Research Journal of Education
ISSN(e): 2413-0540, ISSN(p): 2413-8886
Vol. 7, Issue. 4, pp: 161-167, 2021
URL: https://arpgweb.com/journal/journal/15
DOI: https://doi.org/10.32861/rje.74.161.167

Academic Research Publishing Group

Original Research **Open Access**

A Personal Account: Attaining Muscle Memory and Higher Mental Functioning

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Article History
Received: 23 August, 2021
Revised: 5 October, 2021
Accepted: 26 October, 2021
Published: 30 October, 2021

Abstract

Many articles have been written about elite performers that attain muscle memory and experience flow and zoneness. This article details how the author personally attained higher level performance and explains the feelings experienced during the process. A one-person study was designed to experience muscle memory and explore the mental aspects of putting. Twenty thousand attempts (strokes) were used. The design included four parts; a) Establish Baseline, b) Master Mechanics, c) Experience Muscle Memory, and d) Explore Mental Aspects. The conversion rate for the first 1,000 attempts during baseline was 58.3 percent and for the last 1,000 attempts was 90.4 percent. The concept of deliberate practice was used throughout the study showing performance increases. When experiencing muscle memory it was found to be boring and far from fun. When the mental aspects were explored the concepts of flow and pre-live generated enthusiasm and joy.

Keywords: Deliberate practice; Flow; Pre-live; Muscle memory.

1. Introduction

To develop and eventually master a physical skill requires learning the fundamentals of the skill and practicing until the physical movement becomes automatic.

Once the skill becomes automatic, the perfection of the skill requires enhanced concentration and focus.

Authors, researchers, philosophers, and theorists write about the mastery of a physical skill by studying, interviewing, and researching the performance of a subject or group of subjects. Examples include studying gifted athletes, concert musicians, master chess players, National Spelling Bee contestants, and cadets at West Point (Duckworth, 2016; Ericsson and Pool, 2017). None of the proponents attained mastery of the skill themselves nor personally experienced the process of perfecting the skill. This study details how the author personally attained a high level of performance and explains the feelings experienced during the process.

The purpose of the study was to personally experience muscle memory and to explore the mental aspects of putting.

The act of putting was performed on the practice greens of The University of Mississippi Golf Course and Mallard Pointe Golf Course both located in the northern part of Mississippi. The surface areas selected were as level as possible. The location of the cups changed throughout the study as determined by the course Superintendent who was independent of the study. The selected distance of the putt was determined by establishing a baseline conversion rate between 50 to 60 percent.

Once the baseline distance was determined, the distance remained the same throughout the study. Also, the same 10 golf balls were used. After each of the 10 balls was putted the conversion rate of the set was tabulated. After 10 completions of 10 sets, (10X10 = 100) the sequence of the 100 was totaled. After 10 completions of the 100 sequence (10X100 = 1000) the total conversion rate was recorded and placed on a line graph to be identified as a session. The study consisted of 20, one thousand sessions or 20,000 attempts (strokes).

2. Discussion

The fundamentals of physical skill are established over time and the fundamentals are used to teach and eventually learn how to execute the task.

Once the fundamentals are learned, what follows is practice. Repetition results in the task being performed with little or no conscious thought commonly referred to as ‘habit’.

Habits are learned functions that take over automatically: tying shoelaces, walking, riding a bicycle, driving a car, etc. The word ‘habit’ originally meant garment or clothing. Habits are garments worn by us. In the field of sport,

habits are referred to as muscle memory. Coyle (2018) refers to muscle memory as a way of connecting brain circuits to muscles.

There is a difference between scrimmage and practice. Scrimmage and repetition build muscle memory and by perfecting muscle memory through practice mental toughness evolves. Mental toughness is enhanced through deliberate practice. Deliberate practice is the purposeful working toward a goal while being pushed beyond the expected limit by using repetition and reflection (Ericsson *et al.*, 1993). Pelz (2000), slightly altered the term deliberate practice to perfect practice when researching the skill of putting a golf ball.

Zull (2004), indicated that neuroscientists found the brain physically grows during deliberate practice that is repetitive, challenging, and moves the individual out of their comfort zone. Haufler and Hatfield, well-known brain researchers, studied skilled and novice rifle shooters (Glover, 1998). They found, just before trigger pull, novice shooter's brain activation was scattered while skilled shooter's brain activation was more localized.

Through discussion and demonstration on how the brain works, novice shooter's brain activation can become more localized resulting in increased performance.

As mental toughness enhances concentration and focus, Csikszentmihali (1998), Maslow (1971), Tice (1989), Waitley (1983), Payne (2020), and many other authors contend the individual enters higher levels of consciousness referred to as flow, zone, and pre-live. This study describes what an individual experiences when attaining higher mental functioning.

3. Methodology

The design of the study included four parts:

Establish Baseline

Master Mechanics

Experience Muscle Memory

Explore Mental Aspects

Graph 1. Putting Conversions by 1000 attempts, shows the development of the study evolving from Baseline to Mental Aspects:

A baseline was established during the first session

Mechanics were established during sessions 2 – 4

Consistency of Mechanics was indicated in sessions 5 – 10

Session eleven shows the effect of disruption of study due to illness and coronavirus

Sessions 12 and 13 indicate a recovery period after seven months of termination

Muscle Memory was experienced during sessions 14 – 17

Mental Aspects were explored during sessions 18 – 20 which were believed to include concentration, focus, flow, and pre-live.

4. Results

Results are reported for each of the putting conversions by 1000 attempts as illustrated in Graph 1.

4.1. Baseline (Session 1)

A baseline conversion rate between 50 to 60 was determined by attempting 100 putts at distances of 5, 6, and 7 feet. The six-foot length was selected.

It is believed that when practicing a physical skill the success rate should be above 50 percent, otherwise the brain sends mixed messages to the muscles. The percentage of under 60 was preferred to allow for measured improvement or regression. Once the six-foot distance was established the first 1000 attempts resulted in a total of 583 conversions or 58.3 percent.

4.2. Mechanics (Sessions 2-4)

Best practices for teaching the mechanics of putting consist of two parts: setup and stroke (Payne *et al.*, 2013). The setup is how the ball is addressed which includes head placement, eyes, shoulders, forearms, grip, hips, knees, and feet. The stroke is the swing of the putter head which includes backswing, follow-through, striking ball on the sweet spot of the putter face, and putter face square to aimline sometimes referred to as target line.

4.2.1. Head and Eye Placement

Position head so the left eye is directly above the ball while the bridge of the nose is behind the ball. The head remains still through the putting process.

4.2.2. Shoulder and Forearm Placement

Shoulder and forearm placement is parallel to the aimline. At the moment of contact with the ball, the shoulder and forearm placement are parallel with the intended aimline.

4.2.3. Grip

The traditional grip was used with left hand up and right hand down. The firmness of the grip is similar to that used when holding the hand of a child. The lifelines of both hands face each other and are aligned parallel to the aimline.

4.2.4. Hip and Knee Placement

The upper body is tilted 20 degrees forming the position for an on-plane swing. Knees are slightly bent while hips are parallel to the aimline. Knees and hips are quiet during setup.

4.2.5. Feet Placement

Feet are placed the width of the shoulders. The feet are the foundation of balance which encourages a tension-free stance.

4.2.5.1. Set up Summary

Align all the parts of the body parallel to the aimline keeping head still.
The balance you start in is the balance you end in.
Stay tension-free.

4.2.6. Backswing and Follow-Through

The backswing and follow-through form an on-plane arc with the backswing being three inches and the follow-through three inches. The backswing and follow-through are executed with the shoulders rotating on-plane. Wrists are kept still.

4.2.7. Sweet Spot

The ball is struck on the sweet spot of the putter's face to eliminate the putter head twisting. The sole of the putter head is parallel to the ground.

4.2.8. Putterface Square

At impact the putter face is square, that is perpendicular, to the aimline. To make the ball go in the intended direction, the putter face needs to be square to the aimline. The sole of the putter head should be parallel to the ground and the ball should be struck on the sweet spot.

4.2.8.1. Stroke Summary

Drop putter head through the ball using a three-inch backswing and a three-inch follow-through.
The sole of putter head is parallel to the ground,
Putterface is square to aimline.
The ball is struck on the sweet spot of the putter's face.

4.2.9. Mechanics Results (Summary)

The mechanics of setting up and stroke were addressed during sessions 2 - 4. Conversion rates were 662 (66.2%) for session 2, 631 (63.1%) for session 3, and 650 (65.0%) for session 4 resulting in mastery of mechanics as indicated in session 5 with a conversion rate of 714 (71.4%).

4.2.10. Mechanics Notes

Reflection notes were taken throughout the study in the form of phrases or sentences as reminders of what to remember or insights of experiences. The following is a sampling of notes taken during sessions 2 – 4 while mastering the mechanics:

Left eye directly over ball, the nose behind the ball
Upper arms straight, use shoulders, no wrists
Align putter face
Pull putter straight back
Tip shoulders on-plane
Grip more firm
Right elbow away
No tension
Left elbow point at the hole
Wrists firm, don’t twist
Lead with a shoulder turn
Three-inch backstroke
Rock shoulders on-plane
Use straight spine shoulders, drag putter head back low,
Increase shoulder rock, on-plane, during the follow-through
Relax arms, elbows, shoulders

Insights during this period of the study indicated a curiosity and interest in the process. The situation was challenging and somewhat fun.

4.3. Consistency of Mechanics (Sessions 5-10)

Once the Mechanics of setup and stroke were mastered, that is learned, consistency of the putting skill was initiated using deliberate practice. Duckworth (2016), stated, "Consistency of effort over the long run is everything" (p. 50). Then she indicates that to accomplish a goal, one must put forth an effort, persist in adversity and maintain consistency (Duckworth, 2016).

Not all practice is created equal. There is a big difference between scrimmage and practice or specifically related to putting, smashing ball after ball on the practice green versus practicing with the intent to improve. According to Ericsson and Pool (2017), deliberate practice is the gold standard of practice. Deliberate practice is used to get better: Use best practices recommended by experts, identify weaknesses and correct them, and intentionally push oneself out of the comfort zone. To become consistent the components of deliberate practice were adhered to in this study.

Consistency was evidenced by conversion rates of session 5 which was 714 (71.4%), session 6 which was 710 (71.0%), session 7 which was 685 (68.5%), session 8 which was 703 (70.3%), session 9 which was 719 (71.9%) and session 10 which was 714 (71.4%). During the Consistency of Mechanics period, the challenge was to repeat what was learned in the Mechanics period regarding set up and stroke.

The reflection notes for the Consistency of Mechanics period repeated those noted in the Mechanics period but the repetition was no longer fun. The study turned into work and sheer perseverance.

During sessions 5 – 10 the task was to self-correct mistakes made in the setup and stroke. The specifics of what and how to execute the mechanics were known but the challenge was to execute the specific techniques consistently. It took 6,000 attempts (strokes) averaging 708 (70.8%) conversions to somewhat master consistency compared to 3,000 attempts (strokes) averaging 647 (64.7%) conversions to learn the mechanics of setup and stroke.

At the end of 10 sessions representing a total of 10,000 attempts, a disruption in the study occurred causing a delay of seven months.

4.4. Delay (Session 11)

Because of illness and the invasion of the coronavirus, the study was put on hold for seven months. After seven months the study resumed with session eleven showing a regression conversion rate of 632 (63.2%).

During this session, the reflection for the Delay period emphasized tension reduction, smoothness of stroke, and keeping head still.

4.5. Recovery (Sessions 12-13)

A recovery time was experienced during sessions 12 and 13. The conversion rates for session 12 were 743 (74.3%) and session 13 was 701 (70.1%).

During the Recovery period, the tabulations indicated a jerkiness in performance where spurts of conversions were followed by an array of misses. In lay terms, the putting got hot and cold.

The reflection notes during this period indicated confusion and frustration.

4.6. Muscle Memory (Sessions 14-17)

Muscle memory is when the physical action is performed automatically without consciously thinking. Coyle (2018) refers to muscle memory as a way of connecting brain circuits to muscles. In this study, muscle memory was built through deliberate practice. Through focused repetition and perseverance, an attempt was made to work the brain so hard it would communicate to the muscles what to do with little or no conscious effort.

During sessions, 14 – 17 muscle memory was experienced with conversion rates of session 14 to be 762 (76.2%), session 15 to be 745 (74.5%), session 16 to be 732 (73.2%), and session 17 to be 765 (76.5%).

Originally, it was believed when experiencing muscle memory it would be fun, possibly exciting, or joyful. It was none of these. It was work. It was habitual. It was like going to a factory doing the same thing over and over. During the 4,000 attempts of the Muscle Memory period, going to the practice green was just a part of a daily routine; get up, shower, get dressed, have breakfast, go putt. There was nothing curious, interesting, or exciting it was a relief to finish the putting sessions and go home.

It is interesting to note that Ericsson and Pool (2017) after studying gifted athletes, concert musicians, master chess players, and champion spellers, reported that improvement was hard, there were no shortcuts and practicing was not fun. These elite performers didn't like to practice but they did it anyway to improve.

During the Muscle Memory period, the average conversion rate was 75%. The mechanics were executed automatically without thought and when a putt was missed, the reason for the miss was immediately recognized; as an example, the ball was pushed or the putter's face was not square. Twenty-five percent of the time putts were missed but the reason for the miss was consciously recognized. It was interesting to note that after a miss was diagnosed the following attempt self-corrected itself. The diagnosis was conscious but each attempt during the Muscle Memory period was automatic without conscious thought regardless of the result of the previous attempt.

4.7. Mental Aspects (Sessions 18-20)

Beginning with session 18, something unusual happened. The conversion rate reached 845 (84.5%). Each attempt was initiated by excitement and eagerness. The anticipation before each attempt was met with enthusiasm. Even when an attempt was missed the following attempt was met with, "I can't wait to hit this one." The habit of muscle memory was replaced by mental toughness.

When a commitment is made to accomplish something by doing it repeatedly, mental toughness is developed. Theoretically, as a task is mastered over time (rather than just repeated) the brain activates so often and with such velocity, mental toughness automatically develops. It is not the perseverance, it is the accomplishment that leads to perfection which creates mental toughness.

The reflection notes during the initial Mental Aspects period emphasized excitement, enthusiasm, surprise, happiness, and even joy. Since the mechanics had been learned and muscle memory established, no mention was made regarding setup and stroke in the reflection notes.

Everything experienced in session 18 was carried over into session 19. However, concentration and focus were noticeably intensified. During session 19 every attempt was met with heightened concentration and laser focus.

It is difficult to explain but while concentration on the task was exemplified there was an acute awareness of what was happening in the present environment. There was an awareness of the visual surroundings including sound and smell.

Even though the visual, auditory, and olfactory modes were active, these external factors were automatically filtered out allowing for heightened concentration on the task.

Laser focus may best be described as seeing the dimples on the ball and the surrounding blades of grass. At times it was eerie. The conversion rate for session 19 was 907 (90.7%) and the reflection notes indicated a disconnect between the acute external awareness with such heightened concentration. Being able to count the blades of grass was mentioned in the reflection notes as mystical and somewhat scary.

As a sidebar, during session 19, a bug crawled across the green and although noticed it did not affect the heightened concentration or focus. It did not distract. Attempts continued, as usual, without hesitation until the bug got into the path of the aimline. As it entered the path of the aimline, attempts temporarily halted until the bug got out of the way. Once the bug got out of the way, attempts continued, as usual, as the bug eventually left the practice green.

4.7.1. Flow

During session 19 it was believed that, at times, the concept of flow was experienced. Csikszentmihali (1998) has helped us understand the flow through his ideas about "the psychology of optimal experience." The flow is a state of mind in which people get so involved that nothing else matters. The experience is so joyful that they will continue in the activity over and over again even at great effort and/or sacrifice. When in the flow it is effortless, like being carried by a current. While experiencing the flow the activity is absorbing, interesting, and fun. Abraham Maslow (1968;1971), a famous psychologist and author refers to a flow-like experience as having a peak experience. To explain a peak experience, he uses a Japanese Zen-based word 'MUGA.' A MUGA is a state of experiencing something wholeheartedly, totally without thinking of anything else. Being without hesitation, inhibition, or fear.

To read about flow is one thing but to experience, it is difficult to describe.

4.7.2. Pre-live

The experiences of sessions 18 and 19 lead to an understanding of the concept 'pre-live' in session 20. Payne (2020), explains the concept of 'Pre-live' as follows:

During brain surgery, studies report that patients whose brain cells are stimulated with tiny electrodes to describe 'reliving' scenes from the past. Keep in mind, they are not remembering: they are 'reliving' the experiences. When in the zone, you experience sensations that allow you to 'pre-live.' In other words, you create the future rather than relive the past. When you 'pre-live, you experience an event wholeheartedly before it happens: you 'will' it to happen. People that get into the zone are actually pre-living that is, they are seeing, feeling, and experiencing a future event before it happens. In other words, they create the future.When 'pre living,' the mind tells the body what to do before the task is executed. In other words, the brain fires in the same way and location, before the task is executed, as it does after successful completion of the task. During pre-living the brain thinks the task has been completed before it has happened because the brain can't tell fact from fiction: What happened from what was imagined to happen.

The brains of Olympians and other high-performance individuals make the athlete believe they are going to be successful. This is where the confidence comes from. Through pre-living the activation is so intense the athletes progress from 'believing' they will be successful to 'knowing' they will be successful. They 'know' it because the brain has fired in such a way that the brain thinks the task has already been completed. Zoneness is when the athlete 'knows' they are going to be successful. Mastering the techniques of pre-living leads to being in the zone. (p. 30). Functionally, pre-live involves imagining an on-plane arc with a three-inch backswing and a three-inch follow through – an imagined ping sound from the putter face striking the ball – followed by an imagined sight and sound of a plunk – as the imagined ball drops in the cup. Instantaneously actual excitement is felt. Immediately after the excitement is felt the ball is struck and when the ball drops in the hole a second jolt of excitement is experienced.

4.7.3. Consecutive Conversions

The reflection notes from the Mental Aspects period suggested the change from boring to joyful may not have been from noting the increase of the percent of conversions but possibly the breakthrough may have been perpetuated by experiencing the dramatic increase in the number of 100 percent conversions per set of 10 attempts. See Graph 2, 100 Percent Conversions Per Set of 10 Attempts. Note the dramatic increase of 100 percent conversions per set during the Mental Aspects period of sessions 18 – 20.

4.7.4. Reflection Summary

The reflection notes indicated during the Baseline and Mechanics periods, sessions 1 – 4, curiosity, interest, challenge, and fun were mentioned. During the Consistency of Mechanics period, sessions 5 – 10, the study turned into work and sheer perseverance. Session eleven, Delay period, emphasis was on how to get back on track by reducing tension, smoothing out the stroke so it was not so jerky, and keeping head still. During the Recovery period, sessions 12 and 13, the reflection notes revealed confusion and frustration. The reflection notes during the Muscle Memory period, sessions 14 – 17 showed it was not fun. It was work and habitual. During sessions 18 – 20, Mental Aspects period, an abrupt change occurred indicating excitement, eagerness, enthusiasm, surprise, happiness, and joy.

5. Conclusion

A one-person study was designed to experience muscle memory and explore the mental aspects of putting. A baseline was established at six feet. Mechanics were first learned which included, set up and stroke. A period of sessions was devoted to developing consistency of what was learned regarding the mechanics of setup and stroke. In the middle of the study, a delay of seven months was experienced because of illness and the coronavirus. After the Delay, a period of recovery occurred followed by a period of Muscle Memory. A culminating event occurred during the last period of exploring the Mental Aspects of putting. Conversion rates were recorded per 1000 attempts and the study concluded after 20,000 attempts. The conversion rate at Baseline was 58.3 percent. The Mechanics period resulted in an average conversion rate of 64.7 percent. The conversion rate for establishing the Consistency of Mechanics was 70.8 percent. The Delay period recorded a regression rate of conversions as 63.2 percent. Recovery averaged 72.1 percent while the conversion rate for Muscle Memory rose to 75 percent. An abrupt change during the Mental Aspects averaged 88.5 percent. The increase in skill level as indicated by the calculation of conversion rates may have been a function of experiencing 100 percent conversion rates per each set of 10 attempts.

Muscle memory was defined as when an action is performed automatically without consciously thinking. The Muscle Memory period was boring and not fun. The Mental Aspects period indicated an increase in concentration and focus. The concepts of flow and ‘pre-live’ were explored. Experiencing flow and ‘pre-live’ was exciting and joyful.

In this study, it took 20,000 attempts to experience flow and explore the concept of ‘pre live.’

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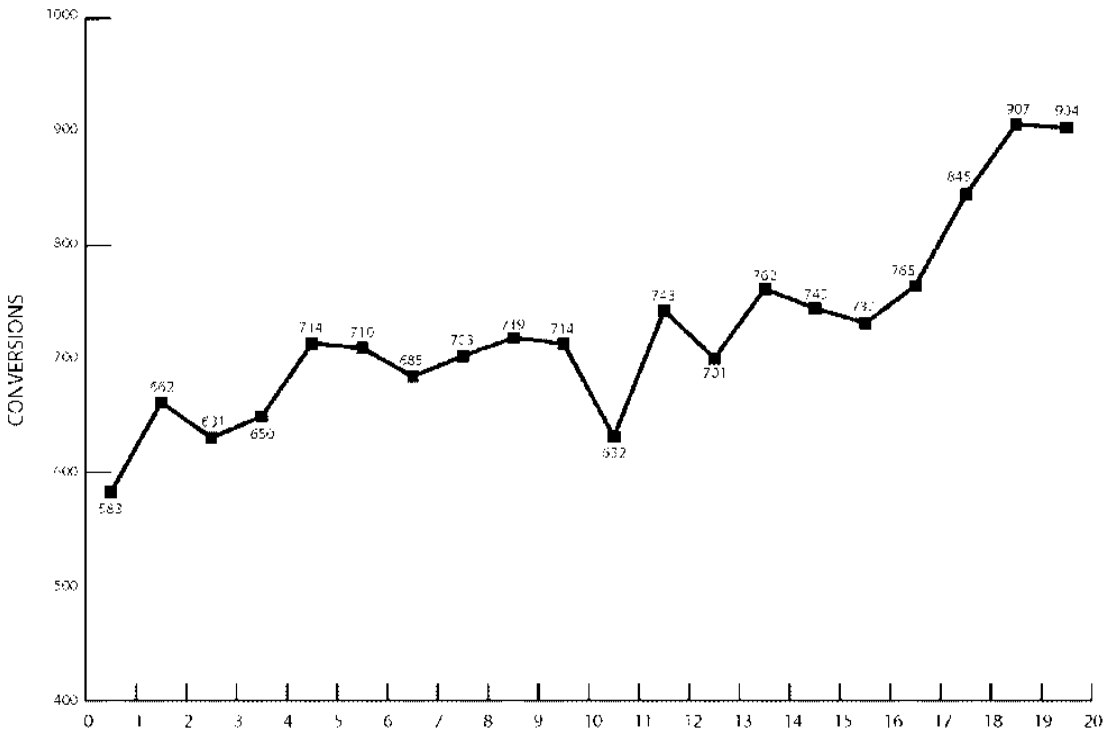
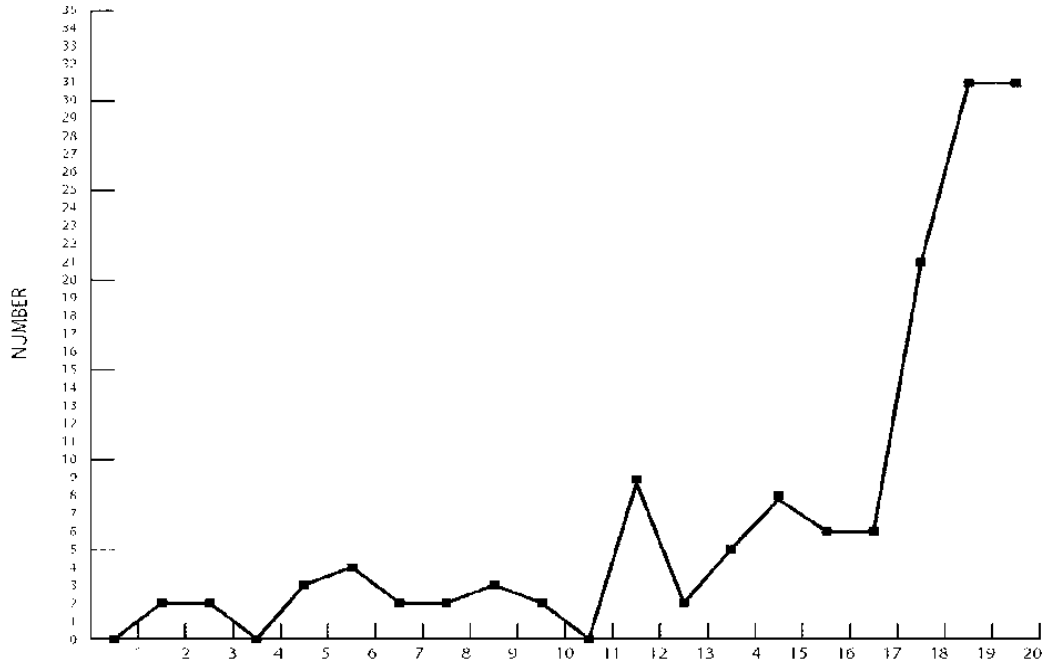


GRAPH 1. PUTTING CONVERSIONS PER 1000 ATTMEPTS



GRAPH 2. 100 PERCENT CONVERSIONS PER SET OF 10 ATTMEPTS