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Acceptance and Commitment Therapy for Improving the Performance of Chess Players Suffering from Anxiety Disorders

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Abstract

Previous research has suggested that brief protocols based on acceptance and commitment therapy (ACT) are efficacious in improving elite chess players' performance without clinical problems. These promising results warranted the examination of the effect of longer ACT interventions with chess players suffering from emotional difficulties. This study advances in this direction by presenting two case studies of elite chess players experiencing anxiety disorders. Each participant was matched to a control participant with similar characteristics. The ACT interventions were conducted in 5 sessions and with occasional follow-ups during the following year. The primary dependent variable was an objective measure of chess performance (ELO Performance). Data analysis was conducted using the JZS+AR Bayesian hypothesis testing for single-case designs and the nonparametric Tau-U statistic. Control participants did not significantly improve their chess performance during the follow-up, but chess players who received the intervention showed significant increases in their performance. Both treated participants experienced clinically significant reductions in symptomatology and improved valued living after the intervention. This study provides empirical evidence regarding the potential benefit of applying ACT to improve chess performance in players with clinical problems.
Key words: Acceptance and Commitment Therapy, chess performance enhancement, psychological flexibility, experiential avoidance, cognitive fusion, anxiety..

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Novelty and Significance

What is already known about the topic?

- Previous research has suggested that brief interventions based on ACT are efficacious in improving elite chess players' performance.

What this paper adds?

- This study presents two case studies with elite chess players suffering from anxiety difficulties treated with ACT.
- The interventions were efficacious in treating the anxiety difficulties.
- Both chess players notably increased their performance compared to the two control participants.

Acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999; Wilson & Luciano, 2002) is a contextual-behavioral model of psychological intervention. The main objective of ACT is to promote psychological flexibility, which is proposed to be at the core of mental health and behavioral effectiveness (Hayes *et alia*, 2006). As described in middle-level terms, psychological flexibility is the ability to stay in the present moment, mindfully aware of private events (thoughts, memories, sensations, etc.), and committed to valued goals (Hayes *et alia*, 2006; see more technical approaches

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in Luciano, Törneke, & Ruiz, 2022; Törneke, Luciano, Barnes-Holmes, & Bond, 2016). ACT has been successfully applied to a wide range of psychological disorders in adults, children and adolescents (e.g., depression, anxiety disorders, etc.), health problems (chronic pain, cancer, diabetes, surgery recovering, quitting smoking, etc.), and performance-related issues (e.g., Gloster *et alia*, 2020; McCracken & Vowles, 2014; Swain, Hancock, Dixon, & Bowman, 2015).

Because of the high cognitive and emotional demand, chess is usually called mental boxing. Chess players must continuously make decisions within a limited time, and only one mistake can lead to a quick defeat. Accordingly, chess players' cardiovascular activity is high and similar to those shown by people who practice sports involving more physical activity (e.g., Troubat, Fargeas-Gluck, Tulppo, & Dugué, 2009). Not surprisingly, chess players' decision-making is sometimes controlled by the discriminative functions of ongoing thoughts and emotions unrelated to the actual chessboard position, which deteriorates their performance (Nunn, 2014; Rowson, 2000). For instance, chess players sometimes behave fused with fear of losing and getting into time troubles because of overthinking to avoid possible mistakes, play defensively or offer draw in a better position (i.e., engaging in experiential avoidance). Other times, chess players behave fused with task-irrelevant thoughts such as lack or excess confidence and lose contact with the actual chessboard position. Lastly, chess players sometimes try to avoid memories of a painful defeat by changing their playstyle to avoid similar positions to those in that game. In summary, behaving fused with ongoing private experiences usually lead to a decrease in cognitive performance because the individual loses sensitivity to the relevant cues of the game.

Identifying the pernicious role of psychological inflexibility in chess competitions has led to exploring the effect of brief interventions based on ACT to improve elite, nonclinical chess players' performance (Ruiz, 2006; Ruiz & Luciano, 2009, 2012). Ruiz (2006) found that after implementing four ACT sessions with a Grandmaster (the highest title conceded by the International Chess Federation, FIDE), the player noticeably improved his performance according to an objective chess performance measure. In a second study, Ruiz and Luciano (2009) compared the efficacy of a 4-hour group ACT intervention given to eight promising young chess players versus a no-contact control condition. Unlike the control condition, the ACT condition showed significant improvement results during the nine months of follow-up compared to the previous nine months. Similarly, Ruiz and Luciano (2012) compared the efficacy of a 4-hour, individual ACT intervention with five international-level chess players versus a no-contact control condition. Participants in the ACT condition significantly improved their chess performance, while the control participants remained at the same play level.

The promising results of brief ACT protocols warrant examining the efficacy of longer ACT interventions with elite chess players suffering from emotional difficulties. Accordingly, the current study aimed at presenting the results obtained applying ACT to two elite chess players suffering from high levels of anxiety: an adult Grandmaster suffering from obsessive-compulsive disorder (OCD) and a comorbid social anxiety disorder and a 12-year-old boy suffering from a high level of performance anxiety and other multiple anxiety problems that could be labeled as a generalized anxiety disorder (GAD). Both interventions consisted of five sessions applied intensively and follow-up contacts during the following year. Each participant was matched to another chess player with similar characteristics whose chess performance was followed during the study period. All participants' chess performance was monitored during an 18-month follow-up.

Method

Participants

Participant 1. Raul was a 23-year-old chess player considered one of the most talented players in Spain. However, his progression had been blocked for the last years before the intervention. Raul received psychological treatment based on rational emotive behavioral therapy for obsessive-compulsive disorder (OCD) and social anxiety disorder the year immediately before the beginning of the intervention. However, he did not experience a significant improvement.

Participant 2. Mario was a 12-year-old boy with high performance anxiety during chess competitions. He was categorized as an exceptionally gifted boy and played chess since his early childhood. Mario obtained excellent results at a national level before being told by a renowned Spanish chess player that he was the most talented young chess player he had ever met. Afterward, Mario developed anxiety performance problems, and his performance significantly decreased. Mario and his parents consulted with a recognized chess trainer for his anxiety problem, but the guidelines provided did not show the desired effect.

Matched control participants. Each participant was matched with a chess player with similar characteristics by searching the International Chess Federation (FIDE) database. The criteria to find control participants were as follows: (a) same gender, (b) age difference of no more than one year, (c) same International Title, (d) difference in ELO score of no more than 30 points, (e) equivalent frequency in playing competitions during the last 12 months, and (f) playing in the same geographic zone (e.g., tournaments in the south of Spain). Only one chess player was matched to every participant because the precise specification of the criteria made it difficult to match both experimental participants to more than one person.

Instruments

ELO Performance Rating (Elo, 1978). The ELO Performance scores were used as the primary outcome measure. ELO Performance is a theoretical index primarily used by the FIDE to establish chess skill levels through consecutive games. The ELO Performance scores were obtained for each participant and their matched controls by analyzing the data from competitions, provided by FIDE's database, in which participants played at least four games.

Acceptance and Action Questionnaire-II (AAQ-II; Bond *et alia*, 2011; Spanish version by Ruiz, Langer, Luciano, Cangas, & Beltrán, 2013). The AAQ-II is a general measure of psychological inflexibility. It consists of 7 items rated on a 7-point Likert-type scale. Higher scores indicate higher levels of psychological inflexibility. The AAQ-II was only administered to Participant 1.

Avoidance and Fusion Questionnaire-Youth (AFQ-Y; Greco, Lambert, & Baer, 2008; Spanish version by Salazar *et alia*, 2019). The AFQ is a 17-item, 5-point Likert scale that measures psychological inflexibility in children and adolescents. Higher scores indicate higher levels of psychological inflexibility. The AFQ-Y was only administered to Participant 2.

Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Gregory, & Allen, 2004). The KIMS is a 39-item, 5-point Likert scale that measures four mindfulness skills: Observing, Describing, Acting with Awareness, and Accepting without Judgment. Higher scores indicate greater mindfulness skills. The Spanish translation by Ruiz (2014) was used, which showed good internal consistency.

Chess Counterproductive Reactions Questionnaire (CCRQ; Ruiz & Luciano, 2009, 2012). The CCRQ is a 15-item, 9-point Likert scale designed to detect psychological inflexibility

in chess competitions. Preliminary data show it has good internal consistency and correlates with the AAQ-II and ELO ratings (Suárez-Falcón, Ruiz, & Luciano, 2012). The CCRQ was only applied to Participant 1.

Psychological Barriers in Chess Questionnaire (PBCQ). The PBCQ is a 30-item, 5-point Likert scale that measures the frequency of problematic private events during chess competitions and the flexible reaction to them. It was designed based on the CCRQ. Preliminary data show that the PBCQ has adequate internal consistency (Suárez-Falcón *et alia*, 2012). The PBCQ was only administered to Participant 2.

Self-monitoring. Participant 1 was invited to respond to a self-register after each competition game. Specifically, he responded to which degree he experienced perfectionist thoughts (0-10) and whether they had controlled their play. Participant 2 was invited to fill out a similar register, but as there was no possibility of obtaining a baseline in this case, these data are not presented here.

Procedure

Both interventions were conducted in the Clinical Psychology Laboratory of *Universidad de Almería* (España). The interventions were applied intensively because the participants lived in other country regions. The participants provided informed consent regarding the videotaping of the sessions and the future publication of the data obtained. The first author conducted the interventions with the chess players under the supervision of the second author. Also, in the case of Mario, the second author conducted a couple of sessions with the parents at the beginning and the end of the intensive intervention. No closed protocol was used because the study aimed to explore the effect of more extensive and individualized ACT interventions on participants with clinical problems.

Interventions

Case 1

Raul's intervention consisted of five, 90-minute sessions conducted on the same number of consecutive days plus brief periodical contact (approximately one per two months) for the next year after the intervention. Session 1 was dedicated to conducting a functional analysis of the problem and promoting creative hopelessness. The aim was for Raul to experience the pernicious long-term consequences of trying to control and avoid obsessive thoughts and social anxiety. Raul used to behave fused with many perfectionist thoughts in everyday life and chess competitions. In reaction to those thoughts, he used to engage in experiential avoidance strategies to neutralize them (e.g., engaging in rituals). He also behaved fused with social anxiety by leaving the situation even when it was vital for him to stay there. Raul considered himself a "very artificial person" who did not enjoy life and wanted to be a more "natural person." He often experienced time troubles in chess competitions because of wasting too much time calculating what was the best move, even in situations where doing that was not adequate. To exemplify Raul's behavior regulation pattern, "the man in the hole" (Hayes *et alia*, 1999, p. 101; Wilson & Luciano, 2002, p. 128) metaphor was proposed, and he was invited to note himself "digging" (i.e., engaging in experiential avoidance) as homework.

In Session 2, creative hopelessness was further promoted by proposing the "turtle metaphor" (Wilson & Luciano, 2002, p. 159). Raul's pattern of behavior was compared to a turtle whose life mission was to walk in the North direction. However, when some problem appeared (e.g., rain, wind, insects, etc.), she stopped walking and got into her shell. Raul felt strongly identified with this metaphor. Finally, in order to clarify values, the "funeral exercise" (Hayes *et alia*, 1999, p. 215; Wilson & Luciano, 2002, p. 153) was introduced in which Raul was invited to imagine his own funeral and, first, think who would assist and what they would say according to how his life had been until this moment and, second, what he would like they would say. According to the results

of this exercise, committed actions were planned for the following days in different valued areas to begin "walking" in the valued direction.

Sessions 3 to 5 were dedicated to providing Raul a multiple-exemplar training in defusing from obsessive thoughts and social anxiety while engaging in committed action. Exercises included the "visual contact exercise" (Hayes *et alia*, 1999, p. 244; Wilson & Luciano, 2002, p. 199), "taking your mind for a walk exercise" (Hayes *et alia*, 1999, p. 162; Wilson & Luciano, 2002, p. 215), engage in social interactions in the campus that involved anxiety (e.g., asking some information, making infrequent questions, doing a survey, etc.), and the chessboard metaphor (Hayes *et alia*, 1999, p. 190; Wilson & Luciano, 2002, p. 209).

The brief electronic sessions focused on reviewing Raul's advances, preventing relapse, and explicitly connecting the work conducted promoting psychological flexibility in everyday life with chess competitions. In a phone interview maintained with Raul at the 18-month follow-up, he stated that "he became a very pragmatic player because he was in charge of his behavior instead of his old guidelines." Raul's behavior in other areas also became more flexible, and he stated, "I have stopped behaving artificially, and I feel more natural now." My life philosophy has changed, and now I see things more clearly than before." He commented that the change developed during the first months after the intervention in which not following the guidelines his "mind" told him generated big confusion and distress and, despite them, he behaved according to his values

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Case 2

The intervention with Mario was also programmed to be implemented intensively in five sessions (90 min. per session) conducted within three days, with new contacts to revise his progress every two months, approximately during the next year.

An assessment session was conducted with Mario and his parents. Mario presented multiples problems during chess competitions related to psychological inflexibility: (a) high anticipatory anxiety that usually lead to defecate 30-45 minutes after the beginning of every game; (b) he usually got into time trouble because he was afraid to make errors; (c) he became distracted for lots of reasons (e.g., seeing his mother in the room, young chess players talking, etc.); (d) he was afraid to initiate the decisive attack when having a clear advantage; (e) he avoided moves that lead to tactical complications because of the fear to lose; (f) he often offered draw in favorable positions; (g) he played defensively after losing a game to avoid another defeat; (h) he used self-deceptive strategies to calm himself (e.g., thinking that he is playing a friendly game); (i) when he lost a game, he wanted to quit chess, blamed her mother, and committed self-harm behaviors (e.g., bite his hand, slap his face) to calm himself; and (j) before the games, he checked whether all these thoughts surfaced and whether he was having bowel movements.

Mario also presented several fears, the most relevant being the fear of being attacked by a man with a knife at night. Mario behaved fused with this fear by asking his parents to check that the doors were correctly closed, looking behind his bed and inside the wardrobe, etc. Because of this problem, Mario lasted between 60 to 120 minutes to fall asleep. Mario obtained good grades in the school context, but he could do better. He was bored in class and suffered some bullying episodes from several schoolmates. Mario had no friends, no children visited him at home, and he did not celebrate his birthdays. In the family context, Mario maintained a dependency relationship with his mother. She chose to work on the night turn to be available to him during the day. Mario always received help of his mother to do the school homework and train chess. He maintained continuous fights with his 17-year-old brother.

Session 1 was devoted to promoting creative hopelessness by making a diagram with Mario's experiential avoidance behaviors and asking for short and long-term efficacy. He concluded that although some of his avoidance behaviors were relatively effective in reducing his unwanted thoughts and feelings in the short term, they continued showing up in the long term and had very negative consequences. Next, the garden metaphor (Wilson & Luciano, 2002, p. 113) was introduced as a functionally equivalent story to

his problem. This metaphor tells the story of a person taking care of his garden as his central value in life, but that day after day, he spends his time eliminating the weed that grows because he does not like it. However, the more the weed is cut in this particular garden, the more it grows. Therefore, although the gardener momentarily alleviates his discomfort and thinks he is doing the right thing by cutting the weed, the fact is that more weed shows up the following day, which traps him in a loop without end. The point is that by cutting the weed, the gardener is not taking care of his plants, and they begin to get worse and worse. Mario was then invited to check some defusion exercises to see if they could be helpful for him when taking care of the plants. Exercises were implemented to facilitate Mario to discriminate neutral and generally aversive thoughts and feelings through deictic and hierarchical relations (descriptions of these exercises can be seen in Luciano *et alia*, 2011; Ruiz, Gil-Luciano, Segura-Vargas, 2022). These exercises were introduced to provide Mario with initial practice in defusion that he would have to practice during the following sessions.

The aim of Session 2 was to provide Mario with the experience of the paradoxical effects of trying to control his unwanted thoughts and feelings and practicing the defusion exercises of the first session with them. The bus metaphor (Hayes et alia, 1999, p. 157; Wilson & Luciano, 2002, p. 170) was proposed as an analog of what occurred to Mario during the chess competitions: he was told the story of a bus driver that what valued and enjoyed in life was to drive the bus in the route he liked. However, sometimes annoying passengers entered his bus and told him what to do, tried to divert his route, and scared him although he was in cabin security. Since the bus driver could not expel them from the bus, he often changed his route to calm them or paid more attention to them than to drive the bus properly. A series of experiential exercises were conducted to promote Mario's realization that trying to control thoughts and feelings (the passengers) was the problem and that he could choose at every moment what to do, no matter how annoying the passengers were. The bus metaphor was then physicalized with the help of a co-therapist. Finally, the visual contact exercise (Hayes *et alia*, 1999, p. 244; Wilson & Luciano, 2002, p. 199) was conducted.

In Session 3, Mario was invited to practice the ability to defuse from unwanted private experiences while solving twenty chess problems on a computer with limited time, noises emitted from earphones, and the colors of the pieces and chessboard changing continuously. After finishing the task, Mario said he had a headache and that he could not follow the session. The psychologist used this opportunity to practice defusion with that physical sensation.

In Session 4, with the help of a co-therapist, Mario played some blitz chess games against both psychologists, which were experienced chess players, with the aim to provide him the opportunity to discriminate in which moments his play was controlled by the "bus driver," and when was controlled by the "passengers." During the games, the psychologist who was playing intermittently asked him: "Who is playing? Mario or the passengers? Mario had to respond quickly and focus on the game. There were some moments in which "the passengers" were playing the game. For instance, in one game, the psychologist made an unexpected move with a very good appearance. Mario thought he was losing, and when he was about to give up, he was asked who was making that decision. He answered that the passengers were giving up and focused again on the game until he found the save move, giving him a clear advantage. Lastly, the garden metaphor was reintroduced to ask for other plants Mario would like to take care of because, during the last sessions, they were mostly focused on the "chess plant."

Session 5 was the last session of the intensive intervention and was conducted by the first and second authors. It was mainly conducted with Mario and his parents to summarize his work and raise some agreements with them. Afterward, some defusion exercises were taught to Mario to do instead of committing self-harm behaviors.

After the intensive intervention described above, several sessions were conducted with Mario and one of his parents. Mario's problems in getting to sleep because of the fear of being attacked disappeared. He began to improve his school grades and was no longer bullied by his schoolmates. He took full responsibility for his studies and chess training. Mario began playing chess very well during this period and did not present habitual problems when facing competitions (e.g., bowel movements, lack of concentration, etc.). Mario's chess trainer, unaware that Mario had received a

psychological intervention, was surprised by his play level and said that he did not play so well before. Mario was very satisfied with his "plants" state because they were between a score of 9 or 10, while before the intervention, they were between 5 and 7.

During Sessions 6 to 9, additional defusion exercises were conducted to help Mario stop fights with his brother and focus better while studying at home. As a result, he stopped fighting with his brother, although he occasionally felt urges to pester him.

In Session 10, ten months after the beginning of the intervention, Mario experienced a setback in chess performance and began to perform very poorly. Mario's play was controlled by his "passengers" in many games. He commented that he was thinking about disputing some tournaments during the summer that were particularly complicated for him, and he avoided playing the last year. The therapist recognized his courage and put this decision in the direction of acquiring the skills to be focused on the chessboard. Because one of the tournaments was near the university, it was agreed that the psychologist would go to the tournament to see how he played and solve eventual problems. Accordingly, Sessions 11 to 12 were conducted during the last rounds of a complicated tournament disputed eleven months after the beginning of the intervention. Mario began the tournament performing poorly, losing several consecutive games and feeling high anxiety. He was paying much attention to the possibility that some "passengers" would appear, so his concentration was inadequate. Mario was asked for the aim of paying attention to the possibility that the passengers surfaced and if that was another way to cut the weed or let the passengers take control of the bus. He agreed and was told to take the steering wheel firmly and only look at the road, not within the bus to explore whether the passengers appeared. Additional defusion exercises were conducted using imagery of previous and possible future games.

A follow-up session was conducted approximately ten months after the end of the intervention. During this period, Mario played in several tournaments performing well in all of them. He was happy with his results and enjoyed playing chess tournaments. His scholar grades improved, and the parents saw him as more responsible. While crying a little, the mother said that living together had significantly improved and that living with him was effortless. Mario did not present the problems that brought him to the consultation (e.g., performance anxiety, sleep problems, fears, self-harm behaviors, etc.) and improved his social life and academic grades.

Data Analysis

Due to our experience in the field of chess performance and the characteristics of the experimental participants of this study, we expected that chess players would show a relatively stable performance around a mean level in baseline (i.e., there would not be significant trends across baselines) and the intervention would produce an immediate and stable level change in chess performance. This was what we observed when graphing the results. Accordingly, we selected two different methods that adequately fit these previous assumptions: (a) the JZS+AR Bayesian hypothesis testing for single-subject designs (de Vries & Morey, 2013) and (b) the nonparametric *Tau-U* statistic (Parker, Vannest, & Davies, 2011).

The JZS+AR Bayesian model is useful when the data within each phase are expected to be stable around a certain true mean (i.e., there is no trend), and the intervention is assumed to produce a level change in scores right after the intervention implementation (de Vries & Morey, 2013). This model adapted the JZS *t*-test and accounts for the serial dependence typical of single-subject designs with an autoregressive [AR(1)] model. The JZS+AR model provides a Bayes factor (BF) that quantifies the relative evidence in the data for the hypothesis of no intervention effect and for the hypothesis of intervention effect (i.e., the true means of both phases differ). Additionally, this model estimates the effect size by standardizing the difference in true means between phases. This standardized mean difference, termed δ, is slightly different from conventional Cohen's d, where the

mean difference is standardized by the within-group standard deviation. All analyses regarding the JZS+AR model were conducted in the BayesSingleSub R package.

Tau-U is a nonoverlap effect size that does not require meeting the assumptions of parametric methods (e.g., normality, constant variance, etc.). It was derived from Kendall's rank correlation and the Mann-Whitney *U* between groups test. *Tau-U* scores range from -1 to 1 and can be interpreted as the percentage of data that improved between the two study phases (Parker *et alia*, 2011). An important advantage of this statistic test compared to other nonoverlap indexes is that it can control undesirable trends in the baseline phase. To analyze the appropriateness of the JZS+AR model, we first computed *Tau-U* for the baseline and follow-up periods to establish if there were significant within-phase trends in the participants' performance. Subsequently, we computed a *Tau-U* value for the effect of the intervention on each participant. *Tau-U* values were calculated using the online calculator provided by Vannest, Parker, and Gonen (2011).

RESULTS

Case 1

Figure 1 shows Raul's evolution in ELO Performance on the left and his matched control participant on the right. Raul did not show a significant tendency across baseline (*Tau-U*= .039, *Z*= .374, *p*= .708), nor during the 18-month follow-up (*Tau-U*= -.039, *Z*= -.227, *p*= .802). However, according to the JZS+AR Bayesian model, a level change in ELO Performance occurred after implementing the intervention. Specifically, Raul performed at a mean level of 2437.3 points (*SD*= 89.548) during the baseline and at a mean level of 2527 points during the 18-month follow-up (M= 2527, *SD*= 60.672, δ= 1.064, ELO Performance increase of 89.7 points). The BF was 53.5, which means that the data support the hypothesis of intervention effect by this ratio compared to the hypothesis of no intervention effect. The nonparametric statistic *Tau-U* also indicated an intervention effect regarding ELO Performance (*Tau-U*= .606, *SEtau*= .163, *Z*= 3.712, *p*= .0002).

Raul's matched participant showed a small but significant positive trend during baseline (*Tau-U*= .21, *Z*= 2.013, *p*= .04) but not during the 18-month follow-up (*Tau-U*= .033, *Z*= .18, *p*= .857). Although the positive trend during baseline was significant, we decided not to control for the trend given the small value of *Tau-U*, as suggested by Parker *et alia* (2011), and continue applying the JZS+AR Bayesian model. Concerning the last model, the control participant 1 performed at a mean level of 2420.2 ELO Performance points (*SD*= 94.558) and at 2414.9 points at the 18-month follow-up (*SD*= 93.197, δ= -.055, ELO Performance decrease of 5.3 points). The BF was 0.234, which means that the data support the hypothesis of no improvement by a factor of 4.258 compared to the hypothesis of an improvement. The *Tau-U* value also indicated no improvement between baseline and follow-up (*Tau-U*= -.054, *SEtau*= .17, *Z*= -.318, *p*= .751).

Figure 2 shows the evolution of Raul's frequency of perfectionist thoughts and flexible reactions. Concerning the frequency of perfectionist thoughts, no significant tendency was found during the baseline (*Tau-U*= -.218, *Z*= -.934, *p*= .35), nor during the follow-up (*Tau-U*= .044, *Z*= .51, *p*= .61). No significant intervention effect was identified (*Tau-U*= -.219, *Z*= -1.153, *p*= .249). Regarding flexible reactions, there were no significant tendencies during the baseline (*Tau-U*= .036, *Z*= .156, *p*= .876) and the follow-up (*Tau-U*= .071, *Z*= .562, *p*= .574). According to *Tau-U*, the intervention increased the frequency of flexible reactions in response to perfectionistic thoughts (*Tau-U*= .493, *Z*= 2.598, *p*= .009).

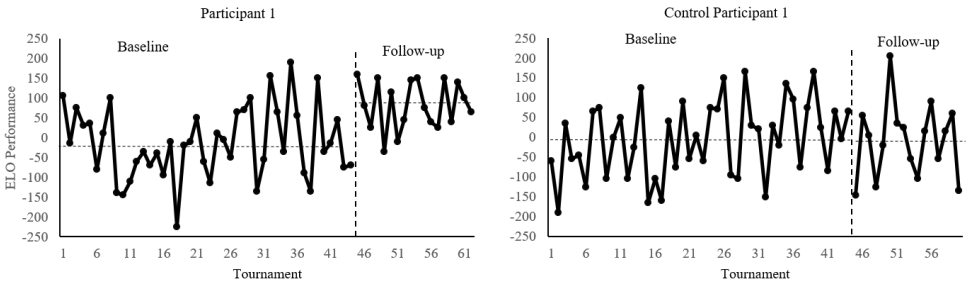

Figure 1. Evolution of ELO performance in Participants 1 (Raúl) and his Control Participant. Vertical axes have been transformed by subtracting all scores by the Participants' rating at the beginning of the study to guarantee Participants' anonymity. Horizontal dashed lines represent the trimmed mean of each phase.

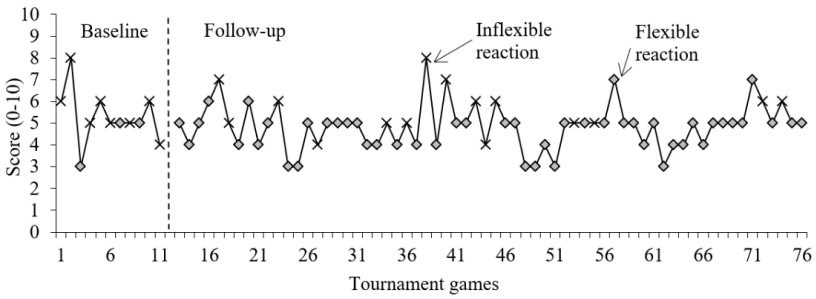

Figure 2. Frequency of Participant 1's perfectionist thoughts per tournament game and reactions (flexible vs. inflexible) to them.

Table 1 shows Raúl's scores on the self-report measures at pretreatment and the 18-month follow-up. Psychological inflexibility levels decreased from a clinical to a nonclinical score. Likewise, chess-related experiential avoidance significantly decreased. All mindfulness measures increased, especially the score on the KIMS factor of Accept without Judgment.

Table 1. Changes in Scores in Self-Inform Instruments.

Measure	Case 1		Case 2	
	Pre	FU	Pre	FU
CCRQ – Chess-related experiential avoidance	77	59	--	--
AAQ-II – Psychological inflexibility	32	23	--	--
KIMS – Observe	31	37	21	24
KIMS – Describe	26	28	24	24
KIMS – Act with awareness	20	26	20	38
KIMS – Accept without judgment	22	34	22	33
PBCQ – Frequency of problematic PE	--	--	57.5	22
PBCQ – Flexible reaction to PE	--	--	27	61
AFQ-Y – Psychological inflexibility	--	--	62	21

Notes: AAQ-II= Acceptance and Action Questionnaire-II; AFQ-Y= Avoidance and Fusion and Questionnaire-Youth; CCRQ= Chess Counterproductive Reactions Questionnaire; FU= Follow-up; KIMS= Kentucky Inventory of Mindfulness Skills; PBCQ= Psychological Barriers in Chess Questionnaire; Pre= Pretreatment.

Case 2

Figure 3 presents the evolution in ELO Performance of both Mario, on the left, and his matched control participant on the right. Mario did not show a significant tendency across the baseline and treatment period (*Tau-U*= -.078, *Z*= -.508, *p*= .612), nor during the 1-year follow-up (*Tau-U*= -.111, *Z*= -.447, *p*= .655). According to the JZS+AR Bayesian model, Mario performed at a mean level of 1838.3 ELO Performance points (*SD*= 173.776) during the baseline and treatment period and at a mean level of 2006 points during the 18-month follow-up (*SD*= 44.171, δ= 1.104, ELO Performance increase of 167.7 points). The BF was 6.2, which means that the data support the hypothesis of intervention effect by this factor compared to the hypothesis of no intervention effect. Likewise, the *Tau-U* statistic indicated an intervention effect regarding chess performance (*Tau-U*= .673, *SEtau*= .224, *Z*= 3.009, *p*= .003).

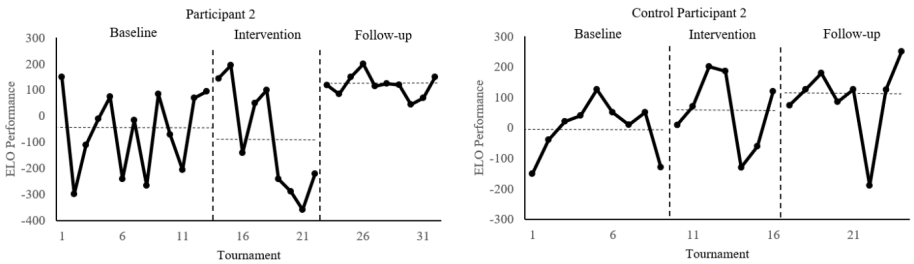

Figure 3. Evolution of ELO performance in Participant 2 and his Control Participant. Vertical axes have been transformed by subtracting all scores by the Participants' rating at the beginning of the study to guarantee Participants' anonymity. Horizontal dashed lines represent the trimmed mean of each phasem.

Mario's matched participant showed small but nonsignificant positive trends during baseline (*Tau-U*= .225, *Z*= 1.216, *p*= .224) and the 1-year follow-up (*Tau-U*= .25, *Z*= .866, *p*= .387). According to the JZS+AR Bayesian model, the control participant 2 performed at a mean level of 1977.7 ELO Performance points (*SD*= 106.237) and 2035.9 points at the 1-year follow-up (*SD*= 128.534, δ= 0.491, ELO Performance increase of 58.2 points). BF was 0.637, which means that the data support the hypothesis of no improvement between baseline and follow-up by a factor of 1.569 compared to the hypothesis of an improvement. The *Tau-U* value also indicated no improvement between baseline and follow-up (*Tau-U*= .477, *SEtau*= .255, *Z*= -1.868, *p*= .062).

Table 1 shows Mario's scores on the self-report measures at pretreatment and the 1-year follow-up. According to the PBCQ, the frequency of problematic private experiences when playing chess significantly decreased from pretreatment to posttreatment and follow-up, while flexible reactions increased. In addition, psychological inflexibility levels decreased from a clinical to a nonclinical score. Mario also showed clinically significant increases in Act with Awareness and Accept without Judgment regarding mindfulness skills.

DISCUSSION

Chess players' decision-making is sometimes subjected to the influence of fusion and experiential avoidance, which usually deteriorate their performance. Identifying the relevance of these processes permitted designing brief ACT protocols that proved

to be efficacious in improving elite chess players' performance (Ruiz, 2006; Ruiz & Luciano, 2009, 2012). These promising results warranted the examination of longer ACT interventions applied to chess players suffering from emotional difficulties. This study advanced in this direction by analyzing the effect of an ACT intervention on the chess performance of two elite players suffering from high anxiety levels. Both interventions were applied intensively in five sessions with follow-up contacts during a year and effectively treated anxiety disorders and improved chess performance.

One of the interventions (Case 1) focused on treating OCD and social anxiety, while in the follow-up contacts, more emphasis was dedicated to transferring what the player had learned to the chess arena. Raul showed an immediate improvement in chess performance parallel to increased chess-related psychological flexibility. This improvement was maintained during the 18-month follow-up. The other intervention (Case 2) was initially more focused on promoting psychological flexibility in the chess context because it was there where the player felt the most intense private experiences. Mario experienced an improvement in chess performance immediately after the intensive intervention, but a relapse occurred approximately after eight months. It is worth noting that this deterioration in chess performance occurred in tournaments that were especially difficult for the player and that the other therapeutic gains were maintained and even increased during this period. After some additional sessions, the intervention was considered finished, and Mario showed a significant increase in chess performance during the 18-month follow-up.

Some limitations and strengths of the current study are worth mentioning. First, the main limitation is that only two chess players received the intervention. However, on the one hand, it is important to consider that the potential number of participants is very low because, by definition, there are few elite chess players, and only some experience psychological disorders. On the other hand, single-case experimental designs seem the most appropriate methodology for the analysis of the effect of these processes. Second, the matched control participants had no contact with the experimenters. Accordingly, we cannot ensure that only possible positive expectations and higher motivation would lead participants to improve their performance. To balance these limitations, this study was conducted by considering Martin, Vause, and Schwarzman (2005) recommendations for research in sport psychology. For instance, participants were elite chess players who competed on a regular and organized basis, performance was measured directly with a highly reliable and valid chess performance measure, and the follow-up was unusually long.

In conclusion, this study provides additional evidence of the potential of ACT in improving elite chess players' performance, in this case, with those experiencing anxiety disorders. Further research might conduct a more systematic evaluation of the effect of ACT interventions in increasing chess players' performance suffering from psychological disorders.

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