

## Review

## The barrier-belief approach in the counseling of physical activity

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## ABSTRACT

**Objective:** To understand inactivity and relapse from PA, and to develop theory-based behavior change strategies to stimulate and support maintenance of PA.**Methods:** We conducted a literature search to explore barriers to PA. Social cognitive theories and empirical evidence were evaluated and guided the process developing a theoretical framework and counseling strategies.**Results:** A theoretical framework is presented to understand why people do not engage in PA and often relapse once they started PA. A distinction is made between three related types of BBs. In PA counseling these three beliefs are addressed using four different BB behavior change strategies.**Conclusion:** BB counseling aims to develop an individual pattern of PA for the long term that is adapted to the (often limited) motivation of the client, thereby preventing the occurrence of BBs. The client will learn to cope with factors that may inhibit PA in the future.**Practice implications:** The BBs approach composes a way of counseling around the central construct of barrier-beliefs to stimulate engagement in PA independently, in the long term.

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## 1. Introduction

Physical inactivity is a worldwide growing problem with one out of five adults being physically inactive [1]. Physical inactivity is a risk factor for chronic diseases such as diabetes and cardiovascular diseases, overweight and several cancers [2]. Regular physical activity (PA) is positively associated with fitness and health related benefits and related to an estimated 30% reduction in risk for all-cause mortality among adults [3]. Engaging in regular, moderate-intensity PA is important for the promotion of physical and mental well-being [4], and the prevention and management of many chronic diseases [5–7]. In addition, stopping or markedly reducing PA can result in a significant reversal of initial health improvements [8,9]. Thus, to improve physical and mental health and to prevent illness, it is important that people engage in PA on a regular basis. However, despite the well-known benefits of PA and the availability of effective PA interventions, many people do not engage in sufficient PA. For example, around the world percentages of physical inactivity vary from 20% up to 70% in different countries, with about 40% in the United States of America, and over 60% in the United Kingdom [10].

In addition, when people start engaging in PA, they often relapse to inactivity, even when they take part in PA interventions [11]: Results of systematic reviews and meta-analyses of long-term effects indicate that a majority of individuals relapse to a less active or to an inactive status when intervention support is no longer provided [12–15]. However, only sustained PA can have relevant effects on health and the prevention of illness. For a sustainable behavioral change, Greaves' review [20] suggests that future interventions should add behavior maintenance strategies. These strategies should target the most influential determinants of PA maintenance [17–21].

In conclusion, PA interventions can lead to higher levels of PA, which is related to several beneficial physical outcomes. However, many people do not engage in sufficient levels of PA and do not use these interventions, and when they do use PA interventions, they often relapse. Therefore, there is a need for understanding inactivity and relapse from PA, and for theory-based behavior change strategies to stimulate and support maintenance of PA.

## 2. The theoretical background

### 2.1. Barriers inhibit PA

In research on PA, the general term barrier is often used to refer to very different factors that hold people from initiating PA or that cause relapse from PA. In summary, these studies mention barriers such as, lack of time, high financial costs, health complaints, lack of safety, lack of facilities, bad weather, no transport, no family assistance or child care support [22–30]. In these studies barriers are often seen as more or less fixed factors that inhibit PA, and it is generally agreed that focusing on barriers is important to counter relapse [31–42].

From a psychological perspective, an important question is: 'How do these barriers influence PA?' Our answer is that the mental representations of these barriers are central. These representations become manifest in people's beliefs about their reality. In psychological theories, the most important beliefs related to barriers are attributions, self-efficacy, and negative outcome expectancies [43,44]. In the present theorizing, these three types of beliefs are called *barrier-beliefs*.

In this article we will, firstly, present a cognitive theory on motivation and relapse, and explain how the three types of barriers-beliefs play their role. The core assumption is, in line with general cognitive-behavior therapy, that barrier-beliefs are actual causes of inactivity or relapse. Secondly, in this article we will present a set of cognitive and behavioral strategies that are developed to deal with these barrier-beliefs in order to motivate PA and prevent relapse. These counseling strategies can be applied in the process of (re)starting to engage in physical exercise, as well as in supporting maintenance of physical exercise.

### 2.2. Barrier-beliefs and goals

Barrier-beliefs (BBs) regarding PA are thoughts or verbalized experiences or estimates of a person about what is keeping him or her from starting or maintaining PA. BBs are a cluster of beliefs that all refer to people's perception of the more or less specific or concrete factors that stand in the way of engaging in or maintaining PA. Importantly, the starting point is that people have at least some knowledge on the benefits of PA: BBs can develop when people feel they should set a PA goal, when they are setting a PA goal, when they have set a PA goal, or when they are working on a PA goal. BBs are related to goals in the opposite direction; they obstruct the achievement of goals by preventing or disturbing the goal related behavior. Although BBs regarding PA may have different sources – from hearing from others, through mass media, or based on the own experience – they have in common that they inhibit PA.

### 2.3. Attributions, self-efficacy and negative outcome expectations

BBs manifest in one of three types; as attributions of PA-inhibiting causes, as self-efficacy expectations with regard to engaging in PA, and as negative outcome expectations of PA.

#### 2.3.1. Attributions

Attributions are beliefs about the causes of behaviors, including one's own PA behavior [45,46]. People spontaneously develop attributions for different reasons but one reason is problem solving [47]: When people notice that their goal accomplishments are inhibited, they start seeking for the cause of the inhibition. In the framework of PA, people's attributions are their diagnosis about what is holding them from engaging in PA. The concept of perceived barriers actually refers to people's attributions to not engage in PA or relapse from PA [48]. Attributions may be based on undeniable facts (e.g., 'I cannot walk because my leg is broken'), on interpretations of experiences or

observation (e.g., ‘I stopped jogging because I may overburden my foot’), or on seemingly farfetched inferences (e.g., ‘I do not exercise anymore because it spoils the fixed and limited number of heart beats I have in my life’). However, once they have developed they may govern behavior; they are ‘true’ for the person as representations of reality and, thus, as a basis of the behavior. Therefore, attributions as BBs regarding PA are important manifestations of the psychological causes of what inhibits people to engage in PA. In counseling people, attributions of inhibiting causes are a starting point for the diagnosis and treatment of inhibited PA.

### 2.3.2. Self-efficacy expectations

Self-efficacy expectations can also be regarded as BBs. Self-efficacy is concerned with people's beliefs in their ability to perform a specific action that is required to attain an expected and desired outcome of the behavior [49]. In the framework of barriers, self-efficacy expectations refer to ‘being able to accomplish the task of overcoming a specific barrier’, for example, ‘being able to engage in 30 min outdoor exercise despite the bad weather’. High self-efficacy expectations will neutralize the inhibiting effects of the barriers (the bad weather). High self-efficacy expectations motivate people to invest in their behavior because it will pay off: They perceive the desired outcomes as within their reach. Perceived behavioral control is a similar construct [50] but in its theory more explicitly based on underlying beliefs on one's control over a task. Empirical data show that self-efficacy is related to barriers to PA [32–38,50], and to PA maintenance [42,51].

Self-efficacy expectations with regard to overcoming a specific barrier can be based on various sources [44]: Comparing to other people's accomplishments (e.g., ‘when he cannot do it, I certainly cannot’), interpretation of physical sensations (e.g., ‘my increased heart rate during PA is a sign of illness, I have to be careful’), social influence (e.g., ‘maybe he is right and I cannot do this’), and enactive learning (e.g., ‘I cannot do this because I failed before’). Thus, different types of knowledge can support self-efficacy expectations, for example – as related to the above sources – knowledge about how others do, and how the body works. In conclusion, in counseling people, low self-efficacy expectations as BBs are another starting point for the diagnosis and treatment of inhibited PA.

### 2.3.3. Negative outcome expectations

Negative outcome expectations can also be conceptualized as BBs. Negative outcome expectations consist of beliefs about the occurrence of aversive or otherwise undesired effects of a specific behavior [44]. They are the cognitive derivative of punishment in operant conditioning. The PA-inhibiting expected ‘punishments’ may be diverse: They may be social (e.g., expected negative social reactions), physical (e.g., expected aversive physical sensations or damage) or monetary (i.e., expected financial costs).

Negative outcome expectations are often based on negative experiences related to being physically active (e.g., ‘I feel more tired instead of feeling better’ or ‘my knee hurts as a consequence of this walking intervention’). These negative experiences translate into expectation on what will follow when one keeps on engaging in PA, or on what will happen next time someone will engage in PA. Expectations of negative outcomes have been shown to be related to relapse and maintenance in PA [43]. The type of negative outcomes people are sensitive to varies among people and maybe based on knowledge or individual history. For example, some people may especially dislike aversive physical sensations because they are inclined to catastrophize, while others are especially sensitive to negative social reactions on the basis of past experiences. In conclusion, in counseling people, negative outcome expectations as BBs are another starting point for the diagnosis and treatment of inhibited PA.

## 2.4. Relating different barrier-beliefs

The three well-defined BBs, attributions of inhibiting causes, low self-efficacy expectations, and negative outcome expectations, can be understood as different mental representations concerning barriers that are closely related (see Fig. 1). For example, one barrier a person forwards to explain his or her relapse from PA may be a lack of time. First of all, this explanation implies an attribution of inhibition: A perception of the cause of a certain event or behavior, in this case, stopping PA. Secondly, handling time constraints may be conceptualized as a task, for which a certain level of self-efficacy is needed to be accomplished. For example, time management skills may be used to handle time constraints. Thirdly, time as a barrier may imply that engaging in PA despite the time constraints is expected to have negative outcomes: It may be that a person expects that engaging in PA will be at the cost off other personal goals. Thus, attributions are end-conclusions; they explain explicitly what causes a person to not engage in PA or what caused relapse. They always refer to a task that cannot (easily) be overcome (self-efficacy expectations) or to a negative experience or outcome (negative outcome expectations). The three types of BBs are related, but each provide their own information on the psychological representations of the factors that inhibit a person engage in PA.

## 2.5. Functions of barrier beliefs

Individuals develop BBs for a reason: BBs concern a diagnosis of why a goal is or might not be accomplished. In the evolutionary framework of survival and goal-setting this is an essential function: People have limited resources and, therefore, it is important to decide to abandon a goal in time to not wait resources. Thus, BBs have a function in resource allocation.

When a person has decided to invest in the behavior of PA to reach desired outcomes, this behavior will be only maintained as long as the person estimates that it pays off. Paying off refers to the balance between the costs and the benefits. The costs, here, refer to the investment costs of engaging in a difficult task (self-efficacy-related) or coping with an aversive experience (negative outcome expectations-related). When this balance is negative – the costs outweigh the benefits – people may give up. In the control theory, abandoning a goal or giving up is called goal-disengagement and is an essential aspect of effective self-regulation [52].

Besides BBs functions in resource allocation, they can also be used by individuals to legitimize goal abandonment. When a person abandons a goal despite knowledge of the negative consequences of this (e.g., increased risk for CHD because of low PA), a psychological state is activated that is conceptualized as a self-discrepancy [53], cognitive dissonance [54] or a self-threat [55]. This is an aversive psychological state that needs to be dealt with. One way to lower it is by psychologically constructing self-serving ‘valid reasons’ to abandon the goal: BBs argue that the investment balance is negative

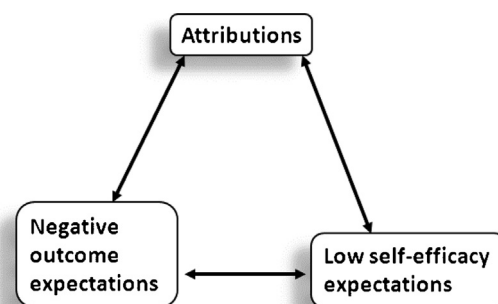


Fig. 1. Three types of BBs.

and, therefore, it is sensible and legitimized to abandon the goal, for example, 'I cannot do this' or 'I don't like this'. With regard to attributions this function is called the self-serving bias [56].

## 2.6. Changeability of barrier-beliefs

In the above perspective on inhibited PA, changing BBs in PA should be central. However, not all BBs can be easily changed. Firstly, BBs may be related specifically to how people try to reach their goal. For example, engaging in PA on Friday evening may bring negative outcomes that may inhibit a person to engage in PA. It may be that engaging in PA on Friday morning or on Saturday leads to less negative outcomes. Thus, creative solutions may help to change BBs. Secondly, BBs may refer to barriers that cannot be changed. For example, when there is a tornado, self-efficacy expectation with regard to the task of 'jogging despite the tornado' may be low but it is not reasonable to expect that people change their self-efficacy with regard to this task. In this case, it might be better to change the goal (to make the BB irrelevant). Thirdly, BBs may be highly changeable and depend on knowledge. For example, a person may stop engaging in PA because of the negative outcome expectations-related belief that certain physical sensations are early signs of tissue damage. However, this BB may not be valid and it may be changed by knowledge on how, for example, joints work. Fourthly, we must realize that sometimes goals cannot be changed and BBs cannot be changed. In that case barriers might be accepted.

These four aspects related to the (lack of) changeability of BBs are the core of the counseling method using four different BB change strategies presented below.

## 3. The barrier-beliefs counseling

In barrier-beliefs counseling PA is stimulated by addressing the BBs. The novelty of this counseling lies in the various ways it addresses BBs to lower their PA inhibiting effect. These ways can be conceptualized as behavior change strategies [56]. The behavior change strategies comprise clusters and sequences of actions of the counsellor (questions, decisions, etc.) with the goal to: (1) design means to reach the goal; (2) change goals to change BBs; (3) restructure/change BBs, and (4) accept the investments and costs demanded by BBs. These four behavior change strategies must be embedded in a broader counseling process.

### 3.1. General principles of the counseling

The goal of physical activity counseling is to guide clients to engage in PA on the long term; independently of professional support. To engage in PA on the long term, intrinsic motivation is essential [57]. According to Magnan et al. (2013) intrinsic motivation is partly determined by people's affective responses during PA [58]: They found that active people often experience a greater degree of positive affective responses than inactive people, and a decrease in negative affective responses towards PA [58]. In addition, affective responses seem to be related to the frequency and intensity of PA [59]: Higher frequency and intensity is related to experiencing a 'flow' of feeling good and enjoyment. Thus, to stimulate intrinsic motivation it is important to work towards positive hedonic responses during PA. We argue that the only way to develop this motivation is by enactive learning: The own experience that PA leads to personally relevant outcomes may lead to a robust long term motivation. In addition, to engage in PA on the long term and to build intrinsic motivation, PA inhibiting factors should be small, thus, BBs should be absent or weak. To be able to independently engage in PA on the long term, clients should be skilled in self-management concerning PA [60]; they should be able to apply the BBs behavior change strategies to their own situation.

A patient-centred approach is applied, meaning that we do not follow general recommendations on the level of PA but focus on individually desired levels of PA. The starting point of the counseling is that benefits for physical and mental health can already be achieved if clients engage in PA less than international recommended 30 min per day [61–67]. Besides sporting, many types and levels of PA can help to satisfy personal goals, for example in transportation and daily domestic activities (lunch walks, cycling to work, gardening, taking stairs), or household or gardening activities, alone or with others. Below we will describe the different subsequent steps and counsellor actions in the counseling process. In this phase the counsellor develops a preliminary insight into potential barriers through identification of BBs. We will not go into these aspects of counseling and only mention them in sum:

- Personal introduction.
- Explanation of aims of the counseling and agreements of the sessions.
- PA diagnosis, extensive inventory of:
  - o health and behavior measurements;
  - o current lifestyle related to PA;
  - o long term goals;
  - o motivation to engage in PA;
  - o attitudes, level of self-efficacy and expectations towards PA.

### 3.2. Designing action

After the diagnostic information is gathered, a plan for client action can be designed. Most BBs are related to specific goals. Therefore, the client's PA goals must be explored.

#### 3.2.1. Installing minimal motivation

To formulate PA goals, clients must have at least some motivation to engage in PA. That is, people set goals on the basis of their motivation to achieve certain valued outcomes, such as, looking good, losing weight, or lowering the risk for a heart disease. Importantly, in the present counseling approach, as argued above, the client's motivation to engage in PA is not boosted to set high goals. Instead, the client's spontaneous intrinsic motivation is explored and only when clients miss knowledge on the basic positive effects of PA (e.g., lowering risk for chronic illnesses) they are provided with potentially motivating information. As mentioned above, we believe that the true motivation that will be sufficiently powerful on the long term, is the motivation based on the own experience with PA.

#### 3.2.2. Formulating specific goals and goal related beliefs

The client's overall goals must be investigated, using questions such as: 'What would you like to achieve through this counseling, What do you dream of, What would you change if you could make a wish?, What would you like to achieve in 1 month?'. The answers to these questions will help the client to formulate one or more specific PA goals that can be unambiguously evaluated, for instance 'walk 30 min every day', 'run the marathon within 6 months', 'go to work on my bike at least 3 times a week', 'to continue my running for the 10 years to come', 'to keep walking in the evening for 4 times a week for at least 10 min'. In a hierarchical perspective on goal structures [68], these personal PA goals are based on values, and they set the direction of the more concrete PA intentions, such as 'Tomorrow I will go to my work by bike'.

#### 3.2.3. Investigation of barrier-beliefs

The goal-scale ratings are used to support the diagnosis of BBs. By talking about the ratings the counsellor has the opportunity to observe the spontaneously generated BBs by the client in reaction

### 1. What keeps you from achieving your goal?

.....

### 2. What is the exact barrier-belief

.....

### 3. How strong this barrier-belief keeps you from your goal?

Not strong at all      1      2      3      4      5      6      7      8      9      10      Very strong

Fig. 2. Rating scale of BBs.

to PA goals in general or specified goals: attributions of inhibition, low self-efficacy expectations, and negative outcome expectations. In addition, BBs may be explored explicitly, for example by asking 'What keeps you from achieving your goal?' or 'What made you stop?'. To support the exploration of BBs and identify the core BBs, BBs also can be rated on their strength (see Fig. 2). The information on goals and BBs set the stage for applying the BB behavior change strategies (Fig. 3).

### 3.3. The BB behavior change strategies

With the above information on the client's psychological representations of barriers, the four main behavior change strategies can be applied. When doing so it is important to be aware of the functions of the BBs: Are they developed in the function of deciding about effort investment or are they in function of protecting the self and legitimizing not engaging in PA? Only when BBs have the investment function the below behavior change strategies should be applied. When BBs have the 'legitimizing' function they should first be used to identify the motivational conflict that brings up this need. However, mostly it is not immediately clear to what extent BBs are a kind of excuses to not

engage in PA. Applying the below BB behavior change strategies may reveal more about the individual's use of BBs.

#### 3.3.1. Changing means

This first behavior change strategy that can be applied and is based on BBs – and that is already used in health counseling – is designing ways to reach the goal [69–72]. For example, a BB regarding the goal to 'lose 2 kilograms of bodily weight in four weeks by exercising 5 times a week for 10 min' may be 'this costs too much time'. An action plan to reach the goal could be: 'I change my evening routine so that I have more time to exercise'. In this behavior change strategy the goal is not changed but different handling strategies, measures or means are applied to make the goal-directed behavior more feasible. Thus, clients have to find solutions and take actions – set priorities, reschedule, ask other people, use other clothing, etc. – to stick to their goal.

One potential drawback of this BB behavior change strategy is that it still may cost (extra) investments. As long as the motivation is strong this way may suffice but when motivation declines, the investments may become too high. However, it is also possible to change the means to reach a goal in such a way that less effort is

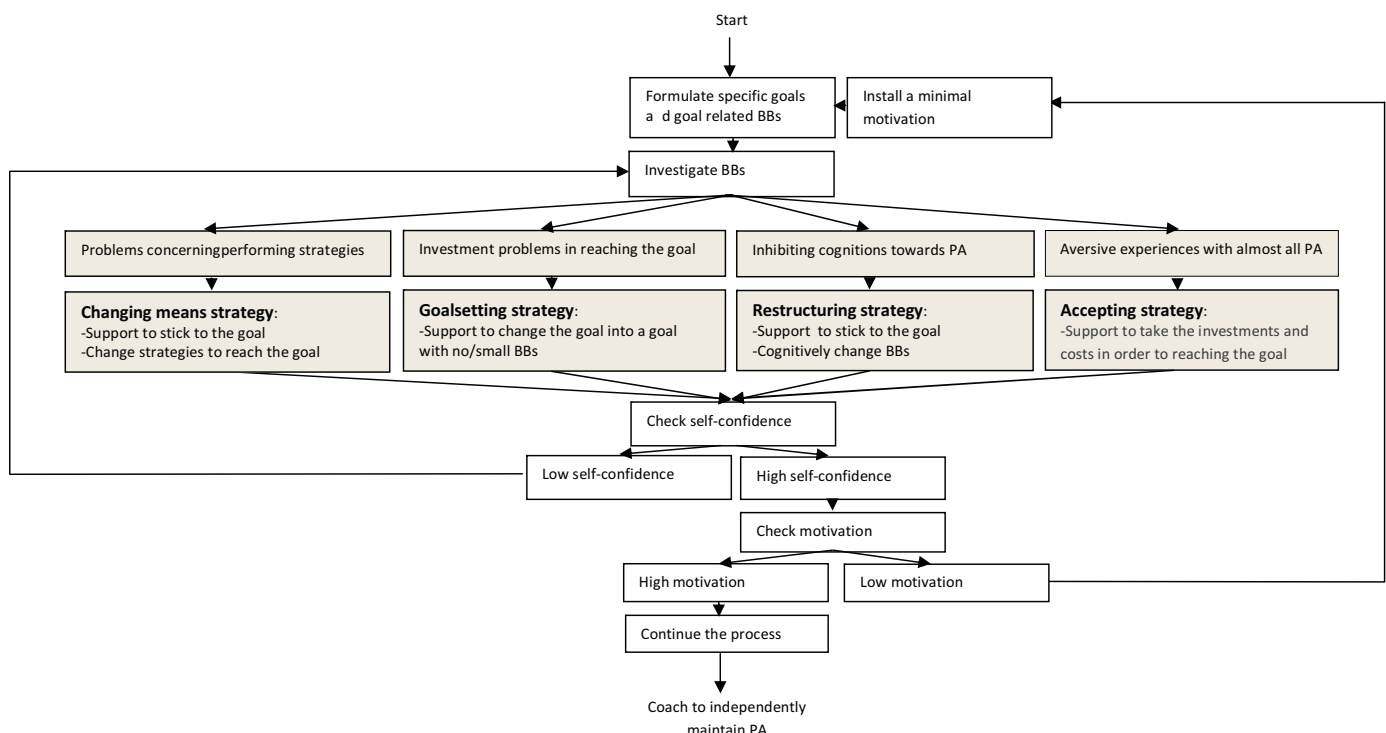


Fig. 3. Flowchart of the BB counseling.



**Table 1**

Various BBs linked to examples of the corresponding counseling strategies.

Barrier-belief	Examples of counseling strategies
	<b>Changing means:</b> 'Stick to your goal but try to be more flexible in when you run'
"I have no time to run five times a week"	<b>Changing goals to change BBs:</b> 'Change your goal from running 5 times to 3 times, or engage in a different activity'
"I feel pain when running 5 times a week"	<b>Restructuring BBs:</b> 'Let us find out whether your expectation about harm can be true'
"I feel pain when I am running and I think this is harmful for my body"	<b>Accepting the investment demanded by BBs:</b> 'You have to accept that you may have to give up something else to take time for physical activity'
"I have no time (anymore) to engage in whatever physical activities"	

needed. For example, regarding the above situation, it may be more efficient to reschedule PA towards the evening than at day time.

### 3.3.2. Change goals to change BBs.

To lower the investments radically, the PA goal may be changed. The above goal may be changed into 'exercising 3 times a week for 10 min' or 'exercising 5 times a week for 5 min', or a completely different PA goal may be set, such as 'take a brisk 10 min lunch-walk every day' or 'take the stairs instead of the elevator'. A variety of creative alternatives can be discussed, and with each feasible alternative BBs must be checked. This goal-setting approach leads to a PA goal with no or with only small barriers. Although the low set goal may have relatively weak effects on health, our premise is that it is better to start small and grow when intrinsic motivation develops, than to start high with increased risk for disappointment and relapse.

### 3.3.3. Restructuring/changing BBs

When BBs cannot be changed by handling them differently and by goal-setting, they must be changed cognitively. That is, BBs may be based on erroneous knowledge based on different sources. For example, BBs may be 'I feel that people ridicule me when they see me jogging' or 'I think it is no use to try to engage in PA regularly again, I already failed so many times'. The first BB primarily refers to an aversive outcome, while the second BB primarily is related to low self-efficacy. Both BBs are interpretations of what people have observed or have experienced. The core question here is 'Is it true?'. As in cognitive therapy in general these beliefs may be challenged in a Socratic dialogue [73]; e.g., 'can you tell me how you came to this conclusion?', or with experiments ('let us see what happens when you do this'). Often erroneous beliefs related to cardiovascular or motoric functioning may work as BBs. For example, a patient with osteoarthritis may avoid PA because of the illness belief: 'When I experience pain in my right knee during PA, this signals a damaging process'. Education may provide the clients with the factual knowledge on the evidence of positive effects of PA in osteoarthritis, thereby changing the BB. Thus, clients are supported to stick to their goal but change their perspective on the inhibiting factors they were bothered by.

### 3.3.4. Accepting the investments demanded by BBs

Sometimes handling cannot further be improved, goals cannot be further adapted, and BBs cannot be restructured. For example, when a client experiences pain as a barrier with (almost) every physical movement, or a client finds even small experiences of physical efforts aversive, the inhibiting factors may be accepted. Acceptance means that the investments and costs that come with reaching a goal are not avoided but taken [74]. Just as renting a car has its costs and we do not expect it to be free, reaching a PA goal may be not expected to be for free either. Good acceptance does not remove the factor that might inhibit PA but it lowers or completely removes the inhibiting power of the factor [75,76].

Several strategies can be used to enhance acceptance. For example, by discussing the positive and negative sides of PA, relevant factors may gain or lose value. Consider the BB: 'I feel uncomfortable riding my bike in my neighbourhood, it looks silly'. This BB reveals a negative outcome. However, this negative outcome may be contrasted with the alternatives of not riding the bike or riding the bike elsewhere. The outcomes related to these options may change the relative value of the BB, which is a mechanism of acceptance. The BB: 'The exercise always costs me a lot of efforts' might be acknowledged but placed in the framework of 'nothing is for free, except the sun'. In this way the efforts needed to exercise do not become lower but they feel less unjust. Mindfulness exercises may help clients to not take BBs too seriously [76]. For example, when during PA a person is dwelling on the thought 'This is crazy, that I need so much time to engage in PA', the person might learn to just observe the belief with some distance and 'let it go'. In that way the person may be less bothered by the BB (Table 1).

## 4. Discussion and conclusion

The presented barrier-belief approach to counseling PA is based on contemporary theoretical models of behavior and on empirical evidence. The theoretical background is social-cognitive and the applied behavior change strategies that target BBs are already used in different change perspectives and therapies. However, in the barrier-belief approach these proven behavior change strategies – change means reach goals, set (different) goals, restructure beliefs, induce acceptance – are all applied to target the core of problems with initiating and maintaining PA. Using well-known theories and strategies, the barrier-beliefs approach composes a way of counseling around the central construct of barrier-beliefs.

The strong focus of our approach on BBs does not mean that the approach is narrow. The BBs comprise the most important psychological factors that have been shown to be related to starting and maintaining PA: perceived barriers (attributions), self-efficacy expectations and negative outcome expectations [43,44]. In addition, in the counseling method the four behavior change strategies are applied in the context of general counseling methods, such as, developing rapport, making agreements, and providing assignments. In addition, within the four strategies common elements in counseling, such as providing knowledge on facts and on skills, are applied. Thus, the present BB counseling makes use of much existing knowledge and skills but applies them with the focus on BBs.

Typically, our approach does not try to boost people's motivation to engage in PA. When the motivation is very strong, all kinds and levels of barriers can be overcome. However, for most people it is not possible to always stay that highly motivated. This means that we as counsellors accept that clients may not have very strong motivations and, therefore, will only engage in PA on the

long term when they experience few inhibitions to do so. Some clients, however, may be trapped in a cycle of low energy/motivation to engage in PA that is caused by a low level of PA, and vice versa. They may have no motivation at all to engage in PA. In these clients the first goal is to induce a minimal motivation by guiding positive experiences of minimal levels of carefully tailored exercise with personal coaching. To start the process, even extrinsic incentives may be used to generate experiences with PA that eventually should lead to intrinsic motivation. Once the client develops intrinsic motivation, further PA goals may be set taking into account BBs.

The BB approach may not only be used to counsel individuals; its principles may be adapted to fit, for example, a school educational programme format. One principle would be to adjust the means and goals concerning PA to what students find feasible. Detected BBs may guide the design of means and goals, possibly for subgroups of students in classes. In addition, student may be educated about self-management by learning to set goals, detect BBs, and handle BBs using (one of) the four BB strategies.

Although the BB counseling in this article is shaped around face-to-face contact, it should also be possible to apply the BB approach through another channel, for example, through the Internet, presented in a Smartphone application (app). Guided questioning on PA goals and on BBs is possible, with individual feedback on accomplishments but also on the power of BBs, and educational texts as well as videos might be applied. Unique features of such an app are that people can use it whenever they want, the potential reach of apps is high (as compared to individual counseling), and that often people have their Smartphone within their reach constantly, even during PA. Research will have to show whether the involvement of the individual with an app is sufficient to lead to actual behavior change.

The barrier-belief approach is evidence based in the sense that most elements it is comprised of are based on theories or empirical evidence. Of course it is important to test the barrier-belief approach as a full counseling method for PA empirically. To start with, the four BB behavior change strategies might be tested and compared experimentally. Another aspect typical of the present approach is the sequence of the application of the four BB behavior change strategies. Although it seems logical to start with not changing the goal but change the means to reach the goal, and only when this does not work change the goal, it may be that it is evenly effective to start with acceptance of BBs. At the least, the present package of four BB behavior change strategies embedded in a broader counseling procedure should be tested against a control group to prove its effectiveness.

Another aspect that needs further study is the duration of the application of the BB-counseling programme. Ideally, the counseling is finished when the client is able to detect BBs and to handle barriers independently of the counsellor. However, in practice the duration of counseling will depend on financial constraints and professional culture. For some clients a continuing care-model may be more appropriate.

We hope that the perspective of BBs in combination with the four BB behavior change strategies in PA counseling will inspire practice as well as research. In the end, the broad availability of effective evidence based interventions for PA may contribute to further increasing health, preventing illness, and supporting quality of life of people.

### Conflict of interest

The authors declare that there is no conflict of interest.

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