

Acceptance and Commitment Training to Promote Psychological Flexibility in Ice Hockey Performance: A Controlled Group Feasibility Study

Tobias Lundgren

Karolinska Institutet, & Stockholm Health Care Services,
Stockholm County Council, Stockholm University,
and MoDo Hockey

Gustaf Reinebo

Karolinska Institutet, & Stockholm Health Care Services,
Stockholm County Council

Markus Näslund

MoDo Hockey

Thomas Parling

Karolinska Institutet, & Stockholm Health Care Services,
Stockholm County Council

Despite the growing popularity of mindfulness and acceptance-based performance enhancement methods in applied sport psychology, evidence for their efficacy is scarce. The purpose of the current study is to test the feasibility and effect of a psychological training program based on Acceptance and Commitment Training (ACT) developed for ice hockey players. A controlled group feasibility designed study was conducted and included 21 elite male ice hockey players. The ACT program consisted of four, once a week, sessions with homework assignments between sessions. The results showed significant increase in psychological flexibility for the players in the training group. The outcome was positive for all feasibility measures. Participants found the psychological training program

Lundgren, Reinebo, and Parling are with the Dept. of Clinical Neuroscience, Centre for Psychiatry Research, Karolinska Institutet, & Stockholm Health Care Services, Stockholm County Council, Stockholm, Sweden. Lundgren is with the Dept. of Psychology, Stockholm University, Sweden. Lundgren and Näslund are with the MoDo Hockey, Örnsköldsvik, Sweden. Address author correspondence to Tobias Lundgren at tobias.lundgren@ki.se.

important to them as ice hockey players and helpful in their ice hockey development. Desirably, future studies should include objective performance data as outcome measure to foster more valid evidence for performance enhancement methods in applied sport psychology.

Keyword: ACT, acceptance, ice hockey, mindfulness, values

Due to advances in behavioral research during the last decades, the “third wave” or “third generation” of cognitive and behavioral therapies emerged in clinical psychology. The third wave puts emphasis on acceptance, mindfulness, attention and values as possible processes of behavioral change (Hayes, Villatte, Levin, & Hildebrandt, 2011). Acceptance and Commitment Therapy (ACT) is a psychotherapy method of this cognitive behavioral tradition (Hayes, Strosahl, & Wilson, 1999). ACT has been evaluated for several clinical conditions (e.g., chronic pain, tinnitus, depression, anxiety disorders) with good results (A-Tjak et al., 2015). Mindfulness and acceptance based interventions were soon adapted to athletic populations (Gardner & Moore, 2004) and are growing in popularity in applied sport psychology. Three systematic reviews have examined the research of mindfulness and acceptance-based methods in sports. One reviewed single subject design studies, qualitative research, and randomized and non-randomized group trials (Sappington & Longshore, 2015). This systematic review included nineteen trials (4 randomized group trials; 7 non-randomized trials; 6 case studies; 2 qualitative studies) and concluded that there is preliminary support for mindfulness-based training with athletes. Another reviewed randomized and non-randomized controlled studies with an active or inactive control group (Buhlmayer, Birrer, Rothlin, Faude, & Donath, 2017). This review included a total of 290 participants from nine studies engaged in sports such as cycling, dart, hammer, judo, hockey, rugby, running, track and field, shooting, tennis and volleyball, and showed that mindfulness and acceptance-based methods can improve physiological and psychological performance surrogates in athletes, and actual performance outcome in shooting and dart throwing. However, both systematic reviews conclude that the evidence is scarce and more intervention studies are needed, especially with robust randomized controlled designs. The third and most recent systematic review by Noetel, Ciarrochi, Van Zanden, and Lonsdale (2019) included all study designs that investigated mindfulness and acceptance-based methods in sports. They conclude that the general quality of studies is poor within the research field. After systematic assessment, none of the 66 included studies had low risk of bias. The evidence base, assessed with GRADE, was considered low. These results address central issues for future research regarding the methodological rigor in applied sport psychology and are highly relevant in order to strengthen the evidence base. Mindfulness and acceptance based interventions have thus far been tested in a range of sports; e.g., precision sports such as shooting and dart (John, Verma, & Khanna, 2011; Solberg, Berglund, Engen, Ekeberg, & Loeb, 1996; Zhang et al., 2016), endurance sports such as cycling and running (Scott-Hamilton, Schutte, & Brown, 2016; Solberg, Halvorsen, Sundgot-Borgen, Ingjer, & Holen, 1995; Solberg et al., 2000) and more common are trials that include athletes from different sports (Aherne, Moran, & Lonsdale, 2011; Hasker, 2010; Thompson, Kaufman, De Petrillo,

Glass, & Arnkoff, 2011). To our knowledge, no mindfulness and acceptance-based intervention has been developed specifically to enhance performance for ice hockey players.

ACT is a contextual behavioral therapy that often includes work with metaphors and experiential exercises. The theory of ACT is based in behavioral analysis and relational frame theory (RFT)—a behavioral account of human language and cognition (Hayes, Barnes-Holmes, & Roche, 2001). ACT aims to promote psychological flexibility (PF) in order to help individuals to live in concordance with personal values and goals (Hayes et al., 1999). PF is defined as persisting or changing actions towards chosen goals or values while consciously contacting what the present moment affords in terms of thoughts and feelings (Hayes et al., 2011). A significant part of examining the workability of ACT is to investigate its underlying processes. A meta-analytic component study demonstrated that ACT processes such as acceptance, cognitive defusion, present-moment-awareness and values had significant influence on behavioral change in a wide range of contexts (Levin, Hildebrandt, Lillis, & Hayes, 2012). Using ACT to enhance athletic performance for ice hockey players may to some extent differ from applying the method with clinical populations. However, ACT processes have been investigated in non-clinical workplace settings (Bond, Hayes, & Barnes-Holmes, 2006; Stewart, Barnes-Holmes, Barnes-Holmes, Bond, & Hayes, 2006), and have shown that promotion of PF can lead to both enhanced performance and increased well-being (Flaxman & Bond, 2010).

The focus of the ACT based intervention in this study is to promote PF for ice hockey players. Ice hockey is a fast paced open-skill sport that combines physical, technical, tactical and psychological demands. The multifaceted team sport can simultaneously involve rough tackles, the finesse of executing dribbles and passes, team play, intense emotion and momentary decision making in a competitive setting. This calls for psychological flexibility from players in order to succeed. Recently, an instrument measuring psychological flexibility in ice hockey, the Values, Acceptance and Mindfulness Scale (VAMS) was developed and psychometrically investigated (Lundgren et al., 2018). An Ice hockey player with PF was defined as a player who approaches development as an ice hockey player by being aware of the experiences that may occur during games and practices, by directing attention towards what is important in given situations, and by acting according to values and goals in the context of ice hockey. *Acceptance*, is defined as the ability to actively and consciously embrace any private event (thought, feeling, memory, sensation etc.) without the attempt to escape or avoid it by trying to change their frequency or form (Hayes et al., 1999). In an Ice hockey context, acceptance is defined as an ability to actively embrace the emotions, thoughts and memories that may occur in such a way that these experiences do not become obstacles to an effective ice hockey performance. Present moment awareness is central to the concept of *mindfulness* (Kabat-Zinn, 1994), and is defined as the ability to shift the attention to here and now in a flexible and non-judgemental way, contacting both internal and external stimuli with dispassionate observation (Fletcher & Hayes, 2005). In an ice hockey context, mindfulness is defined as the ability to be consciously present and aware on the ice, direct attention according to what the situation demands, and choose actions effectively during games and practice. *Values* are the verbal descriptions of overarching important goals, also known as

verbally established motivation (Plumb, Stewart, Dahl, & Lundgren, 2009). In an ice hockey context, values are defined as the qualitative individual description of how an ice hockey player wants to approach the game and training in order to give themselves the best chance to be successful and enjoy ice hockey. Significant correlations were found between the above-mentioned processes (values, acceptance and mindfulness; VAMS) and life satisfaction ($r = -.43$, $n = 38$, $p < .001$), and depression, stress and anxiety ($r = .47$, $n = 39$, $p < .001$) in ice hockey players (Lundgren et al., 2018). The total scale of the VAMS instrument was also associated with hockey performance outcome such as assists ($r = .30$, $n = 59$, $p = .020$) and team points (the total number of goals and assists made by the team, and goals conceded against, that occur while the player is on the ice) ($r = .29$, $n = 59$, $p = .028$). The mindfulness-subscale of the VAMS was also significantly correlated with made assists ($r = .38$, $n = 59$, $p = .003$) and team points ($r = -.35$, $n = 59$, $p = .007$). Thus, higher levels of PF, regarding ice hockey related private events (e.g., thoughts, feelings, and memories that occur during training and game), are associated with increased performance. This suggests that further research aiming to influence PF for ice hockey players is warranted.

The specific aim of this study is to investigate the feasibility and effect of an ACT training program for ice-hockey players with the following research questions: (1) Can an ACT based group-intervention increase psychological flexibility in ice hockey players as measured with the VAMS? (2) Will the intervention be important to them as ice hockey players? (3) Will the intervention help the ice hockey players to develop their game? (4) Would they recommend the intervention to other ice hockey players?

Method

Participants

Participants were recruited as part of the Ice hockey project, a collaboration between MODO hockey, Stockholm University and the Karolinska Institute. 21 elite male Swedish Hockey League (SHL) players with a mean age of 26.29 ($SD = 5.14$) were invited and accepted to participate in the study. 13 ice hockey players signed up for the training and 8 declined to participate in the training. Participants were divided in an experimental group ($n = 13$) and a control group ($n = 8$). All participants received written information about the study and returned a signed consent. Study procedures were in accordance with the declaration of Helsinki (World Medical Association General Assembly, 2004), reviewed and accepted by the ethical review committee at the Psychology department at Stockholm University, Sweden.

Material

The Values, Acceptance, and Mindfulness Scale for ice hockey (Lundgren et al., 2018) exhibits three sub-scales: Values, Acceptance and Mindfulness in the context of ice hockey. The scale consists of 11 questions and participants' rate on a 1–7 point Likert scale ranging from “always true” to “never true.” The instrument shows good face validity, concurrent validity, construct validity, and

predictive validity (assists and team points) as well as an acceptable internal consistency for the total scale (Cronbach's $\alpha = .76$). When the instrument was administered to the players it had not yet been evaluated hence the original 22 item version was completed (VAMS-22). However, the evaluation of the scale resulted in the final 11-item version (VAMS-11). The results for both the VAMS-22 that the players originally completed and the recalculation for the VAMS-11 will be displayed for transparency reasons.

The credibility/expectancy questionnaire: An adapted version of the credibility/expectancy questionnaire (Devilly & Borkovec, 2000) was used to evaluate the feasibility of the training program. The items investigated (1) whether the intervention was important for them as ice hockey players, (2) if the intervention helped them develop their game, and (3) if they would recommend the training program to other ice hockey players. Items one and two were rated on a 1–4 point scale (1 = not at all, 2 = a little bit, 3 = much, 4 = very much) while item three was rated either yes or no.

Procedures

The design of the study was a controlled group trial with an experimental group and a control group with pre- and post-training assessments. Participants were invited to participate in the study at an oral presentation on sport psychology at the ice hockey organization. Assessment was conducted by blinded administrators pre and post ACT training in both groups. Training took place at a conference room at the ice hockey organization. The course was conducted during four weeks in February with one training session each week and homework assignments between sessions. An ACT manual adapted for ice hockey players was developed for the study by the first author. The first author conducted all training.

Intervention

The intervention was delivered in a group format and consisted of four, once a week, sessions which each lasted for 30–40 minutes. The content of the intervention consisted of ACT exercises targeted to enhance skills in acceptance, mindfulness, and values to promote ice hockey related PF and enhance performance in ice hockey. Each session followed the same structure. First session: 1) overall aim of the training, 2) presentation of the central skill trained in the session, 3) experiential exercise on chosen skill, 4) homework assignment. Session two and three followed the same structure with the addition that homework was reviewed after the introduction of the overall aim of the training. The last session consisted of an overall review of the aim of the skills training, summary of the training and discussion on how to maintain and continue the acquired skills. Between sessions players were offered telephone support from the first author.

Session 1. The aim of the first session was to introduce and work with functional analysis and values in relation to the individual hockey development. The purpose was to identify and analyze obstacles (thoughts, feelings etc), past and recent behaviors in relation to obstacles and describe values in the ice hockey context. The ice hockey lifeline and the ice hockey bulls-eye values worksheet were introduced as working tools (Lundgren & Kenttä, 2015). The lifeline and the ice hockey

bull's-eye were discussed throughout the course of the training. The ice hockey lifeline represented the player's continuous development throughout their ice hockey careers and it also embodies a functional analytic perspective of ice hockey related behavior. The ice hockey bull's-eye was used to work with values and committed action and players were asked to describe what was most important to them in order to be the best player they could be and conduct their best practices. Their description was defined as their personal ice hockey values. Also, players were asked to describe their obstacles to performance, e.g., nervousness, thoughts of failure, thoughts of previous mistakes, fear of letting the team down. At the end of the first session players chose an action they were willing to commit to in the upcoming game or practice that was in line with their described values. Players were instructed to choose an action that would challenge their described obstacles. Values, obstacles and chosen actions were written down in the bull's-eye for ice hockey player's work sheet. Players were informed to monitor their practice and development in the bull's-eye worksheet daily. Also, players were given a 5-minute mindfulness exercise to do two times a day. The aim of the mindfulness exercise was to practice awareness, refocusing and directing attention.

Session 2. The aim of session two was introduction and practice of acceptance and mindfulness. The purpose of practicing acceptance and mindfulness was to train players to become increasingly aware of private experiences (e.g., thoughts, emotions, feelings), and continue or change their behavior so that they are actively directing attention to, and acting effectively towards, their values. Since emotions will change during the career, games, and practices, players were trained to be able to handle whatever experiences showing up. Two experiential exercises were included in the session to facilitate acceptance skills. First "The bag with your experiences close to or far from you" exercise was performed. The aim of the exercise is to experientially become aware of the difference between keeping experiences at a distance or keeping experiences close. Keeping difficult emotion close (acceptance of private events) instead of trying to push or keeping them out of the way (avoidance), will alleviate the private struggle and make room for a more flexible behavioral response to be able to attend to what is important in the situation. This exercise was conducted while walking along the hockey lifeline while carrying a bag with extended arms compared with carrying the bag close to the body to illustrate how the psychological skill of acceptance can be promoted and used in ice hockey. Another exercise, the "Eyes on" exercise was also introduced. In "Eyes on", players were asked to look closely in each other's eyes for a long time to evoke emotion. The players were then instructed to stay in the situation and notice, nonjudgmentally, whatever thought and emotion showed up. This was another way to practice skills of acceptance and mindfulness in emotional situations. At the end of the session, players received two homework assignments; a 10-minute mindfulness exercise with the purpose of increasing awareness and attentional skills, and also to choose a "challenge of the day" with the purpose of evoking emotion and practice awareness and acceptance.

Session 3. The aim of session three was to introduce and practice mindfulness, cognitive defusion and awareness. The purpose of practicing awareness and cognitive defusion was to train players to become aware of thoughts without engaging in them and direct attention towards effective valued actions. In order to

do that, two exercises developed for this training was introduced; the “Juggling exercise” and the “Sing a song exercise.” In the “Juggling exercise” players are asked to juggle (engage in an activity) while someone throws wrinkled pieces of paper with negative thoughts written on them towards the player. If the juggling activity gets disrupted because of the thrown pieces of paper (e.g., the player focuses on the thought or tries to catch it) it becomes clear to what cost this is of the activity the player really wants to succeed with (the juggling). The players then practice to let these thoughts “bounce off” them while engaging in an activity (playing ice hockey). In the “Sing a song exercise” a few players are asked to stand in front of the whole group with their eyes closed not knowing what they are supposed to do. The trainer then asks the players to come up with a song that they will sing in front of the crowd and then let them stand there for a while. Normally this evokes unexpected intense thoughts and emotions for the participants standing in front of the crowd with their eyes closed. They do not get to sing the song, but the trainer instead asks the participants to be aware of their thoughts and feelings while aroused. Experiences of the exercise and how it relates to ice hockey and the overall aim of the training is discussed in the group. The experiential exercises were developed with the intention to both describe the awareness and defusion processes as well as practice them. At the end of session three, two homework assignments were given to the players; a mindfulness exercise (same as session two) and an exercise to pay close attention to and write down thoughts players experienced in situations they considered problematic during a game.

Session 4. The aim of session four was to summarize and discuss the psychological skills the players had worked on and how the players could maintain the training. The purpose was to increase the likelihood of continuous practice in order to establish these new skills as part of the player’s behavioral repertoire.

Statistical Analysis

A split-plot analysis of variance (ANOVA) was used to investigate interaction effect for time (pre and post) X group (ACT vs control group). To calculate between group and in-group effects dependent t-test was calculated. Cohen’s *d* was calculated using the pooled standard deviation to further test the strengths of the effects. Cohens *d* between group effect sizes were evaluated accordingly; 0.2- small, 0.5- medium, and .80- large (Cohen, 1988). To evaluate feasibility and credibility percentages was calculated and presented.

Results

There was a significant interaction effect (time x group) for the summed score of VAMS-22 ($F(1,19)=17.34, p=.001$) and for the VAMS-11 ($F(1,19)=7.23, p=.015$). See Tables 1 and 2 for means and standard deviations. There was a significant main effect of time for VAMS-22 $F(1,19)=15.34, p=.001$ and for VAMS-11 $F(1,19)=7.23, p=.015$. There was no significant main effect for group on the VAMS-22 $F(1,19)=0.13, p=.91$ or the VAMS-11 $F(1,19)=0.60, p=.45$. At post assessment there were no significant differences between the groups but medium and large effect sizes, $d=0.76$ and $d=0.81$ for the VAMS-22 and the

VAMS-11 respectively. Also, as shown in Tables 1 and 2 a significant increase in psychological flexibility was shown in the experimental group between pre and post with large effects as measured with both VAMS-22 and VAMS-11. No significant change was detected in the control group.

All participants answered that they would recommend the course to other ice hockey players. Other feasibility and credibility scores are presented in Table 3.

Table 1 ACT Training of Ice Hockey Related Psychological Flexibility as Measured by the VAMS-22

VAMS-22	Pre VAMS-22 M (SD)	Post VAMS-22 M (SD)	t Within Group	p-Value Within Group	Effect Size Cohen's d Within Groups
ACT group (n = 13)	54.0 (9.4)	45.8 (6.1)	2.18	.015*	1.04
Control group (n = 8)	50.2 (10.4)	50.5 (10.8)	2.37	.96	0.02

Note. VAMS = values, acceptance and mindfulness scale for ice hockey players.

* $p < .05$.

Table 2 ACT Training of Ice Hockey Related Psychological Flexibility as Measured by the VAMS-11

VAMS-11	Pre VAMS-11 M (SD)	Post VAMS-11 M (SD)	t Within Group	p-Value Within Group	Effect Size Cohen's d Within Group
ACT group (n = 13)	30.5 (6.9)	25.2 (5.1)	2.18	.004*	0.86
Control group (n = 8)	29.9 (6.2)	29.9 (6.7)	2.37	1	0

Note. VAMS = values, acceptance and mindfulness scale for ice hockey players.

* $p < .05$.

Table 3 The Feasibility and Credibility Questions and Results Post-Intervention for the Intervention Group

	Not at All	A Little Bit	Much	Very Much
Has the intervention been important for you as an ice hockey player?	0%	6%	50%	44%
Has the intervention helped you develop as an ice hockey player?	0%	56%	22%	22%

The results show that 100% of the participants in the experimental group thought that the training had positive effects and that the players would recommend the training to other ice hockey-players.

Discussion

The aim of the present study was to evaluate the feasibility of an ACT training program to increase ice hockey related psychological flexibility. The present study is, to our knowledge, the first to evaluate ACT for elite ice hockey players. The results show that the four-session ACT group training program was feasible and positively evaluated by the participating ice hockey players. Implementation of the adapted ACT training program showed a significant increase in ice hockey related psychological flexibility. This suggests that ACT training has an effect on ice hockey player's psychological skills, and therefore on their performance. Randomized controlled trials are warranted to further investigate the effects ACT has on ice hockey performance.

Subjective performance data and feasibility measures were collected in the study. Ninety four percent of the players concluded that the intervention had been important for them as hockey players ("A lot" = 50%; "Very much" = 44%) and 44% responded that it had helped them develop as hockey players ("A lot" = 22%; "Very much" = 22%). Another 56% responded that it helped them to develop "a little bit" as hockey players. Furthermore, all participants in the ACT intervention responded that they recommend the course to other ice hockey players. The results on the feasibility measures indicate that players perceive the ACT skills-training program as both helpful and important. These findings, that the players understand and consider the training useful, are important and useful for future research directions.

The intervention targeted and influenced central ACT processes such as acceptance, mindfulness, and values, which led to a significant increase in psychological flexibility for the ACT group. Psychological flexibility, as measured with VAMS, showed a significant correlation with performance in ice hockey (Lundgren et al., 2018). At post assessment there were medium to large effect sizes between the two groups. This suggests that psychological flexibility influences ice hockey players and that it may be an important process to target in ice hockey performance. This is reassuring, since theoretical models and basic principles of behavior need to be studied across content domains to strengthen both the internal and external validity of the theory and its applied methods (Levin, Twohig, & Smith, 2016). Hence, if central aspects of language and cognition, such as derived relational responding and rule-governance, have extensive influence on behavior in several contexts, the assumption that it applies to behavioral change in sports is also strengthened. Although such assumptions are still to be considered as hypotheses to be further empirically tested in the area of sports using larger groups and with a randomized control design.

The strengths and weaknesses of objective and subjective performance assessments is a continuous discussion in sport psychology. Concerns has been raised that objective performance measures may be affected by a number of uncontrollable factors in the environment which can threaten the validity of the

measure (Thelwell, Greenlees, & Weston, 2006). It is true, especially in team sports such as ice hockey, that team members' performances influence individual success. However, promoted change in a psychological construct proposed to be important for performance cannot be equated to performance itself. No objective performance data was collected in this study and the promoted psychological flexibility's effect on actual performance can therefore not be concluded even though VAMS significantly correlates with objective performance (Lundgren et al., 2018). Therefore more research is needed to investigate the direct effect of training in ACT processes on objective performance as well as indirect performance measures such as psychological flexibility for ice hockey.

The present study, as a feasibility trial, show that the program is acceptable and that it changes processes that it was supposed to influence. The fact that no randomization is conducted and that no performance measures are investigated suggests caution in the interpretation of the results and more research is important. However, this is one step further in the research endeavor to increase our knowledge and the evidence on how and what psychological skills to work with in ice hockey.

Previous research (Buhlmayer et al., 2017) suggests that larger trials using randomized controlled design are warranted in sport psychology in general. That also applies to the field of ice hockey. However, larger trials using RCT design are only one way to gather and develop knowledge on these procedures. It would be of importance to also develop instruments that target hypothesized mechanisms of change, adapted to the specific target population, that could be used as both outcome measures and processes measures. Also, in future RCT designed studies for sport psychology performance enhancement methods in general and more specifically for ice hockey, objective performance measures should be included as well as measures on program feasibility and indirect effects. Furthermore, to gather even more information, the inclusion of objective and blinded raters of performance would add to the evidence of the program effectiveness. To include measuring methods targeting direct objective performance, indirect process variables, feasibility, as well as blinded performance raters would build a stronger evidence base for the effectiveness of programs targeting performance enhancement in sports.

In conclusion, the present study suggests that the application of an ACT program adapted to the context of ice hockey is considered helpful and meaningful to ice hockey players. It also suggests that it is possible to train and influence acceptance, mindfulness and values skills, which is related to effective performance. More research is worthwhile and preferably using a randomized controlled design with objective performance measures.

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