

Effectiveness of “PIM” Training on Putting Performance and Pre-Competitive Anxiety of the Golfers

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Based on recent research, it is perceived by golfers that putting from six feet is more difficult than from 24, 12 or 3 feet (Ismail, 2014b). The objective of this study was to investigate the effectiveness of PIM training program on putting performance and precompetitive anxiety (i.e., cognitive anxiety and somatic anxiety) of the golfers. The golfers, comprising of sixty-three males with 1–3 years of golf experience were randomly apportioned to one of three groups. PIM group and CI group participants completed imagery together with physical practices while a control group completed physical practices only. The three assessments were conducted before 10 putting tasks. One-way repeated-measures ANOVA revealed that the PIM group improved putting performance and helped to reduce cognitive anxiety and somatic anxiety compared with the CI and control group. More studies should be conducted in the future, focusing on golfers that are skilled and of different gender and age groups.

Keywords: golf putting performance, PIM Training program, cognitive anxiety, somatic anxiety, putting distance

There has been an emphasis on the importance of imagery research by many authors to improve sports performance. The technique has gained popularity and is the most widely used by athletes. For example, a consciousness for the actual environment must be applied by the athlete especially when in a competitive environment (Holmes & Collins, 2001). Actual experience will be applied and thus help performer during practice (Garza, & Feltz, 1998; McKenzie, & Howe, 1997; Ramsey, Cumming, & Edwards, 2008). The term controllability on the other hand refers to a process of creating outcomes desired and image manipulation. As a matter of fact, a combination of awareness and vividness has to be combined for a condition that is similar (Morris, Spittle, & Watt, 2005). In imagery, you generally get what you envision, and you should envision what you want to happen to achieve the result (Short, Monsma, Short, & Harris, 2004; Moritz, Hall, Martin & Vadocz, 1996).

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Practice in Mind training program or “PIM” is another approach to perceive problems in implementing programs involving motor imagery (Mazlan, 2014). PETTLEP Imagery which was developed by Holmes and Collins (2001) is one of the criteria used in PIM training program. Based on this model, the ‘Physical’ aspect studies actual performance’s physical conditions of imagery reflected. For example, proper body position, grip and stance images should be assumed when mentally practicing putting skills. Based on Holmes and Collins (2001), when the skill is used in real performance the physical responses would then occur. The ‘Environment’ component is the similarity between the physical environment where imagery is performed and the actual environment where the golfer is performing. For instance, it is more ideal that putting skills are performed on real putting grass if not the real course itself. The ‘Task’ component emphasizes on making the imaged task as similar in terms of thoughts, feelings and actions when performing the actual task, while the ‘Timing’ component is defined as having the same pace when imagining the task and actually performing it (i.e., real time). For example, a successful putting task is timed starting from the moment they stood on the putting surface. This is then followed by replacing their marker and finally until sounds of applaud is heard from others for the successful task. The ‘Learning’ component is described as the application of a person’s imagination to match with the stage of learning they are currently at. For instance, when practicing putting skills, a golfer may think of proper movements as if they are actually performing. Next, a heavy imagery focus on correct methods on elements such as position of grip and alignment of body. Finally, the movement will become more effective when the skills get familiarized and changes can be made on the scripts as planned in their mind. The ‘Emotion’ component is a referral to all emotions aroused when imagining as well when actually performing. The final component, ‘Perspective’ refers to how closely the visual perspective would reflect when performing the imagery to when the task is actually performed (i.e., internal or external).

It is implied in previous studies that imagery is popularly used by researchers as a method used to improve golfer’s performance (Hall, Munroe-Chandler, Cumming, Law, Ramsey & Murphy, 2009; Memmert, Blanco & Merkle, 2009). For example, a modification on the concept of imagery direction in golf putting performance was done by Ramsey, Cumming, and Edwards (2008). A total of 75 participants were divided to 3 condition groups; facilitative imagery, suppressive imagery and control group. Results from the posttest showed that participants from imagery group performed better compared with suppressive imagery group. These findings show the effectiveness in using facilitative imagery when performing the task. This study concludes that motor skill performance is not influenced by debilitating imagery.

Based on Smith, Wright, & Cantwell, 2008; Smith, & Holmes, 2004, PETTLEP imagery is also considered to improve performance of golfers. In Smith et al. (2008), PETTLEP imagery was applied when taking bunker shots to improve golfer’s performance. Thirty-two male golfers who possess different levels of skills were allotted into separate groups; PETTLEP imagery, physical practice, PETTLEP and physical practice, and also control group. A response proposition script was given to all the imagery groups in this study (Smith et al. 2008). In a session, PETTLEP imagery group participants were required to integrate PETTLEP components and visualize 15 bunker shots twice weekly. While wearing golf clothes in a bunker,

the participants were required to stand and hold the sand wedge iron. Furthermore, the PETTTLEP imagery group participants were required to feel emotions based on the script given while performing in real time. Changes were to be made on the script if it was not suitable with their technique.

The PETTTLEP and physical practice group follows the same procedure as the PETTTLEP group and practiced PETTTLEP imagery once a week. 15 bunker shots were to be completed once a week. On the other hand, the control group only had to complete a reading of a golf champion's performance book. In this study, the pre and posttest of 15 bunker shots were assessed. In the posttest result, a noticeable improvement was apparent when the combination of PETTTLEP imagery and physical practice was applied. However, not much difference was noted between physical practice and PETTTLEP imagery. As a summary, the findings of this study support the efficacy in using PETTTLEP imagery to improve golf performance especially when it is combined with physical practice. However, a limited amount of literature is available on the study of PETTTLEP imagery effectiveness and gold putting performance.

The previous researchers also highlighted the effect of imagery on different anxiety levels. Ramsey and colleagues (2010) stated that anxiety could be manipulated through imagery to improve penalty taking performance. In this study, they found out that the emotion-based group (PETTTLEP model) was significantly helpful at interpreting anxiety symptoms in a more positive manner than the skill-based imagery group. They summarized that the stimulus and response propositions (based on bioinformational theory) were effective to be used when the emotion elements were involved during the performance (Ramsey, Cumming, Edwards, Williams, & Brunning, 2010). However, the question on the effectiveness of PETTTLEP imagery reducing the anxiety of golfers before the putting performance still remains unanswered.

Recent study found that golfers find it more challenging to perform a 6-feet putt compared with distances such as 3, 12 and 24 feet (Ismail, 2014b). The number of strokes it takes to get the ball to sink into a hole was taken into consideration. The result was consistent with the objective in identifying the specific distance which is perceived as the hardest to putt. Nevertheless, the effectiveness of PIM training program in specific; the study on anxiety level and putting performance from the 6-feet distance requires further research. Therefore, investigating the effectiveness of PIM training programs on a golfer's precompetitive anxiety (i.e., cognitive anxiety & somatic anxiety) before putting performance from the 6-feet distance is the objective of this study.

Method

Participants

The study were participated by 18–25 year old male golfers with a total of sixty-three participants ($M = 20.83$, $SD = 1.94$). The basis of this sample size is the number of golfers in the selected club (i.e., golf academy) and the participants also have never undergone any imagery training before. Less skilled golfers were used for this study, where participants has golf experience between 1–3 years ($M = 1.40$, $SD = 0.58$). As previously supported to improve the performance of the unskilled or

novices golfers produced significantly worse putting errors than the skilled golfers (Hayslip et al., 2010; Beilock & Gonso, 2008; Taylor & Shaw, 2002).

Materials and Procedure

PIM Imagery Intervention Guides. An imagery script where the functions of the seven PETTTLEP components comprising of; Physical, Environment, Task, Timing, Learning, Emotion, and Perspectives (Holmes & Collins, 2001) were studied. The script was developed by researchers to explore the relation between facilitative with stimulus-response proposition. All seven components of PETTTLEP imagery was applied in this study. For the Physical component, participants were required to wear proper golf clothing. The Emotion and Timing component requires the participant to envision in real time the moment they start walking to the green until they finally get a birdie. For the Environment component, the task was carried out 10 m from the actual green where they stood holding the putter on an artificial putting mat. In the Task component, the participants would then perform as they similarly would when performing the actual task. The Perspective component requires the participant to listen to a voice recording of their imagery script. As for the Learning component, participants were advised to make changes on the general script after each imagery sessions.

In this study, a digital voice recorder was used (Sony model ICD-P620). This is due to the fact that an audio aid used during imagery practice is convenient (Smith et al., 2008). Approval by three professional golfers who had teaching certification from Professional Golfers' Association (PGA) was gained before using the script.

Putting Task Performance and Scoring. The researcher provided five standardized competition golf balls (Titleist DT) for the participants. The putter used however belonged to the golfers themselves. For the putting task, an indoor mat with a 10 cm diameter hole on the end made of artificial grass (25.4 × 198cm) was provided. A total of 10 putts were required. The participants were scored based on the position of the ball after the putt. 5 points were given for every ball they holed in. Balls that were not holed in were given 3 points if it stayed at the lip of the hole, 2 points if each ball goes over the high side of the hole and 1 point for balls that pull up short and did not reach the hole. In the end, the participants were scored a maximum total of 50 points (Smith & Holmes, 2004).

The Revised Competitive State Anxiety Inventory-2 (CSAI-2R; Cox, Martens & Russell, 2003). CSAI-2R was used to assess anxiety before the putting task. The CSAI-2R comprises 17 items, with 7 items in somatic anxiety subscale and 5 items in each of the subscales of cognitive anxiety and self-confidence. The present study employs a precompetitive anxiety measure for the specific task (i.e., 6-feet distance) under study. Therefore, the self-confidence subscale of CSAI-2R was not considered for the current study. Examples of somatic anxiety items include "I feel jittery" and "My heart is racing"; Cognitive items include "I am concerned about losing" and "I am concerned about performing poorly". Subjects responded on a 4-point Likert scale comprising statements such as "not at all, somewhat, moderately, very much." In the current study, the Cronbach alpha coefficient was .74 and .76 for cognitive anxiety and somatic anxiety and these were considered to be acceptable values (Pallant, 2011).

Procedure

Before gathering the data in this study, ethical approval letters were issued from the internal research committee before the person in charge at the golf club was contacted personally. In the initial meeting between the golfers and club manager, the objectives of this study were explained in an informed consent letter. Participants were randomly assigned to one of three groups, (i.e., PIM group, conventional imagery, and control group (only physical practice) with 21 participants in each group. Participants were selected based on an imagery ability assessment. Self-assessment on their ability to visualize and also kinaesthetically apply the movement was required. They had to rate from 1 being very hard to see/feel to 7 being very easy to see/feel based on a 7-point Likert scale. This is then averaged to create visual and kinaesthetic subscales.

As recommended by the previous researchers, participants who underwent the imagery manipulation, were required to have MIQ-R scores of at least 5 and above or a minimal score of 16 (corresponding to somewhat easy to see/feel) (Ramsey et al., 2010, 2008; Short et al., 2002). Based on responses to the MIQ-R (Hall & Martin, 1997), all participants had adequate levels of movement imagery ability with scores of 16 or higher. To compare imagery ability scores between groups, an independent-samples *t* test was conducted. The result indicates equal imagery ability in participants before the intervention program.

Before intervention, the CSAI-2R questionnaire was completed. The participants performed 10 putts from 6-feet distance. The test was performed 10 m from the actual green on an indoor putting mat made of artificial grass to achieve a most similar putting environment as possible (Wright & Smith, 2009; Holmes & Collins, 2001).

During the 6-week intervention program, participants were instructed to complete the practice three times per week. The PIM group was divided into two separate training days due to the training place allocation provided by the academy. Eleven participants performed on Monday, Wednesday, and Friday while 10 participants performed on Tuesday, Thursday, and Saturday. Each PIM group participants carried out 10 imagery practices and 10 physical practices. A most similar environment as the actual putting surface was created by placing an artificial indoor putting mat 10 m away from it.

Each PIM group participant received the script. They were required to make changes based on their own putting skills during each session. Each of them listened to their voice recorder which contains their personal imagery script. Overall, it took 10 min for the imagery practices and 10 min for physical practices in this study.

The conventional imagery group also completed 10 imagery practices and 10 physical practices inside the golf club three times for 6-week program. However, the imagery script used consider as a normal procedure for conventional imagery method (Beilock & Gonso, 2008; Ramsey et al., 2008). They were advised to wear any clothes that they felt comfortable while practicing the imagery (Wright & Smith, 2009; Smith, Wright, Allsopp, & Westhead, 2007). Diary was used to obtain the detail about the program including the timing and imagery session being performed.

Control group participants performed only 10 physical practices at the actual putting green 3 times weekly for 6 weeks. They were asked to report the details of the program in a diary. The sessions were monitored by the coaches to pay equal attention as to the imagery groups.

The second assessment was conducted after 4 weeks of the intervention program. The third assessment was conducted after 6 weeks of intervention program and all participants completed the assessments for the third time.

Results

Preliminary assumption testing was conducted and the scores are normally distributed. The results of one-way repeated-measures ANOVA were performed for the putting performance, cognitive anxiety, and somatic anxiety scores across three assessments namely: pretest, second-test, and posttest in the PIM group, CI group and control group. The means and standard deviations are presented in Table 1.

Putting Performance

For PIM group, there was a significant effect on the three assessments, Wilks's Lambda = .35, $F(2, 19) = 17.33$, $p < .001$, multivariate partial eta squared = .65. Table 2 shows the pairwise scores for 6-feet distance putting performance indicate that the increase in the PIM training group from the pretest to the second-test ($M = 28.86$, $SD = 3.25$ vs. $M = 31.48$, $SD = 3.63$, respectively) is statistically significant ($p < .001$). There was a statistically significant increase from the second-test to the posttest ($M = 34.52$, $SD = 0.97$, $p < .05$). Finally, there is a statistically significant increase from the pretest to the posttest ($p < .001$). In addition, there was a significant effect on control group in the three assessments, Wilks's Lambda = .61, $F(2, 19) = 6.01$, $p < .05$, multivariate partial eta squared = .39. Table 3 shows the pairwise for 6-feet distance putting performance mean scores indicates that the decrease in the control group from the pretest to the second-test ($M = 27.38$, $SD = 4.30$ vs. $M = 24.71$, $SD = 3.96$, respectively) is statistically

Table 1 Descriptive Statistics for 6-Foot Distance Putting Performance, Cognitive Anxiety, and Somatic Anxiety For Pre-Test, Second-Test, and Post-Test in PIM Group, CI Group, and Control Group

Independent variables	Pretest		Second-test		Posttest		Dependent variables
	Mean	SD	Mean	SD	Mean	SD	
PIM group	28.86	3.25	31.48	3.63	34.52	4.42	6-feet distance Putting
CI group	27.14	4.51	27.19	2.25	27.00	3.15	
Control	27.38	4.31	24.71	3.96	24.95	2.85	
PIM group	12.43	2.25	10.24	2.32	10.24	2.77	Cognitive anxiety
CI group	10.57	1.54	10.43	1.57	10.76	1.76	
Control	11.00	3.12	10.43	2.84	9.76	2.98	
PIM group	12.62	2.31	10.43	1.96	9.10	1.90	Somatic anxiety
CI group	11.33	1.56	11.43	1.89	11.38	2.09	
Control	12.57	3.84	11.38	3.56	10.00	3.07	

Note: PIM group: Practice In Mind group, CI group: Conventional Imagery group

Table 2 Pairwise for 6-Foot Distance Putting Performance in PIM Group

(I) time	(J) time	Mean difference (I-J)	Std. Error	Sig. ^a	95% confidence interval for difference	
					Lower bound	Upper bound
1	2	-2.619*	.600	.001*	-4.185	-1.053
	3	-5.667*	.947	.000*	-8.141	-3.193
2	1	2.619*	.600	.001*	1.053	4.185
	3	-3.048*	.742	.002*	-4.985	-1.110
3	1	5.667*	.947	.000*	3.193	8.141
	2	3.048*	.742	.002*	1.110	4.985

**the mean difference is significant at the .01 level

a. adjustment for multiple comparisons: Bonferani

Table 3 Pairwise for 6-Foot Distance Putting Performance in Control Group

(I) time	(J) time	Mean difference (I-J)	Std. Error	Sig. ^a	95% confidence interval for difference	
					Lower bound	Upper bound
1	2	2.667*	.751	.006*	.706	4.628
	3	2.429	1.068	.102	-.362	5.219
2	1	-2.667*	.751	.006*	-4.628	-.706
	3	-.238	.862	1.000	-2.489	2.013
3	1	-2.429	1.068	.102	-5.219	.362
	2	.238	.862	1.000	-2.013	2.489

*the mean difference is significant at the .05 level

a. adjustment for multiple comparisons: Bonferani

significant ($p < .05$). There was no statistically significant difference in 6-foot distance putting performance in the posttest ($M = 24.95$, $SD = 2.85$) from the pretest ($p > .05$).

Cognitive Anxiety

For cognitive anxiety, the significant effect found in the three assessments for PIM group, Wilks’s Lambda = .56, $F(2, 19) = 7.52$, $p < .05$, multivariate partial eta squared = .44. The pairwise scores in Table 4 shows the cognitive anxiety mean scores decrease in the PIM group from the pretest to the second-test ($M = 12.43$, $SD = 2.25$ vs. $M = 10.24$, $SD = 2.32$, respectively) is statistically

Table 4 Pairwise for Cognitive Anxiety in PIM Group

(I) time	(J) time	Mean difference (I-J)	Std. Error	Sig. ^a	95% confidence interval for difference	
					Lower bound	Upper bound
1	2	2.190*	.716	.019*	.320	4.061
	3	2.190*	.713	.018*	.329	4.052
2	1	-2.190*	.716	.019*	-4.061	-.320
	3	.000	.910	1.000	-2.378	2.378
3	1	-2.190*	.713	.018*	-4.052	-.329
	2	.000	.910	1.000	-2.378	2.378

*the mean difference is significant at the .05 level

a. adjustment for multiple comparisons: Bonferani

significant ($p < .05$). The cognitive anxiety posttest also decreases from ($M = 10.24$, $SD = 2.77$) which is statistically significant to the pretest ($p < .05$). There was no statistically significant effect in the three assessments for CI group, Wilks's Lambda = .959, $F(2, 19) = 4.08$, $p > .05$, multivariate partial eta squared = .04. There was no statistically significant effect in the three assessments, Wilks's Lambda = .899, $F(2, 19) = 1.06$, $p > .05$, multivariate partial eta squared = .10.

Somatic Anxiety

Table 1 shows the statistically significant effect for PIM group in the three assessments, Wilks's Lambda = .385, $F(2, 19) = 15.18$, $p < .001$, multivariate partial eta squared = .62. Table 5 shows the somatic anxiety mean scores for the PIM group has a decrease from the pretest to the second-test ($M = 12.62$, $SD = 2.31$ vs. $M = 10.43$, $SD = 1.96$, respectively) which is statistically significant ($p < .05$). There was no statistically significant difference from the second-test to the post test ($M = 9.10$, $SD = 1.90$). The somatic anxiety posttest has also decreased in the pretest which is significantly different from the pretest ($p < .001$). Meanwhile, there was no statistically significant effect for CI group in the three assessments, Wilks's Lambda = .998, $F(2, 19) = .018$, $p > .05$, multivariate partial eta squared = .002.

The results also revealed that there was a statistically significant effect for control group in the three assessments, Wilks's Lambda = .538, $F(2, 19) = 8.16$, $p < .05$, multivariate partial eta squared = .46. Table 6 shows the somatic anxiety mean scores indicate that the control group has a decrease from the pretest to the posttest ($M = 12.57$, $SD = 3.84$ vs. $M = 10.00$, $SD = 3.07$, respectively) which is statistically significant ($p < .05$). There was no statistically significant difference from the pretest to the second test ($M = 11.38$, $SD = 3.56$). Finally, the second test also has a decrease in the posttest which is statistically significant ($p > .05$).

Table 5 Pairwise for Somatic Anxiety in PIM Group

(I) time	(J) time	Mean difference (I-J)	Std. Error	Sig. ^a	95% confidence interval for difference	
					Lower bound	Upper bound
1	2	2.190*	.675	.012*	.428	3.953
	3	3.524*	.623	.000*	1.895	5.153
2	1	-2.190*	.675	.012*	-3.953	-.428
	3	1.333	.607	.120	-.252	2.919
3	1	-3.524*	.623	.000*	-5.153	-1.895
	2	-1.333	.607	.120	-2.919	.252

*the mean difference is significant at the .05 level

a. adjustment for multiple comparisons: Bonferani

Table 6 Pairwise for Somatic Anxiety in Control Group

(I) time	(J) time	Mean difference (I-J)	Std. Error	Sig. ^a	95% confidence interval for difference	
					Lower bound	Upper bound
1	2	1.190	.642	.236	-.487	2.868
	3	2.571*	.642	.002*	.894	4.249
2	1	-1.190	.642	.236	-2.868	.487
	3	1.381*	.528	.050*	.002	2.760
3	1	-2.571*	.642	.002*	-4.249	-.894
	2	-1.381*	.528	.050*	-2.760	-.002

*the mean difference is significant at the .05 level

a. adjustment for multiple comparisons: Bonferani

Discussion

As previously outlined, it is apparent that the Practice in Mind “PIM” training program helps in improving golfer’s performance (Ismail, 2014a). The effectiveness of the program is shown where no improvement was seen in the only imagery group and only physical practice group (control group) when they performed putting tasks from the hardest distance (6-feet). However, results show significant improvement in putting performance by participants in PIM group during pretest to second-test. An even greater improvement was seen during second-test to posttest. Consistent to the findings in previous studies, this study shows that physical practice alone was not sufficient in improving the performance of a golfer unless they combine it with PETTLEP imagery (Ismail, 2014a; Smith et al., 2007; Wright & Smith, 2009).

Based on previous golf studies, similar findings concurs that PETTLEP imagery helped improving golfer's performance from a bunker shot (Smith et al., 2008). It is shown that the procedure used in PIM training program was effective for participants. The present study also highlights that no significant difference was shown in the conventional imagery group's (CI) putting performance from a 6-feet distance in the three assessments. However, the performance in conventional imagery group was better than the control group (only physical practice). The present study's effectiveness of PIM training program may be due to the sessions being monitored personally aside from listening to their imagery scripts (internal perspective). The participants in PIM group had similar emotions, task and physical components with the method proposed. Instead of using video or practicing at the real putting green, standing closer (10 m) to the actual putting green by holding the putter can also help golfers feel like the actual environment. The findings also supported the effectiveness of using audio modality to practice imagery compared with the written scripts (Smith & Holmes, 2004; Holmes & Collins, 2001).

Consistent with the objective of the current study PIM training program also helped to reduce the precompetitive anxiety of the golfers, but not for conventional imagery. The results revealed that the PIM group had a reduction in cognitive anxiety from pretest to second-test and posttest. Moreover, somatic anxiety was also reduced in PIM group compared with conventional imagery group. The results indicated that the PIM group had a reduction in somatic anxiety from pretest to second-test. Indirectly, the current study confirmed the importance of imagery on anxiety before task performance (Ramsey et al., 2010; Smith et al., 2008; Hale & Whitehouse, 1998).

There is a potential for golfers in the conventional imagery group and control group to feel anxious when performing in front of people with stress environment. The findings in the current study revealed that the somatic anxiety for control group is better than the conventional imagery group because of the conventional imagery group felt the feeling of choking when putting during the test. As also supported by the previous study, when golfers feel choked they led to make the putt faster and reduced accuracy (Gucciardi, Longbottom, Jay-Lee, Jackson, & Dimmock, 2010). Another probable reason would be the practice area where control group practiced at an actual putting green while conventional imagery group practiced inside the golf club on a putting mat. In regards to female golfers, the results obtained and the conclusions drawn from this study cannot be applied. Future studies should focus on skilled or low handicap golfers and golfers of different age groups (e.g., children and older golfers).

There Are Some Limitations and Recommendations in This Study:

- a. The sample of this study is limited to unskilled male golfers only. The findings obtained and conclusions that were drawn cannot be applied to female golfers. Hence future studies should focus on skilled or low handicap golfers and golfers of different age groups (e.g., children and older golfers).
- b. The present study involves a 6-feet distance reported to be the hardest distance to putt. This requires future research to use the hardest distance based

on quantitative evidence (i.e., putting test from different distances). It is also recommended for further research to use the efficacy of this method based on this distance.

- c. Future researchers should also explore the effectiveness of the PETTTLEP imagery precisely in its single component to investigate which component is strongly effective in PIM training program and improving putting performance from the hardest distance.
- d. Different imagery technical training aids may be more effective in investigating the effectiveness of PIM training program and this has not yet been comprehensively tested. Researchers may wish to examine the relative effectiveness of the PIM training program with audio-aided vs. written script or with video –aided.
- e. It is also possible to extend studies on the environment aspect for practicing imagery. For instance researchers may examine the different locations for practicing imagery. An example based on this study, actual putting green vs. practicing imagery in an artificial environment most similar to the actual putting green.

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