If-then Planning in Sports: A Scoping Review

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Abstract

If-then planning (implementation intentions) describes a self-regulatory strategy that helps people to attain their goals across a variety of domains, such as achieving physical activity goals. Based on such beneficial effects, if-then plans are anecdotally discussed as a strategy to enhance sports-related performance as well. However, this discussion currently lacks an empirical basis. We therefore conducted a scoping review to identify experimental research on if-then planning effects on sports-related performance, potential moderators of these effects, the methodological approaches used, and the suitability of the available evidence for assessing the effectiveness of if-then planning in sports. Based on a search of four online databases, we identified a set of eleven studies that investigated if-then planning in experimental research with sports-related performance as outcome measure. Six of these studies focused on if-then planning in endurance tasks, the remaining studies investigated sports performance beyond endurance. The samples were often small and comprised university students, and conclusions regarding the effectiveness of if-then planning for improving sports-related performance were rather heterogeneous. Still, the majority of studies shed light on tentative mechanisms (e.g., perceptions of effort and pain, arousal) and moderators (e.g., athletes' beliefs about their performance limits, feasibility of the behavior) of if-then planning in sports, guiding future research regarding the question of when and for whom if-then-planning might be a beneficial strategy. Based on these findings, we identify potentials and pitfalls when using if-then plans to enhance sports-related performance, discuss promising routes for future research, and derive practical implications for athletes and coaches.

Keywords: if-then planning, implementation intentions, self-control, sport performance,

23 scoping review, psychological interventions

Zusammenfassung

Wenn-Dann Pläne (Implementierungsintentionen, engl. „Implementation Intentions“) sind eine selbstregulatorische Strategie, die Menschen beim Erreichen ihrer Ziele in vielen Domänen unterstützt, z.B. im Kontext körperlicher Aktivität. Basierend auf solchen positiven Effekten werden Wenn-Dann-Pläne anekdotisch als Strategie zur Leistungssteigerung auch im Sport diskutiert. Allerdings fehlt dieser Diskussion derzeit eine empirische Grundlage. Wir haben daher einen Scoping Review durchgeführt, um experimentelle Forschung zu Effekten von Wenn-Dann-Plänen auf die sportbezogene Leistung, mögliche Moderatoren dieser Effekte, die verwendeten methodischen Ansätze und die Eignung der verfügbaren Evidenz zur Beurteilung der Wirksamkeit von Wenn-Dann-Plänen im Sport aufzuzeigen. Basierend auf einer Suche in vier Online-Datenbanken identifizierten wir elf Studien, die Wenn-Dann-Pläne in experimenteller Forschung mit sportbezogener Leistung als Ergebnismaß untersuchten. Sechs dieser Studien konzentrierten sich auf Wenn-Dann-Pläne bei Ausdaueraufgaben, die restlichen Studien untersuchten sportliche Leistungen jenseits der Ausdauer. Die Stichproben waren oft klein und bestanden aus Universitätsstudierenden, und die Schlussfolgerungen bezüglich der Effektivität der Wenn-Dann-Planung zur Verbesserung der sportbezogenen Leistung waren eher heterogen. Die Mehrzahl der Studien gibt jedoch Aufschluss über mögliche Mechanismen (z.B. Wahrnehmung von Anstrengung und Schmerz, Erregung) und Moderatoren (z.B. Überzeugungen der Athlet_innen über ihre Leistungsgrenzen, Durchführbarkeit des Verhaltens) von Wenn-Dann-Plänen im Sport. Das kann die zukünftige Forschung dahingehend informieren, wann und für wen die Wenn-Dann-Planung eine vorteilhafte Strategie sein könnte. Basierend auf diesen Erkenntnissen identifizieren wir Potenziale und Fallstricke beim Einsatz von Wenn-

Dann-Plänen zur sportlichen Leistungssteigerung, diskutieren vielversprechende Wege für zukünftige Forschung und leiten praktische Implikationen für Sportler_innen und Trainer_innen ab.

Schlüsselworte: Wenn-Dann Pläne, Implementierungsintentionen, Implementation Intentions, Selbstkontrolle, sportliche Leistung, Scoping Review, psychologische Interventionen

If-then Planning in Sports: A Scoping Review

Volitionally controlling dominant impulses or automatic behavioral tendencies in sports-related settings does not always work effectively (for an overview, see Englert, 2019). For instance, picture the increasing muscle fatigue during a marathon: In order to keep going, runners have to volitionally override the impulse to interrupt this rather straining act. So how can athletes be supported to effectively follow through with their sports-related goals? One promising strategy is if-then planning (often referred to as implementation intentions, Gollwitzer, 1999).

If-then planning is a self-regulatory strategy that helps people to attain their goals across a variety of domains (Gollwitzer, 2014; Gollwitzer & Sheeran, 2006). For instance, about half of the people who have the intention to exercise on a regular basis fail to act upon this intention (Rhodes & Bruijn, 2013)—which is but one example of the notorious "intention-behavior gap" that pervades many areas of life in the health, professional, and interpersonal domain (Sheeran & Webb, 2016). Making if-then plans like "If I come home from the office, then I will go for a run in the park" has been repeatedly shown to narrow this gap with respect to physical activity (PA; Bélanger-Gravel et al., 2013; da Silva et al., 2018). Thus, if-then planning qualifies as a viable self-regulatory strategy for increasing regular PA.

However, people who are already physically active and regularly engage in sports often adjust their goals and raise their personal bar, often goals that pertain to the level of performance: beating their personal best, achieving a certain performance in a competition, or improving their technical skills (e.g., Franck et al., 2018). Such goals are likely to be relevant at various levels of ability and aspiration and across different sports. Like the goal to engage in

physical activity in the first place (Englert & Rummel, 2016), attaining these goals requires effective self-regulation (Englert, 2016; Wolff, Hirsch, et al., 2021): In order to improve one's finishing time in a race, for instance, one must resist the urge to slow down and stick to one's pacing strategy even when it gets effortful and aversive towards the end of the race. This suggests that athletes might benefit from if-then plans to effectively strive for their performance-related goals. The effects of implementation intentions on the PA intention-behavior gap have been systematically investigated in several studies and are meanwhile well established (reviews by Bélanger-Gravel et al., 2013; Rhodes & Bruijn, 2013). However, it is currently unclear to what extent such evidence exists for if-then planning effects on improving performance in sports-related domains other than PA. Accordingly, we conducted a scoping review of the available empirical evidence, which allows us to systematically map research on this topic, collect tentative findings about if-then planning effects and their moderators, discuss potentials and pitfalls when using if-then plans to enhance sports performance, and to derive practical implications as well as promising routes for future research.

If-Then Planning: What is It and Why Does It Work?

When making if-then plans, people think about a goal-relevant situation and mentally link it to a goal-directed behavior in an if-then format (i.e., "If Situation S occurs, then I will perform Behavior B"). As such, if-then planning complements goals that merely specify a desired outcome or behavior (i.e., "I want to perform Behavior B / attain Outcome O") by conditioning a behavioral response on the occurrence of a critical situation. This critical situation might be a good opportunity to act towards a goal or an obstacle that hinders goal pursuit.

Making if-then plans facilitates the attainment of goals by virtue of two cognitive processes. First, thinking about the critical situation enhances its cognitive accessibility (Aarts et al., 1999), directing attention to the situation and making it easier to detect (Achtziger et al., 2012; Janczyk et al., 2015). Second, linking the situation to the intended behavior creates a strong associative link, which is thought to automate the initiation of the respective goal-directed behavior (e.g., Bayer et al., 2009; Brandstätter et al., 2001; Gollwitzer & Brandstätter, 1997). Both processes have been shown to jointly mediate the beneficial effects of if-then planning on goal attainment by automating the detection of the situation and the initiation of the behavior (e.g., Webb & Sheeran, 2007).

The Potential Relevance of If-then Planning in the Domain of Sports

It is commonly assumed that if-then planning is a beneficial strategy in sports (e.g., Brick et al., 2016; McCormick et al., 2018). This assumption seems plausible, given that attaining goals in sports is likely subject to many of those challenges for which if-then planning is known to be effective (for a general overview see Gollwitzer & Oettingen, 2011; for an overview specific to endurance sports see Wolff, Bieleke, & Schüler, 2019). First, if-then planning helps to get started even when performing the goal-directed behavior is rather aversive (e.g., Milne et al., 2002) or the critical situation is easy to miss (e.g., Webb & Sheeran, 2004). Such situations arise frequently in sports, for instance, when athletes have to increase their speed despite feeling exhausted or need to recognize opportunities to exploit their opponents' mistakes. Second, if-then planning helps to stay on track when the going gets tough (e.g., Legrand et al., 2017). For instance, making if-then plans helps to deal with negative emotions (Schweiger Gallo et al., 2009), which is of crucial importance for sports-related performance (Jones, 2003). Third,

if-then planning allows people to instigate deliberative processes (Martiny-Huenger et al., 2016) and to acquire information systematically (Bieleke et al., 2020). This can be crucial for flexibly responding to changing circumstances during a competition, such as the need to change one's strategy. Finally, making if-then plans automates the initiation of intended behaviors, which makes their execution less dependent on information processing capabilities in the planned situation (e.g., Webb & Sheeran, 2003) and it helps to volitionally control more impulsive processes (e.g., Thürmer et al., 2020). This is especially beneficial in sports when behaviors must be initiated under considerable stress (e.g., distractions or time restrictions) or when automatic responses must be regulated (e.g., the urge to slow down; c.f. Wolff, Bieleke, & Schüler, 2019).

Thus, from a theoretical point of view, if-then plans are a very promising self-regulatory strategy to help deal with the action-control demands of sports. Consequently, sporting federations (e.g., Calder, 2009), applied sport psychologists (e.g., Brick et al., 2016; McCormick et al., 2018), and the media (e.g., Gregoire, 2016) endorse the application of if-then plans to deal with these multiple demands. These endorsements are typically substantiated with reference to if-then planning research outside of the sports domain. However, it is not a priori evident that findings from basic psychological research or from other fields of applied psychology directly translate to the context of sports and exercise, where people oftentimes have to regulate strong aversive sensations (e.g., pain, effort, and fatigue; Bali, 2015). We hypothesized that the available literature would be scarce and provide rather heterogeneous results. This provides the main rationale for conducting this scoping review, in which we address the following questions: What is the available empirical evidence for the assumption

that if-then planning improves sports-related performance? What is known about the conditions (moderators) and processes (mediators) of such effects? What are the potentials and pitfalls of using if-than plans in applied sport settings that can be derived from these findings? What are the current gaps in knowledge and methodology that should be addressed in future research? By addressing these questions, this scoping review of if-then planning effects on sport-related performance will be highly important for theorists and practitioners alike.

Methods

Our review was based on the PRISMA guidelines for scoping reviews (PRISMA-ScR; Tricco et al., 2018), which is freely accessible online (http://www.prisma-statement.org/Extensions/ScopingReviews). In September 2020, we developed a protocol and conducted a search for peer-reviewed, empirical studies that experimentally investigated whether asking participants to make if-then plans improves a measure of sport-related performance. To be eligible, a study had to compare performance in the if-then planning condition to performance in a condition with either another intervention control condition (e.g., setting a performance goal) and/or to a no-treatment control condition. Studies were excluded if they comprised no such control condition (e.g., comparing two different if-then planning conditions). We included quantitative, qualitative, and mixed-method approaches to cover multiple ways in which sport-related performance could be assessed. No further restrictions were made, for instance, regarding the year of publication or participant characteristics.

We relied on four different databases (Web of Science, SportDISCUSS, PsycInfo, and

PubMed) and used the following search string: ("implementation intention*" OR "if-then plan*") AND sport*. The first two authors developed the search string and the first author conducted the search, the results of which were then exported to the reference management software Citavi. Duplicates were removed with the Levenshtein algorithm implemented in Citavi. The resulting list of publications was screened for papers that the authors were aware of but that were missing from the list. The identified records were then reviewed by the first two authors. They selected relevant publications based on the information contained in titles and abstracts. Full texts were then retrieved for the relevant publications and their eligibility for the scoping review was determined by all authors. There were no disagreements among the authors regarding study selection.

We used a data-charting form that comprised the following pieces of information (see Table 1): author(s), year of publication, type of sport, sample size (overall and per condition), sample characteristics (athlete vs. student sample, age, gender), content of the if-then planning intervention, type of task, performance and other measure(s), and effects of the intervention. The form was developed by the first author and jointly refined by all authors. The first author charted the data and the results were verified by all authors.

Results

The flow of the literature search is depicted in Figure 1. Our search initially identified a total of 106 publications, to which we manually added three publications (109). We then removed 26 duplicates and screened the remaining 83 publications for their content. Several of these publications focused on physical activity rather than a sport-related performance (38) or were in other ways irrelevant for the present review (35; e.g., if-then planning only mentioned,

theoretical contributions). We arrived at a final sample of 10 publications covering *k* = 11 studies that met our selection criteria and were included in the present review. A complete overview of all identified studies is provided in Table 1, while Table 2 shows the content and structure of the if-then plans. As about half of the studies focus on endurance performance and the other half on a sport-related performance beyond endurance (i.e., tennis, golf, darts, basketball, and volleyball), we structured the results accordingly.

Endurance Performance

One focus of research on if-then planning in sports has been on endurance performance (Wolff, Bieleke, & Schüler, 2019), which has so far resulted in six published studies (see upper part of Table 1). The majority of these studies focused on static muscular endurance performance, predominantly via weight-holding tasks (Bieleke & Wolff, 2017; Hirsch et al., 2020; Thürmer et al., 2017; Wolff et al., 2018) and once in a posture-holding yoga task (Wang et al., 2019). Only one study used a cycling task to examine whole-body endurance performance (Latinjak et al., 2018). Common to all studies is their reliance on university student samples from diverse subject domains as well as on laboratory experiments with highly standardized tasks that maximize the internal validity at the expense of the external validity. As perceptions of effort and pain are key challenges to successful endurance performance (e.g., Pageaux, 2016), participants were assigned pre-formulated plans that focused on ignoring or managing effort and pain. The main dependent variable in all studies was time-to-failure, in some studies accompanied by ratings of perceived exertion (RPE) and in one study by a measure of activity in the dorsolateral Prefrontal Cortex (dlPFC) as a marker of effortful self-regulation. The central hypothesis was that if-then planning helps participants to deal with negative sensations that

emerge during the endurance task more effectively, thereby persisting longer than participants in the control conditions.

Main Effects

Increased time-to-failure in if-then planning versus control conditions has been observed in two studies (Thürmer et al., 2017; Wang et al., 2019). These studies utilized different static muscular endurance tasks (i.e., holding up a heavy ball in a group of three people, holding a difficult yoga posture for as long as possible). The remaining four studies (Bieleke & Wolff, 2017; Hirsch et al., 2020; Latinjak et al., 2018; Wolff et al., 2018) observed no differences between conditions in a static muscular task (i.e., task, where participants are asked to hold two metal bars that are connected by two intertwined rings for as long as possible, while avoiding contacts between the rings), as well as in a whole-body endurance task (i.e., a time-to-exhaustion cycle ergometer task). Thus, the majority of studies conducted so far indicates that if-then planning does not significantly improve endurance performance.

However, this conclusion must be qualified in at least two ways. First, most of the null-findings were obtained with the same muscular endurance task (Bieleke & Wolff, 2017; Hirsch et al., 2020; Wolff et al., 2018), which has so far solely been used to study if-then planning effects on endurance. Accordingly, it is unclear whether the failure to observe if-then planning effects might at least partially be attributable to the specific demands of this task. On the other hand, this task constitutes a highly controlled setup, which allows to measure performance with more precision (e.g., errors in task execution) and more rigorously (e.g., preventing compensation movements) than in the studies that yielded significant effects. Second, the studies relied on rather small sample sizes for reliably detecting main effects of if-then

planning. As illustrated in Figure 2, the sample size required to detect common if-then planning effect sizes ranges between 80 and 700 participants in the two-group design most studies relied on (i.e., planning vs. control condition), sample sizes that have not been realized so far in any of the studies included in the current review.

Mechanisms and Moderators

A major strength of the studies on if-then planning effects on endurance performance is their focus on mechanisms and moderators, which sheds light on the specific conditions under which if-then planning does or does not facilitate sports-related performance. For instance, in the study by Thürmer et al. (2017), both correlational and causal evidence showed that planning to motivate each other by heightening efficacy feelings (i.e., … then we tell ourselves that we can do it) required that the team members could subsequently interact with each other during the task and cheer each other up. If, however, participants had no adequate means to translate their planned behaviors into action (i.e., they were not allowed to talk to each other), planning did not affect performance in this study.

Hirsch et al. (2020) identified people's believes about their own performance limits as another moderator of the effect of if-then planning on sports-related performance. Specifically, the authors found that planning to deal with effort versus pain improved endurance performance among participants who believed that they had not yet fully reached an assumed physical or mental limit of their performance, respectively. Plans that did not fit participants' beliefs in such a manner turned out to be ineffective. Moreover, plans were also found to induce higher levels of perceived exertion under some conditions although they had been designed to optimize dealing with this very sensation (Bieleke & Wolff, 2017; Latinjak et al.,

2018). Finally, on the neuronal level, if-then planning was found to reduce activity in brain regions associated with effortful control (Wolff et al., 2018). More specifically, participants who had formed an if-then plan completed the task with less activity of the lateral Prefrontal Cortex (dlPFC).

Beyond Endurance Performance

The second focus of research on if-then planning in sports is on sports behavior that does not (primarily) focus on endurance, accumulating to five studies in total (see lower part of Table 1). In contrast to research on endurance performance, these studies have primarily focused on isolated sports-specific performance outcomes within a particular type of sport (e.g., volleyball serves), with the exception of one study that employed a broader focus (i.e., tennis competitions).

Two studies relied on university student samples (Stern et al., 2013), whereas three studies focused on athletes in their respective sports: tennis players who participated regularly in competitions across various German tennis leagues (Achtziger et al., 2008), high school students of Swiss volleyball schools with an average training load of about 12 hours/week (Bieleke et al., 2019), and U17 basketball players from several Polish basketball clubs (Wilczynska et al., 2014). In all of these studies, participants generated their plans with the help of the experimenter. In some studies, these self-generated plans focused on how to deal with anticipated negative internal states (e.g., stress, anxiety). Most studies used an objective indicator for successful performance (e.g., successfully serving into the opponent's field) as their main dependent variable, with the exception of one study that measured performance in terms of self- and other reports (Achtziger et al., 2008).

Main Effects

Better performance in if-then planning versus control conditions has been reported in three studies (Achtziger et al., 2008; Stern et al., 2013, Studies 1 and 2), while in two studies no such effect was observed (Bieleke et al., 2019; Wilczynska et al., 2014). The studies that reported improved performance adopted plans that focused on regulating negative internal states (e.g., stress, anxiety), whereas participants in the other studies were not using plans with such a focus. In sum, the available evidence tends to favor beneficial effects of if-then planning in non-endurance performance.

A striking difference to the endurance domain is the wide variety of tasks that has been used, all of them based on or representing a behavior that reflects a valid sporting situation (e.g., volleyball serves). Also, most studies focused on athletes in their respective sports (e.g., tennis players in a tennis match). As such, the results have high external validity while still using well-controlled experimental settings. On the downside, the sample sizes were again rather small, which might have made it difficult to reliably establish main effects of if-then planning on performance.

Mechanisms and Moderators

The studies provide several tentative insights into the mechanisms and moderators of if-then planning with regard to sports performance in non-endurance performance domains. For instance, Wilczynska et al. (2014) found no effect of if-then planning on performance in a basketball free-throw test; yet, the authors did observe a lower heart rate among if-then planning participants as compared to control participants. The authors interpreted this finding in terms of a reduced physiological arousal in a potentially stressful situation. While such a

response is not necessarily adaptive, it might improve performance in tasks where high arousal is detrimental. Corroborating this interpretation, Stern et al. (2013) found that planning how to regulate arousing internal states (stress, anxiety) reduced perceptual distortions that often accompany such states of arousal. Specifically, participants in if-then planning conditions perceived the target (Study 1: golf hole, Study 2: dartboard) as being closer than participants in the control conditions; and accordingly they rated the task as easier, which mediated the observed beneficial effects of planning on their performance.

Bieleke et al. (2019) demonstrated that if-then plans that targeted the execution of well-learned motor sequences (i.e., volleyball serves) initially interfered with performance. In their study, youth volleyball players who planned how to improve their service performed worse at the beginning of a subsequent series of serves compared to a baseline series; but their performance gradually improved again. Accordingly, potential effects of if-then planning might unfold over time. Alternatively, it is also conceivable that athletes benefit more from planning how to shield the performance of relevant motor sequences from potentially interfering sensations (e.g., Achtziger et al., 2008) than from planning how to execute these sequences in the first place. In addition, objective performance measures and subjective performance ratings by experts might not map on the same thing when it comes to complex motor sequences. In the study by Bieleke et al. (2019) experienced coaches (who were blind to the condition assignment) rated the volleyball serve performance as being better after players had received a self-regulatory intervention (either a goal or an if-then plan), while no such improvement could be observed in the objective performance measures. Even more interestingly, as performance started to improve gradually after the intervention, it is conceivable that the expert coaches

already saw improved performance before it translated into measurable improvements.

Discussion

If-then planning is a self-regulatory strategy with beneficial effects in many domains of life (Gollwitzer, 2014). While the effectiveness of implementation intentions on PA behavior has been rigorously investigated over the years, recent general reviews of if-then planning research suggest a lack of such evidence in the domain of sports (Bieleke, Keller, & Gollwitzer, 2021). To address this supposition, we conducted a scoping review of the studies that are available to date in order to stimulate and encourage future research. In a nutshell, we found only very few studies that tested the effects of if-then planning on sport-related performance. Moreover, evidence for the hypothesis that if-then planning improves sports-related performance is rather mixed, with currently more supportive findings emerging in domains that revolve not primarily around endurance (e.g., tennis, golf, darts) than in the domain of endurance performance. These results must be considered as preliminary, however, as they are based on few studies that used rather small and predominantly student samples.

Nevertheless, the available studies already shed a nuanced light on potential mechanisms and moderators of if-then planning in sports that might help understand why planning effects were sometimes observed and sometimes not. If-then planning modulated perceptions of exertion and experienced pain in endurance tasks (Bieleke & Wolff, 2017; Latinjak et al., 2018; Wolff et al., 2018) and attenuated the arousal that accompanied performance in challenging situations (Stern et al., 2013; Wilczynska et al., 2014). This points to various sensations (i.e., effort, pain, arousal) as potential mechanisms of if-then planning effects, and future research might focus on them when investigating how if-then planning

might leverage sports performance. At the same time, the research conducted so far cautions against reliance on if-then plans without considering the specific circumstances that athletes face in sports (i.e., personal and situational factors). For instance, it seems necessary for effective plans to be compatible with exercise-related beliefs about the determinants and limits of performance (Hirsch et al., 2020). Also, care should be taken that exercisers are in a position to translate their planned behaviors into action (Thürmer et al., 2017) and that acting upon them does not interfere with well-elaborated behaviors (Bieleke et al., 2019). Failing to incorporate such insights into the if-then plans might yield unexpected and undesired (i.e., ironic) effects (Bieleke & Wolff, 2017), like amplifying attention to a thought that an individual plans to suppress or ignore (akin to the “white bear” effect; e.g., Binsch et al., 2010). Other studies were compatible with the idea that if-then planning automates behavior and reduces effortful control in challenging situations (Stern et al., 2013; Wolff et al., 2018), which should be helpful when these situations are conducive to automaticity but might be disadvantageous when dealing with sensations that must be overridden with effortful force. Specifically, it has been suggested that planning to ignore aversive sensations during an endurance task (i.e., effort, pain) might backfire by making these sensations more salient while simultaneously throttling the control mechanisms required to deal with them (Wolff et al., 2018). Taken together, even the limited set of studies that has so far investigated if-then planning effects on sport-related performance presents several promising candidates for the moderators and mechanisms that future research might want to focus on. This research might also investigate the mechanisms that are most important for conveying if-then planning effects.

The need to investigate the characteristics of situations and individuals that modulate

359 the effectiveness of if-then planning is not specific to the sports context (Prestwich & Kellar,
360 2014). For instance, the effects of if-then planning are generally known to depend on the
361 presence of a superordinate goal that is active and valued (Sheeran et al., 2005), which likely
362 applies to sports as well. This could be taken to suggest that future studies should focus more
363 strongly on improving performance among experienced and motivated athletes in their
364 respective sports. On the other hand, research in domains like physical activity and health (e.g.,
365 Hagger et al., 2016; Hagger & Luszczynska, 2014) also highlight the importance of accounting
366 for moderators that are specific for a certain domain. As such, the initial inconsistencies
367 observed in the present review are part of scientific progress and unavoidable; they constitute
368 an important step to develop tailored and effective if-then planning interventions in sports.

369 **Determining the Contents of If-Then Plans**

370 It is striking that studies focusing on endurance performance relied primarily on generic
371 plans prescribed by the experimenter, whereas studies focusing on performance in other
372 sports-related domains relied predominantly on individual plans generated by the participants
373 themselves (see Table 1 and 2). This reflects two common approaches in research on if-then
374 planning (Keller et al., 2019). In the domain of sports and in particular when working with
375 experienced athletes, self-generated plans might be better suited as they can take individual
376 differences in relevant personal strengths and weaknesses into account. This might also be a
377 fruitful avenue for research on endurance performance, especially when considering the role of
378 individual beliefs for the effectiveness of if-then plans. For self-generated plans it might
379 additionally be useful to resort to established procedures for eliciting personally relevant
380 contents specified in the if- and then-parts of the plans, thereby maximizing their effects in

future studies. One such procedure is the combination of “mental contrasting and implementation intentions” (MCII; Oettingen, 2014; Oettingen & Gollwitzer, 2010). With MCII, people first think about their wishes and goals (e.g., improving their performance) and about their obstacles for attaining these goals (e.g., fear of failure). This valuable information about individual obstacles can then be used in the if-then plan, which might specify how to deal effectively with them.

Another remarkable feature of the studies reviewed here is that they predominantly revolved around dealing with few negative internal states (e.g., exertion, anxiety). However, it is not clear whether these states are the performance-limiting factors, especially among amateur athletes and exercises. For instance, it has recently been suggested that boredom is a highly relevant internal state that can affect sports performance (Wolff, Bieleke, Martarelli, & Danckert, 2021). As boredom is closely linked to self-control (Bieleke, Barton, & Wolff, 2021), it might be promising to investigate whether if-then plans targeting boredom could be more effective than those targeting exertion or anxiety. Moreover, research on if-then planning in sports has so far focused on how to overcome obstacles to good performance. However, if-then plans can also be used to seize good opportunities to attain a goal (Bieleke & Keller, 2021). A sports-related example is a study showing that planning when and where to drink carbohydrate-electrolyte drinks during stationary cycle ergometer exercise improved physiological markers of hydration (Hagger & Montasem, 2009). While not directly targeting performance, this study exemplifies the potential benefits that could be reaped by gearing if-then plans in sports to seizing good opportunities for attaining a performance goal.

Methodological Advances in Future Research

We have argued that the sample sizes of the reviewed studies were rather small throughout, which might have rendered a reliable detection of effects of the size commonly observed in research on if-then planning difficult (see the meta-analysis of existing meta-analyses of if-then planning effects conducted by Keller et al., 2020). In research that focusses on recreational athletes, this shortcoming can be rather easily overcome by increasing sample sizes. This is not the case for research that focuses on elite-level athletes, as this population is notoriously small and difficult to access, making the issue of small sample sizes a rather general one in sport psychology research (Schweizer & Furley, 2016). Accordingly, future research on if-then planning effects on sport-related performance should also utilize other means to increase statistical power (e.g., Batterham & Atkinson, 2005): leveraging knowledge about the processes and moderators of if-then planning to maximize its effect, relying on experimental designs with repeated measures to attenuate measurement error, and combining different ways of assessing performance.

Another relevant consideration pertains to the observation that people differ in their inclination to engage in if-then planning (Bieleke & Keller, 2021). These individual differences suggest that some people use if-then plans to enhance their performance (Bieleke & Keller, 2021) and to deal with difficulties of goal attainment (Bieleke, Martarelli, & Wolff, 2021) even without being prompted to do so. In sports, this could apply in particular to more accomplished athletes who generally tend to score higher on self-control (Englert, 2017; Wolff, Bertrams, & Schüler, 2019). Accordingly, it seems advisable to take such differences into account when conducting experiments on if-then planning interventions; it can boost statistical power and

allows researchers to gauge the genuine effects of if-then planning interventions. Tentative support for the importance of individual differences in if-then planning in sports is already available: Individuals with a higher propensity to make if-then plans have been shown to be more exercise more (Wolff, Bieleke, Stähler, & Schüler, 2021).

Practical Implications

We want to address the practical implications of our review for athletes and their coaches. At the bottom line, if-then planning is a simple self-regulatory strategy that can be used to target sports-related performance at virtually no costs. If-then plans are also likely to be in frequent use already, judged by their recommendation in scientific and lay outlets as well as by the evidence for a general inclination to attain goals by making plans. Actually, practitioners have been using if-then plans in their work with athletes for numerous years (Birrer & Morgan, 2010; Samuel et al., 2020). The question of whether if-then plans can reliably improve sports performance cannot be adequately answered yet, as this would require more data gathered systematically from active athletes and in authentic sport environments. However, about half of the studies we have reviewed observed performance improvements, especially when the sporting tasks did not call for the regulation of pain or effort. And importantly, the remaining studies only found no effects of if-then planning rather than detrimental ones, suggesting that unintended effects are unlikely to adversely affect performance. Athletes and coaches might thus experiment with if-then plans to enhance sports performance, while researchers continue to work on advancing our understanding of how if-then plans should be optimally devised for this purpose.

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Table 1

Overview of Studies on If-Then Planning Effects in Sports

Study	Topic	Sample Size (Condition)	Sample Characteristics	Intervention	Task (Measures)	If-then Planning Main Effects
Endurance Performance						
Bieleke and Wolff (2017)	Weight-holding	62 (plan: 29, goal: 33)	university students, *M* = 24 years, all female	plan to continue despite exertion	hold rings while avoiding contacts between them (time-to-failure, errors, RPE)	no effect on performance, faster increase of RPE
Thürmer et al. (2017, Study 1)	Weight-holding	47 triads (plan: 21, goal: 26)	university students, *M* = 23 years, 75% female	plan to deal with pain by self-affirmation	hold ball simultaneously as a triad (time-to-failure)	increased time-to-failure
Latinjak et al. (2018)	Cycling	27 (plan: 15, control: 12)	sport students, *M* = 22 years, 41% female	Self-generated plans	Cycle endurance test (time-to-failure, RPE)	no effect on performance, increased RPE
Wolff et al. (2018)	Weight-holding	60 (plan: 30, control: 30)	university students, *M* = 22 years, all female	plan to continue despite exertion	hold rings avoiding contacts (time-to-failure, errors, DLPFC activity)	no effect on performance and RPE, reduced DLPFC activity
Wang et al. (2019)	Yoga	90 (plan: 30, goal: 30, control: 30)	high school students, *M* = 16 years, 53% female	plan to continue despite pain	holding a yoga posture (time-to-failure)	increased time-to-failure
Hirsch et al. (2020)	Weight-holding	66 (plan: 33, goal: 33)	university students, *M* = 26 years, all male	plan to continue despite either exertion or pain	hold rings avoiding contacts (time-to-failure, errors, RPE)	no effects on performance and RPE
Beyond Endurance Performance						
Achtziger et al. (2008, Study 2)	Tennis	107 (plan: 37, goal: 38, control: 32)	tennis players, *M* = 34 years, 29% female	self-generated plans focusing on negative inner states	tennis match (rating of performance and fitness)	higher fitness and performance ratings
Stern et al. (2013, Study 1)	Golf	48 (plan: 24, control: 24)	university students and community members, *M* = 23 years, 77% female	self-generated plans focusing on anxiety-related states	putting shots into golf hole (success)	higher success rate
Stern et al. (2013, Study 2)	Darts	93 (plan: 31, goal: 30, control: 32)	university students, *M* = 20 years, 66% female	self-generated plans focusing on anxiety-related states	throwing darts on center circle (success)	higher success rate
Wilczynska et al. (2014)	Basketball	76 (plan: 38, control: 38)	basketball players, *M* = 15 years, 42% female	self-generated plans	throw effectiveness test (throwing success, heart rate)	no effect on success, reduced heart rate
Bieleke et al. (2019)	Volleyball	62 (plan: 33, goal: 29)	volleyball players, *M* = 14 years, 44% female	self-generated plans based on coach feedback	Serve ball to target position (error, velocity, precision)	no effects on performance indicators

Note. RPE = rating of perceived exertion, DLPFC = dorsolateral prefrontal cortex.

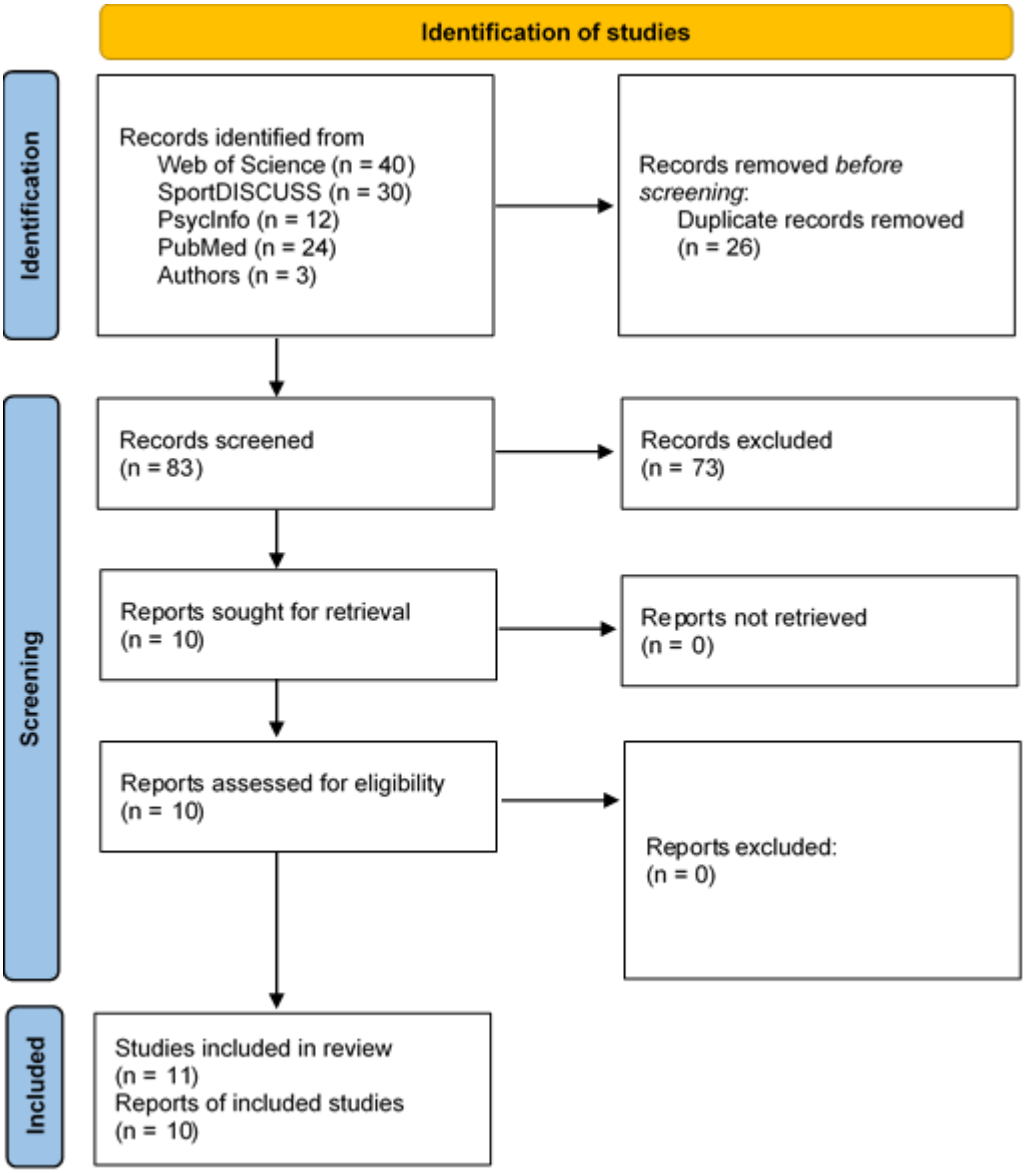
Table 2

Overview of the Content and Structure of If-Then Plans Regarding Sports-Related Performance

Study	If-then Planning Intervention
Endurance Performance	
Bieleke and Wolff (2017)	Participants received the following if-then plan from the experimenter: "If the task becomes too strenuous for me, then I ignore the strain and tell myself: Keep going"
Thürmer et al. (2017, Study 1)	Participants received the following plan either in an individual (I) or a collective (We) format: "And if my (our) muscles hurt, then I (we) will ignore the pain and tell myself (ourselves): I (We) can do it"
Latinjak et al. (2018)	Participants generated their own if-then plans by anticipating problematic situations (e.g., disengagement thoughts, dejection, fatigue) and specifying a goal-directed behaviors.
Wolff et al. (2018)	Participants received the following if-then plan from the experimenter: "If the task becomes too strenuous for me, then I will ignore the strain and tell myself: Keep going"
Wang et al. (2019)	Participants generated their own if-then plans. Example: "If I tremble and am in pain, I will encourage myself to persevere and keep counting up to 90"
Hirsch et al. (2020)	Participants received the following if-then plan from the experimenter: "And if my exertion (pain) becomes too high, then I tell myself: I can still keep going"
Beyond Endurance Performance	
Achtziger et al. (2008, Study 2)	Participants generated their own if-then plans by specifying inner states (e.g., "not concentrating enough", "feeling self-abandoned", "feeling exhausted", "feeling angry") and goal-directed behaviors (e.g., "then I will risk something and play courageously," "then I will calm myself and tell myself 'I will win!'") from prepared lists of inner states and behaviors.
Stern et al. (2013, Study 1 & 2)	Participants generated their own if-then plans by specifying four negative inner states that might be detrimental for the upcoming task and linking them to goal-directed behaviors. Example: "If I feel irritated, then I will tell myself to relax"
Wilczynska et al. (2014)	Participants generated their own if-then plans with the help of an experimenter. No examples are given.
Bieleke et al. (2019)	Participants received if-then plans that were developed by an experimenter based on individual feedback of their coaches, who had observed their previous service performance. Examples: "When I serve, then I tighten my hand and fingers", "When I approach the ball, then I take a small step first", and "When I make the service, then I throw the ball higher up"

669 **Figure 1**

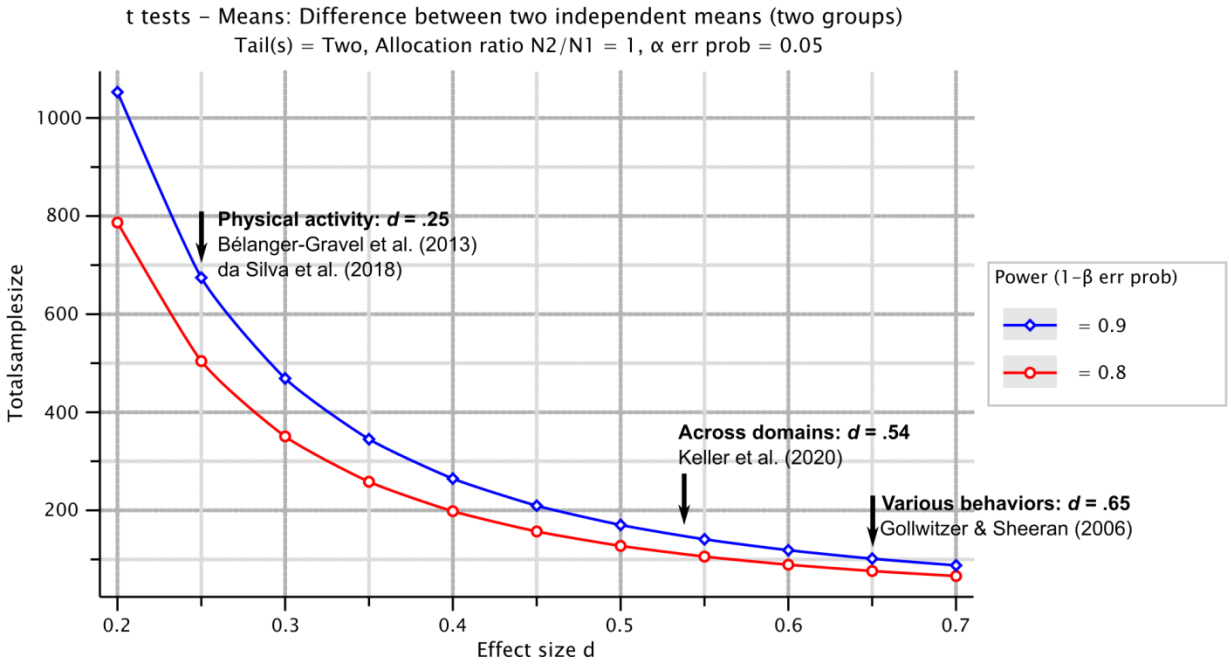
670 *PRISMA Flow Chart Illustrating the Literature Search for the Scoping Review*



671

Figure 2

Required Sample Sizes to Detect Main If-Then Planning Effects in a Two-Group Design With 80% and 90% Power



Note. This figure has been created with G*Power (version 2.1.9.2; Faul et al., 2007). It shows how the required total sample size (y-axis) changes as a function of the effect size (x-axis), once for a test power of 80% (red line, circles) and once for a power of 90% (blue line, diamonds). For instance, an experiment with two independent groups (control vs. implementation intention) would require a total sample size of about 500 participants to detect a small effect of d = .25 with 80% power and about 675 participants to achieve 90% power. For detecting a medium-to-large effect of d = .65 it would be necessary to recruit about 80 participants to achieve 80% power and about 100 participants to achieve 90% power. The effect sizes found in three meta-analyses on implementation intentions effects are highlighted with arrows: an initial meta-analysis reported by Gollwitzer & Sheeran (2006) covering various domains, two meta-analyses on implementation intentions effects in the domain of physical activity (Bélanger-Gravel et al., 2013; da Silva et al., 2018), and a recent meta-analysis of meta-analyses (Keller et al., 2020).