practical examples of ways through which BC support can be delivered to patients based on the comprehensive literature review and patient survey are provided throughout this text.

Limitations

- For reasons of feasibility, the literature review was not explicitly conducted in a systematic manner. However, the authors made efforts to provide well-rounded information on a variety of BC topics, with a focus on clinical guidelines, systematic reviews, meta-analyses, and large randomized controlled trials.
- Despite a strong (yet relatively homogenous) absolute n-value, there was a relatively low response rate as the survey was sent via email to an audience of 30,000 patient users.
- Stratification analyses were helpful for teasing out some relationships, but not for others (e.g., cases where n-values become too small to be considered reliable).
- Survey responses relied heavily on patient memory with inclusion criteria of having received a treatment plan within the last year. Ideally, we would have liked to compare and contrast some of the subjective data (most affected by memory) to objective data gathered through the Fullscript platform. This was apparent in the likely overestimated adherence and BC success rates.
- When describing barriers and strategies to adherence or BC, the authors could not assume which components of the treatment to which patients were primarily referring since patients typically have more than one component in their treatment plans.

Conclusions

Effectively supporting patient health outcomes may require that practitioners use tools and implement strategies to help patients begin and maintain new health behaviors. Behaviors such as following nutrition plans, engaging in physical activity, quitting smoking, moderating alcohol intake, and taking supplements or medications often require significant effort. This is especially apparent if the behaviors are new to a patient or if multiple behaviors need to be adopted simultaneously.

However, our survey highlighted the potential benefits of cross-modality collaboration to more effectively support patients in engaging in specific health behavior types. Efforts dedicated to improving patient access to alternative forms of medical and health and wellness expertise is highly recommended.

Despite the widespread knowledge of the importance of engaging in healthy behaviors to support general wellness and to help manage chronic diseases, BC continues to be a challenge for practitioners and patients alike. However, integrative medicine may be well poised to play a significant role in supporting patient BC and in mitigating barriers to BC based on factors such as its foundations in lifestyle medicine, its tendencies to have higher number of touchpoints with patients, and its potential to motivate engagement in additional health behaviors commonly seen in integrative care. Helping patients manage long-term behaviors will require practitioners to be familiar with both the barriers and underlying psychosocial elements that are regularly described by BC theory to influence the likelihood of success and failure to change.

Cost, lack of time, and lack of motivation continue to be key barriers to adherence and BC. These areas may be paramount to generally address with all patients engaging in new treatment plans and/or health behaviors.

Assessing constructs such as readiness to change or patient empowerment can provide useful baseline and intermediary measures to better understand how a patient may respond to a treatment plan and/or how they are feeling about an active plan. Moreover, practitioners may more effectively identify specific BCTs or strategies that are more likely to positively influence their patients' likelihood of BC success.

Receiving education and strategies to simplify treatment plans; receiving practitioner monitoring and feedback; receiving help with setting goals, planning, and making commitments; and using self-monitoring strategies were the most widely preferred strategies for BC. The vast majority of patients also indicated that they would consider using technology to support BC, making this delivery format an ideal means through which to deliver these BC strategies.

With the widespread access to tools like mobile devices, apps, or other platforms made available through the internet, there is ample opportunity to facilitate the delivery of BC support. A key challenge to overcome is perhaps the overabundance of tools that claim to support BC, but through this white paper, practitioners have been provided with recommended steps to assess the quality of technological platforms available to them.

Often, the culminating decision to incorporate a technological platform into a patients' wellness plan to support their BC journey may rely upon the available evidence base. Practitioners may optimally choose to seek technologies from organizations or companies that directly publish or highlight the research supporting their technology (as with DTx products). Current and future platform designers should prioritize offering features with supportive evidence and those demonstrating thought leadership and expertise in behavioral science.

Ultimately, as highlighted throughout this white paper, through education, assessment, and the delivery of BC interventions, practitioners will be better equipped to support long-term change and improved health outcomes for their patients. These strategies may be particularly important for those patients who may require added support in changing and maintaining healthy behaviors.

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