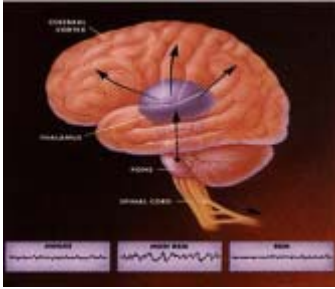


Association / Disassociation Theory



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Abstract

The following paper will provide a systematic review of the association/dissociation theory. These phenomena will be discussed in terms of various performance variables, which include both the ability to enhance and sustain intensity and duration during a given criterion task.

Introduction

Historically association/dissociation studies have their roots within research pertaining to pathological conditions. The American Psychiatric Association (1994, p. 477) defines dissociation as “a disruption in the usually integrated functions of consciousness, memory, identity, or perception of the environment. The disturbance may be sudden or gradual, transient or chronic.” Association, however, is concerned with attentional focus centered on reality. Over a quarter of a century ago, Morgan and Pollock (1977) conducted a breakthrough investigation in which cognitive racing strategies were assessed in a group of distance runners. This was the first study to deal with this phenomenon from an athletic standpoint. The results found that elite runners generally utilized association strategies, while sub elite runners utilized dissociation strategies. In this context association can be defined as a methodology in which the athlete seeks to “monitor sensory input, and adjust their pace accordingly, with the net pain (Morgan et al., p. 400).” Further, dissociative cognitive strategy can be defined as mentally disconnecting from “the painful sensory input (p. 390).” When viewed from an attentional standpoint, these terms are referred to as the allocation or directed effort of attention toward internal

(association) or external (dissociation) foci (Ogles et al., 1994). Internal focus occurs when attention is directed towards such cues as body awareness, heart rate, pain, and other physiological states. External focus is said to allocate attention away from bodily sensations.

As stated, much of the research has been concerned with pathological conditions. It is acknowledged that the concept of dissociation during athletic events does have

many similarities to the pathological condition. As an illustration, long distance cyclists may imagine themselves riding with their friends during childhood years, while an individual with pathological dissociation may also imagine themselves during childhood years. However, there is a marked distinction between the two. The former utilizes these strategies to avoid boredom or pain, while the latter is concerned with disruption of memory or mental consciousness associated with past disturbances. Ogles et al. (1994) investigated 131 marathon runners and found no significant relationship between their use of internal/external strategies and their counterpart clinical conditions. Therefore, the purpose of this paper was to analyze peer reviewed literature on association/dissociation strategies during performance events. Following, the results of these studies will be applied to methodologies concerned with optimizing hypertrophy, exercise adherence, and enhanced lipolysis (fat burning).

Analysis of Attention

The following will review various theories on attention, as this concept serves as a basis for the comprehension of association/dissociation theories. Wilson (2004), in a review on attentional mechanisms, showed overwhelming evidence that this construct was related to limitations in informational processing and therefore must be directed toward that which was optimal for the situation of interest. The renowned experimental psychologist William James (1890) suggested that attention was "the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought...It implies withdrawal from some things in order to deal effectively with others."

Perhaps no other concept in cognitive science has been studied so thoroughly as attention (Pashler, 1995, Weinberg & Gould, 2003), and yet only the surface has been scratched as to what it actually is. One of the more popular theories is to view attention as a sort of "capacity" (Schmidt & Lee, 1999) or fuel for information processing. This fuel is thought to have a limited space or ability to process information. The earliest capacity explanations were known as "Single Channel" theories. Welford (1952) suggested that attention was literally a single channel that could occupy only one stimulus at a time. However, the evidence is clearly against this, as it would render the capability of performing two tasks at once impossible. A more practical theory concerning attention was to view it as a reflection of how much fuel was being drained by a certain activity. Experiments were performed on such a concept using what is known as the "probe" technique. The probe technique uses a criterion task which serves as the dependent variable in the experiment.

A dependent variable in an experiment is what is affected by scientists as they change various parameters known as independent variables. For example, if knee extension strength were being tested at various angles, then knee extension strength would be the dependent variable, while the various angles would serve as the independent variables. The criterion task in the probe technique serves as the dependent variable. This task may be running, typing, or playing an instrument. The probe or independent variable is a second task which is introduced while the first task is being performed. If the second task interferes with the performance of the first task, then it is said to be attention demanding, and the amount of interference it causes reflects the amount of fuel that it utilizes. While this appears to explain attention to a greater extent than Welford's (1952) single channel hypothesis, it fails to account for other phenomena. For example, further experimentation has shown

that interference between tasks is literally task specific. Thus, performing activity A may be interfered with by introducing task B, but not task C, even though other experiments clearly show task C to be highly attention demanding.

This task specificity of attention led researchers (Wickens, 1980) to postulate that attention was not one fixed capacity but actually several pools of various capacities. Gould and Weinberg (2003), two highly respected Sports Psychologists, also lend support to this theory. It is thought that these multiple pools may be dedicated to such aspects as vocal stimuli, stimuli for taste, touch, and other phenomena. Such a construct would explain why one activity would interfere with task A, but not task B.

A further problem is that it appears that attention somehow adjusts to the demands of a situation. For example, as arousal increases, vision and attentional capacity may narrow, and if arousal increases to extreme levels, the individual may only be able to focus on a very limited number of stimuli. However, when relaxed, attention may be so widespread that it is difficult to focus on any one task (Schmidt & Lee, 1999). Such evidence led Kahnman (1973) to propose the flexible allocation theory. This construct predicts that attentional capacity is actually flexible and that more can become available depending on the nature of the task. However, limitations were still acknowledged.

If attention is a capacity, then evidence suggests it to be a combination of the multiple pool and flexible allocation theories. However, there are many other possibilities. Studies by Pashler (1984, 1995) and Neumann (1987) have strongly suggested that attention may not be a function of a fuel or capacity but rather interference. As a review, Lazarus proposed a theory known as Cognitive Appraisal. Cognitive appraisal states that individuals go through three stages of information processing. These are known as Stimulus Identification, Response Selection, and Response Programming (Schmidt & Lee, 1999).

In the Stimulus Identification stage, a stimulus is introduced into the environment. This stimulus could come from a coach telling an athlete to start a 100 meter dash. The Response Selection Stage is self explanatory, in that the individual literally selects out a response. In this case the athlete would most likely choose to contract his or her legs so as to start the 100 meter dash. In response programming, time to coordinate and direct neural impulses into motor neurons which ultimately control the musculature relevant to the task completion occurs (Henry 1957). That is, all the structures needed to perform the task selected are recruited, prepared, and finally used.

Neumann (1987) and Pashler (1984, 1995) have provided much evidence to suggest that early stages in information processing actually occur without the use of attention. Therefore, what seems to be an unlimited supply of information can stream into the human system of information processing without being obstructed. However, at later stages in information processing a filter or bottle neck may actually exist. This filter acts to disallow information which is not deemed to be relevant to the task. Further, the early stages of information processes are said to be subconscious, while the latter actually reach consciousness.

Therefore right now it is proposed that endless information is streaming into your processing system, but only a portion makes it past the filter or bottle neck. For example, currently you are intently focused on the article at hand. However,

sensations are also streaming in which concern your behind which is parked in the computer chair. Most likely these sensations were not felt until told to direct attention toward this region. This is an example of how the filter is proposed to operate. It is suggested to act as a protective mechanism. And evidence suggests that when one task is selected, others are blocked out by the filter mechanism so as to allow for task completion. If the task was important for survival, such as dodging a tackle in a football game, then the individual would not want it to be interfered with.

In summary, we see that each attentional theory points to limitations in human information processing, whether through capacity or filter theories. The association/dissociation strategies take advantage of this phenomenon. If the participant dissociates to external stimuli, then internal stimuli associated with pain will stream into the early stages of information processing, but will be filtered from reaching consciousness. The implications of this will be reviewed next.

An analysis of Studies Researching the Association Dissociation Phenomenon

Effects on Endurance

King (2004) discussed one of the earliest documented examples of the dissociation strategy through the following statements:

"According to ancient Greek manuscripts from about 490 B.C., there lived a man named Phidippides. Phidippides was a messenger for the Greek army. Back then, the only way to effectively send messages from town to town was by men who could run great distances in a short time. Phidippides was arguably the best. In 490 B.C., the first battle for democracy was fought at the Greek village of Marathon."

During this battle, Phidippides had to carry a number of vital messages over great distances.

King (2004) explains, *"Phidippides ran a total of 280 miles in two days and two nights. Back in Marathon, the Athenians banded together with the Plataens and Thespians and drove back the invading Persians without the aid of Sparta. Upon victory, Phidippides was ordered to run to Athens to spread the good news. Athens was a mere 26.2 miles away (the standard distance of a marathon today). Upon reaching Athens, Phidippides shouted the good news of the victory at Marathon just before he collapsed of exhaustion and died."*

It was also reported that he was a master of psychology, and that he would use the dissociation technique to separate himself from "the pain building up inside his legs and his lungs by reciting the Homeric poems. In fact, he was able to separate himself from the pain so much that he literally ran himself to death."

Today, evidence suggests that the dissociation strategy can indeed enhance endurance, both in running and non running studies. Weinberg et al. (1984) investigated the effects of association, dissociation, positive self-talk, or control on leg lifting endurance. Comparison of the various cognitive techniques on leg lifting performance found that dissociation and positive self-talk conditions resulted in

greater leg lifting endurance than both the association and control conditions. Gill and Strom (1985) investigated the effect of internal versus external focus while performing leg lifts. Performance was gauged as the total number of repetitions attained. Further, the same participants were tested twice, under both conditions. Greater leg lifting performance was found in the external condition than the internal condition.

In a note worthy study, Spink (1988) investigated the effects of association, dissociation, and dissociation combined with analgesic methodologies on a static leg lift task. The term analgesic can be defined as an insensibility to pain without loss of consciousness. Thus, participants were told before hand that the dissociation method was an effective means to reduce pain. Comparison of various cognitive conditions found the greatest static leg lifting performance in the dissociation-analgesic condition, followed by the dissociation condition. Performance was lowest in the association condition.

In summary, the evidence suggests that dissociation is correlated to greater endurance in tasks which are endurance specific. These tests do not demonstrate that participants would actually be able to obtain more repetitions in a high intensity exercise by dissociating. In this case intensity is defined as percentage of a one repetition maximum. In fact, the evidence leans against this.

Effects on Ability to Perform at High Intensity Tasks

To illustrate, Spink and Longhurst (1986) analyzed internal and external foci conditions on 400 meter medley swim performance. Therefore this experiment was not concerned with how long the participants could endure a given task, but rather how quickly they could finish it. Swim performance among cognitive conditions was greater in the internal condition than the external condition.

Such results can be traced back to the Morgan and Pollock (1977) study mentioned earlier. These investigators found that elite runners associated during a race while non elite runners dissociated. Therefore a trend toward faster run times and utilization of the associative strategy were noted. In a similar study Masters et al. (1989) ran correlations on a large distribution of marathon runners and found a significant relationship between associative strategies and faster run times. Silva and Applebaum (1989) investigated cognitive strategies of the first 50 athletes from the last 50 competing in the US Olympic marathon trials. It was found that the top 50 used associative strategies more than the lower 50.

It is also interesting to note that the relationship becomes stronger as the intensity of the race increases. That is, as the need for speed increases, so does the use of associative strategies. As an illustration, Tammen (1996) analyzed high level athletes in both middle and long distance runners. A direct relationship was found between running intensity and internal foci strategies.

As further evidence, Saintsing et al. (1988) found that associative cognition produced faster run times in the 1.5 mile race than both psyching up strategies and dissociation. It is important to note that the environment in which participants train highly effects their ability to perform. Much of this is due to psychological variables. Within this context, Pennebaker and Lightner (1980) studied an 1,800 meter run in two conditions. Condition one was performed on a trail, while condition two was

performed on a 200 meter track without much in the way of scenery. Faster run times were found on the 200 meter track than the trail condition. Further, the investigators concluded that the trail condition had more external attracters of attention than did the track condition, and this may be the reason for the faster run times.

What is also fascinating to note is that both elite and non elite runners typically prefer dissociation during runs while training, regardless of their preference during a race. Reasons for this will be discussed in the practical applications section. However, what should be noted is that training times are generally slower during training than during a competitive race. The relation seems obvious in that slower running times are correlated with dissociative strategies; this leads the discussion into why this may be the case.

Rate of Perceived Exertion

The rate of perceived exertion is certainly a key variable for differences in performance among cognitive conditions. Fillingim and Fine (1986) investigated the effects of association and dissociation on perceptions of fatigue during an indoor track running task. It was found that runners reported lower feelings of fatigue and pain during dissociation than association. Pennebaker et al. (1980) studied perceived exertion while participants ran on a treadmill. Participants were instructed to either focus their attention toward their own breathing rate, or to external sounds such as music. Results suggested that perceived exertion was lower when focusing on external stimuli. In another fascinating study, Wristberg (1990) investigated how perceived fatigue would be affected while participants looked in the mirror and monitored their breathing rates, as compared to watching a movie. Results showed significantly higher reported exertion rates in the mirror condition than the movie condition. Further, these results have been replicated by investigators such as Stones (1980) and Johnson and Siegal (1992).

The effect of internal and external foci on injury occurrence is also a main concern. If perceived exertion is lowered, it follows that injury occurrence may increase. In fact, Morgan and Pollick postulated that many injuries in runners they studied "could have been prevented had the runner not attempted to dissociate he painful input (p.401)." However, the relationship is not this simplistic, as a host of other variables come into play. It may surprise the reader to note that it is actually association rather than dissociation that may lead to injury.

Masters and Ogles (1992) studied the relationship between internal and external cognitive strategies and injury occurrence. Findings indicated no relationship between dissociation in running and injury occurrence. Further, these same investigators in 1996 found that athletes with higher injuries associated more than those with lower injury occurrence.

The current author theorizes that this may very well be related to the filter theories proposed by Neumann (1987). There is much evidence for the existence of such a filter, and it is measured by a concept known as "refractoriness." In experimental protocols a stimulus is introduced into the environment, and the participant is to respond to the stimulus. However, after the first stimulus has been introduced (S-1) a second stimulus is also introduced, calling for a second response (R-2). Refractoriness can be defined as the latency or delay that is seen in the reaction time

or time taken to initiate R-2, as compared to when it is done by itself. Continually it is seen that there is a relatively large delay (See Wilson 2004, on The Psychological Refractory Period and Attentional Mechanisms in Information Processing for a review). Thus, while S-1 is being processed and R-1 initiated, S-2 and R-2 appear to be somehow filtered out, which is what is seen in the refractoriness.

This filter appears to buffer information which is not deemed pertinent to the situation. And what is deemed pertinent is in much part controlled by the participant's own cognitions. Schmidt and Lee (1999) give an example of a social environment, in which the participant is able to have a conversation with relatively few people, while almost entirely ignoring the rest of what may be hundreds of other voices. This individual has decided that only the conversation he or she is in is pertinent to the situation. However, if suddenly their name is called out from somewhere in the crowd, their attention will just as suddenly be allocated toward the auditory signal. The filter is proposed to have allowed passage of the stimulus.

In a similar manner, McCaul and Malott (1984) suggest that dissociation is a tool for reducing pain and discomfort when the stimulus is low enough.

However, when intensity is very high, the dissociation loses its effectiveness. This theory is in line with viewing attention through filtration mechanisms. That is, a threshold of discomfort may exist in which the pain is deemed important to the organism and can no longer be buffered, much like a name being called out can enter through.

McCaul and Mallott (1984) propose that elite athletes are able to redefine or reinterpret the pain. This is known as Cognitive Reappraisal (See Wilson, 2004, A Psycho Somatic Approach to the Neurophysiologic Control of Movement Conducive to the Initiation of Hypertrophic Stimuli). For example, rather than interpreting the pain as a negative, the individual may interpret it as a positive stimulus which signals greater present and future performance. In this context, the individual will be able to go deeper into the Pain Zone. Tom Platz is known for coining this term, as he stated, "Welcome to The Pain Zone, this is where we live." As the individual pushes further and further limits, the risk for injury may increase, explaining the relationship found by Masters and Ogles (1996).

Practical Applications

1. Associative Strategies are correlated to greater performance under high intensity situations in which time constraints are involved. The greater the intensity, the greater the application for association becomes. The reasons for this are numerous. First, as has been seen, if a filter does indeed exist, there appears to be a threshold for painful or intense stimuli. By associating, it is thought that the athlete can reinterpret the unavoidable pain levels at high intensities to elicit lower emotive responses, or to deem them positive. As such, performance will be increased. Therefore during high intensity squats, or bench presses, or any intense lifting protocol, the dissociation strategy should be avoided, while the associative strategy should be adopted if optimal performance is desired.
2. Associative Strategies may improve elite's performance as they serve as a gauge for the athlete's current physiological state of being. For example a non invasive and

easy way to know what percentage of your V02 max you are at can be found by utilizing Borg's Rating of Perceived Exertion Scale. This scale starts at a rating of 6 and represents that the participant has no exertion at all, with a 20 being maximal exertion. The correlations between the scale and V02 max are high.

Table 1 – Relationship Between V02 Max and Rate of Perceived Exertion

V02 Max	Rate of Perceived Exertion
< 30 %	< 9 – Very Light
30-49 %	10-11 – Light
50-74 %	12-13 – Moderate
75-84 %	14-16 – Heavy
≥ 85 %	> 16 Very Heavy

That is one of many examples. As another illustration, it is also noted that perceived exertion is inversely related to glycogen storage. As glycogen levels lower, perceived exertion increases. Therefore the athlete can use this as a monitor of where he or she is at nutritionally. One of the key signs of over training is a drop in performance. However, usually before performance drops it is maintained for a few or several workouts, but with notably greater physiological and psychological effort. Thus, if you note greater effort for the same intensities, the correlation may simply mean that you need to increase your carbohydrates. The optimal time for this would occur post-workout (Knowlden 2003, 2004, Venom 2003).

Lactate Threshold is a further variable in which association strategies can work. The athlete who pays careful attention to internal factors can know approximately what level of V02 max he or she is at during any given racing speed. If at an elite level, the athlete will no doubt have tested when their lactate thresholds actually are in relation to their V02 Max. Lactic Acid is continually produced, but only accumulates when production exceeds clearance rates. When production does exceed clearance rates, then lactate thresholds are said to be reached. When this occurs, performance is lowered. Therefore the athlete wants to perform at as high a level as is possible of their V02 max, below lactate threshold.

3. In perhaps the most thorough review ever of the Satiety Mechanism, Venom (2004) showed overwhelming evidence that association strategies were correlated to higher levels of satiety. Therefore when calories are lowered, it would be best to concentrate on meals, as opposed to watching TV or listening to music. However, the opposite also holds true. When gaining weight, excess calories are taken in, which can in many cases prove difficult to consume. In this case disassociation strategies should be implemented.

4. For events in which duration rather than constrained or intense performance are vital, the dissociation strategy appears to be optimal. Therefore when performing cardio for the purpose of fat burning, outside distracters will correlate to longer biking times. In terms of weight training, high endurance exercises such as crunches can be coupled to dissociative strategies. It may also be beneficial when training with super high repetitions during seated calf raises, as the soleus is composed of over 90 percent slow twitch muscle fibers.

5. As noted, even elites would use dissociation during practice runs. This may be to avoid burnout and monotony. It is generally accepted that competitive times are

higher than training times. This effect is known as delayed transformation of gains and will be discussed in further issues. However, briefly, before competition the athlete will go through what is known as a restitution cycle which causes supercompensatory mechanisms leading to greater performances. There are conflicting views on attempting to train at competitive levels or training under competitive levels. First, to associate requires tremendous mental exhaustion. Arousal levels may be higher, and a feeling of mental fatigue will be more prominent. For example, after relatively few lifts in competition, weightlifters end up being absolutely drained for the rest of the week and then some, when compared to numerous lifts in training. This is in large part due to the mental fatigue experienced with competition. This mental fatigue can be avoided by dissociation during training for runners. However, the problem that occurs is centered on specificity. Transfer is greatest when the criterion task is performed closer to that which is desired. Therefore a combination of strategies may be used. This is fine for running, but is not highly recommended for weight training. External foci during a set of heavy squats could prove to be deleterious! The athlete may compensate by not always going for 100 percent of his or her load capacity, but to utilize the technique of tapering or cycling of training sessions. An example of this is found in the Cliff Hanger Series (Wilson, 2004), in which three workouts were cycled. Workout A was light, workout B was moderate, and workout C was extremely heavy. Therefore mental anguish as well as physiological overreaching was avoided.

Final Thoughts

Cognitive Strategies are of vital importance to the sport of bodybuilding. For this sport to progress, it will need to adopt a full onslaught of such techniques if new levels of muscularity are to be reached. The association/dissociation strategies certainly fall under this category and provide valuable tools in the optimization of hypertrophy, exercise adherence, and lypolysis (fat burning).

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