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The watercolor "Yellow Bouquet" was among McClure's pieces exhibited at the 2007 national convention. McClure graduated in 2007 with majors in English and art. Photo of the painting by Jordan Tubbs.

Shoulder Fatigue Following a Pitching Bout: A Case Study Examination of Time to Recovery

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Gregory W. Hess is an H. Y. Benedict Fellow for 2007-2008.

INTRODUCTION

This case study addresses the question of when, after a functionally demanding competition, is it suitable for baseball pitchers to return to the playing field. Currently there exist varying requirements between baseball leagues as to when a participant may return to pitch. Some leagues base the rule on innings pitched (American Legion Baseball, 2006), some use pitch counts or age (USA Baseball Medical & Safety Advisory Committee, 2004), while others use traditions based on limited supporting evidence. To address this problem, this study examines two aspects of shoulder function as it relates to throwing. First, we characterize the nature of shoulder fatigue as it is sustained during game-like situations. Second, we track and examine the characteristics of the shoulder's physical recovery post-game. Our main focus is the shoulder complex, as it is frequently the location of greatest perceived fatigue and the most susceptible joint for injury while throwing. Performance-based regulations stipulating time to return to competition can be developed once fatigue and recovery are fully understood.

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Shoulder and Overhand Throwing

The shoulder or glenohumeral joint supplies a significant proportion of the force necessary to create a baseball's initial velocity. Yet it is only one of many body segments associated with the throwing motion, which is a full body movement, with actions at the trunk and lower extremities being as or more important for ball velocity development (Manske, Tajchman, Stranghoner, & Ellenbecker, 2004). Also, elbow, wrist, and finger movements contribute to throwing by fine-tuning ball direction and spin and creating force. Nonetheless, in contrast to other body segments, the glenohumeral joint's relationship to throwing fatigue and associated injury is evident. In a study by Olsen and colleagues (2006), 67% of pitchers surveyed stated they pitched despite a shoulder injury and 52% pitched despite shoulder fatigue. Further, Mullaney and colleagues (2005) described repeated overhead throws over multiple innings as resulting in shoulder fatigue and an increase for injury occurrence at the glenohumeral joint.

The actual motion of throwing at the shoulder has been described in four phases. The first phase is wind-up and cocking: the shoulder abducts and horizontally abducts slightly before maximal external rotation occurs, placing the humerus in its loaded position (Burmitt, Meira, & Davidson, 2005). The second phase is acceleration, when the shoulder produces its greatest proportion of throwing force. Internal rotation and extension are the predominant motions. The third phase is deceleration; here the shoulder attempts to slow the rapidly, internally rotating humerus (Mulligan, Biddington, Barnhart, & Ellenbecker, 2004). Internal rotation, extension, and horizontal adduction (Prentice, 2003) are the most pronounced movements. It is important to note that during the deceleration phase the rotator cuff's external rotators contract eccentrically to slow the joint's motion (Burmitt et al., 2005) to produce substantial torque at the shoulder. The final phase, follow-through, represents the time from maximal internal rotation to maximal extension, horizontal adduction, and adduction (Prentice, 2003). Overhand throwing, especially during the acceleration and deceleration phases that produce the greatest forces concentrically and eccentrically and result in the highest humeral velocities, produces an abusive event within the shoulder (Prentice, 2003). Combining these requirements with limited muscle and ligament rotation space and the inherent instability resulting from a shallow glenoid fossa makes injury highly probable (Starkey & Ryan, 2002), including impingement of the supraspinatus tendon and subacromial bursa. Chronic instability and tenosynovitis may also result (Starkey & Ryan, 2002). Fatigue predisposes the shoulder to these injuries (Noffal, 2003). Determining a safe, post-fatigue return to competition for pitchers may prevent the eventual development of injuries that can often change career or life.

General Muscle Fatigue

Olsen and colleagues (2006) suggest that injury risk increases 36 times at the onset of local muscular level peripheral fatigue. It can be caused by the body's energy, producing pathways' failure to produce, nervous system inhibition, and local muscle contractibility failure (Wilmore & Costil, 2004).

On the other hand, fatigue injury risk can also come from changes at higher centers of control in the nervous system, called central fatigue, a change in the efferent input from the central nervous system to the muscular synaptic level or a change in motor neurons' response to the efferent neural input (Taylor et al., 2005). One or both changes increase the

action potential threshold needed to initiate a contraction that produces force (Taylor et al., 2005). In a sense, the central nervous system decreases the muscles' force production ability in an effort to prevent injury (Michaut, Pousson, Millet, Belleville, & Van Hoecke, 2003). As functional fatigue accumulates, a congruent decrease in the glenohumeral joint's ability to sense joint motion, known as proprioception (Carpenter, Blasier, & Pellizzon, 1998), also occurs. A discrepancy at this level inhibits optimal control and coordination (Lee, Liao, Cheng, Tan, & Shih, 2003), further sacrificing the joint's ability to remain stable as the neuromuscular responses that normally balance the glenohumeral motions are delayed (Myers & Lephart, 2000).

Regardless of whether muscle fatigue is peripheral, central, or a combination of both, or results from changes in proprioception, for this study we define fatigue as the inability of a muscle or group of muscles to produce force following any exercise (Taylor et al., 2005).

Shoulder Fatigue

During overhand throwing, the shoulder must dynamically stabilize the joint throughout the entire motion. Peripherally, the static and dynamic soft-tissue components of the glenohumeral structure achieve this stability (Lee et al., 2003). Central fatigue and/or a combination of peripheral and central factors also affects stabilization ability. For example, decreased force production within rotator cuff musculature may contribute to insufficient dynamic stabilizing factors within the joint and supersede the protective function the central nervous system is attempting to provide (Michaut et al., 2003).

Peripheral feedback also plays a role. For instance, during pitching's deceleration phase, it becomes necessary to decelerate the arm using mechanoreceptors as feedback and preparatory guides (Myers & Lephart, 2000). In the glenohumeral joint, the rotator cuff external rotators achieve this deceleration (Brumitt, Meira, & Davidson, 2005) as they eccentrically contract to brake the internally rotating humerus (Mulligan, et al., 2004). Normally, the accepted ratio for external rotator to internal rotator strength is 66% (Mulligan et al., 2004), i.e., the internal rotators can produce 66% more peak force than the external rotators. With fatigue onset, Taylor et al. (2005) found a 45% decrease in initial force to fatigue force production ability in muscle. In all, the discrepancy between the shoulder's agonist and antagonist muscle groups may become compounded when fatigue accumulates and continued use of the joint becomes less than optimal and mechanically unstable (Carpenter et al., 1998). Fatigue during and/or following competition decreases the shoulder's dynamic stabilizing musculature beyond the point of effectiveness (Taylor et al., 2005). In this situation, stabilization been sacrificed and continued participation increases injury chances.

General Recovery

The stressor's volume, intensity, and frequency of exposure ultimately determine recovery from fatigue (Baechle & Earle, 2000). These factors each influence muscular level structural damage. Once damaged, changes in muscle fiber and contractile protein loss prevent the muscle from producing the same quantity of force (Lieber & Fridén, 2002; Wilmore & Costil, 2004). The necessary excitation-contraction coupling process fails; the muscles cannot perform as needed (Wilmore & Costil, 2004). If dynamically stabilizing musculature is not at maximum functional capacity, glenohumeral damage may result from compensation or poor biomechanics (Wilk et al., 2002).

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Associated with muscular components' structural damage is delayed onset muscle soreness (DOMS) that occurs after 24 to 48 hours after strenuous exercise (Lieber & Fridén, 2002). DOMS is thought to result from secondary effects after muscular structural damage (Lieber & Fridén, 2002). An inflammatory response occurs following the cellular membrane disruption to cause the sensation of muscular pain (Connolly, Sayers, & McHugh, 2003). The painful sensation may initiate an inhibition process at the spinal and cortical levels to prevent the motor system from functioning at full capacity (Bottas, Linnamo, Nicol, & Komi, 2004). In addition to pain, there exists a decrement in range of motion (ROM) and peak torque, and stiffness within the muscle (Cheung, Hume, & Maxwell, 2003; Lieber & Fridén, 2002). From these alterations, motor unit recruitment pattern compensation may produce an outcome of similar value but at a higher injury risk (Cheung et al., 2003). Also with DOMS, previously performed exercises become more intense and possess a higher probability for injury from an inability to perceive the impairment (Cheung et al., 2003). DOMS typically resolves around 5 to 7 days post stressor with the symptoms peaking between 24 and 72 hours following the event (Cheung, et al., 2003; Lieber & Fridén, 2002).

Present study

Limited investigation on recovery time following overhand throwing has been performed. Using two subjects, this study attempted to identify the degree of fatigue sustained during throwing, defined as a decrement in physical performance below a baseline level. The study also tracked the rate of recovery post-game, defined as the time necessary to reach baseline levels of physical performance. Finally, the study attempted to determine which of the motions tested correlated most closely with the act of throwing and the fatigue accumulated.

In all, the goal was to determine how long a time period the subjects required to fully recover from a stressful throwing bout. It was hypothesized that the degree of fatigue the subjects experienced would peak during the 24 to 72 hours following the game in accordance with DOMS; furthermore, full recovery was suspected to occur within 5 to 7 days after the pitching bout.

METHODOLOGY

Subjects

For this study, two Roanoke College affiliates and former athletes (1 faculty member and 1 student) volunteered for participation. The subjects (labeled S1 and S2 throughout the remainder of the study), both right hand dominant, were 34 and 21 years old, were 64.25 and 70 inches tall, and weighed 146 and 185 pounds, respectively. S1 had childhood experience with baseball, while S2 participated on the competitive level until the first year of college. S1 had a previous history of tendonitis in the dominant shoulder. S2 had a previous history of laxity in the dominant shoulder that required rehabilitation. Both were pain and symptom free when the study began and both reported resistance training on a regular basis. The Roanoke College Internal Review Board approved the procedures and consent form.

Measurements

Isokinetic testing was performed on the Cybex-II isokinetic dynamometer (Cybex-II Bay Shore, NY) and interfaced with HUMAC software (CSMI Waltham, MA)

that included testing and data collection protocols and a basic data analysis package. Internal and external rotation at 90° of abduction and 90° of elbow and extension in the sagittal plane were the motions performed (Cybex-II). To position subjects appropriately, all movements utilized the Cybex Upper-Body Exercise and Testing Table (U.B.X.T.) and two Velcro straps stabilized the subject on the apparatus.



Figure 1: Internal and External Rotation



Figure 2: Extension

The Cybex-II was calibrated using a standard procedure provided by the HUMAC software. Known weights of 70 and 5 lbs. were placed on a testing T-bar that moved through a predetermined range of motion (x) from 45° above horizontal, at a known rate (12°/s) and distance from the axis of rotation (30 inches). As the T-bar passed a pre-determined position, torque was calculated. Using these known points, a regression function was determined for this range of torque values (CSMI Waltham, MA). Within the range of positions (180°) and range of torque values (20 – 100 ft lbs.) examined in this study, the Cybex-II is accurate up to approximately ±3.0° and ±2.5 ft lbs, respectively. It is repeatable, day-to-day, ± 1.0° and ± 1.0 ft lbs, respectively (Cybex-II: Isolated-Joint Testing & Exercise, 1980).

Procedures

Subjects met at the Health and Human Performance (HHP) Lab at Roanoke College’s Department of Health and Human Performance for all but one of the testing sessions. The pitching bout was held in the Alumni Gymnasium. Subjects took part in seven testing sessions (see Figure 3), totaling approximately 4 hours.

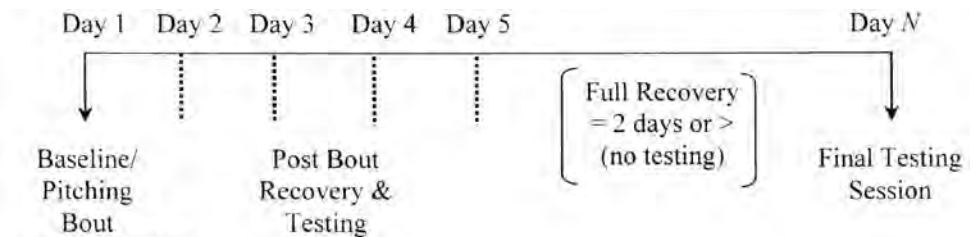


Figure 3: Timeline

The baseline testing phase (Day 1) included anthropometric and physical measurements related to pitching and the initial isokinetic testing on the Cybex-II. Each subject’s height, weight, arm length, and leg length were measured. Each subject’s throwing shoulder was assessed for Range of Motion (ROM) using manual passive goniometry on an examination

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table. Internal and external rotation were assessed in the supine position with the arm positioned at 90° of abduction and 90° of elbow extension. Extension required the subject to be prone. Adduction and abduction were assessed supine (Norton & White, 1985). Background questions included glenohumeral injury history and current strength training status.

Each isokinetic testing condition contained a warm-up of 4 repetitions followed by 6 maximal efforts at 300 °/sec and another warm-up of 4 repetitions followed by an 18 repetition bout at 300 °/sec with sixty seconds of rest between the 6 and 4 repetitions. The rest between warm-ups and maximal tests was 10 seconds. To ensure accurate and efficient dynamometer and related apparatus set up for ensuing tests, height and positioning measurements on the Cybex-II were taken and recorded for each subject and the U.B.X.T. positioning for each marked on the floor with tape. During testing, the investigator provided consistent verbal encouragement and periodic repetition status. To control for possible fatigue, conditions were alternated day-to-day.

After the baseline phase, subjects met in the Alumni Gymnasium for simulated pitching. Each subject threw approximately 60 pitches at a distance of 60 feet at a target resembling a baseball strike zone (approximately 2 feet by 3 feet). Time between pitches was approximately 20 seconds, resulting in approximately 3 pitches per minute and 20 minutes for the entire session. The researchers felt it unnecessary to simulate time between inning and that without the recovery period intrinsic in a game fatigue might also be maximized. Nonetheless, future studies will simulate pitching and time between pitches and innings so the functional decrement in performance observed at the shoulder will more closely approximate what athletes actually contend with during and after a game.

Following the baseline session and pitching bout, subjects reported to the HHP Lab for Post-fatigue (days 2 – 5) and Final Rested phases (at least 2 days following the last post-fatigue session) for isokinetic measurements identical to the baseline procedure.

Data Analysis

For each movement, the HUMAC software calculated key measures associated with the shoulder's functional performance including peak torque and range of motion (ROM). Peak torque, measured in foot-pounds, was the maximum torque produced during the 5 repetition condition. ROM was determined as the maximal motion in either movement direction from a set neutral position.

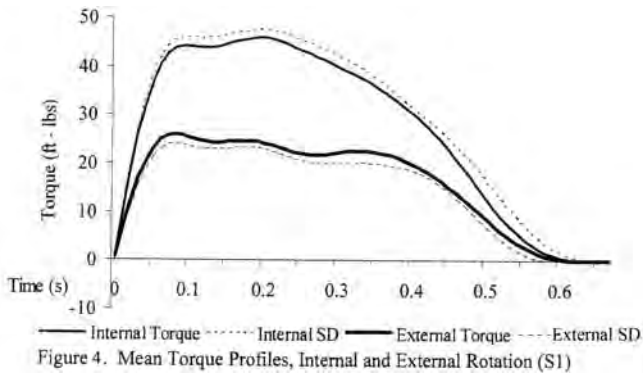
Difference Score

To make comparison across subjects from expected differences in overall peak torque production, peak torque values were converted to a percentage of the difference score from Baseline testing: Equation 1: $100 - [(Session\ Peak\ Torque / Baseline\ Peak\ Torque) * 100]$

RESULTS

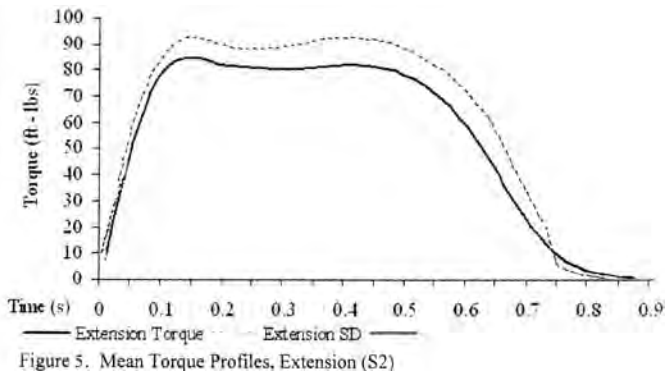
Torque Profile

Figure 4 shows a characteristic torque profile exhibited by S1 for internal and external rotation, respectively. There is an early and rapid rise in torque production, with S1 reaching peak torque in both internal and external within the first 0.2s of an approximately 0.6s motion. Internal rotation produces approximately 60% more torque than external rotation, consistent with previous studies (Mulligan et al., 2004).



The dashed lines, representing standard deviation (SD) above (internal) or below (external) the mean, emphasize the high level of consistency S1 maintained from repetition to repetition. Torque profiles between the two subjects varied slightly, but these three general phenomena were observed in both.

Figure 5 shows a characteristic torque profile exhibited by S2 in extension. Although similar to internal and external rotation (Figure 6), slight variations can be observed in the torque production's overall pattern and the total torque produced; there is a slightly longer repetition time and greater peak torque in extension than in internal rotation. These differences are to be expected, especially when considering peak torque. In extension a larger moment arm (0.25m) contributes to the production of this movement pattern. Nonetheless, both subjects are relatively consistent day-to-day in overall movement time (for the entire condition) and repetition time (for each full repetition counted).



Range of Motion

For all movement conditions and testing sessions (Figures 6 and 7), subjects reproduced consistent and reliable movement patterns within and across testing days. The lone exception was with S2 in extension. Following baseline, S2 exhibited variance between Post 1 and Post 3, increasing the range of motion approximately 40° throughout the sessions. After Post 3, S2 maintained this new range for the remainder of the testing days. Overall, both subjects successfully performed the motions necessary for collecting reliable peak torque data.

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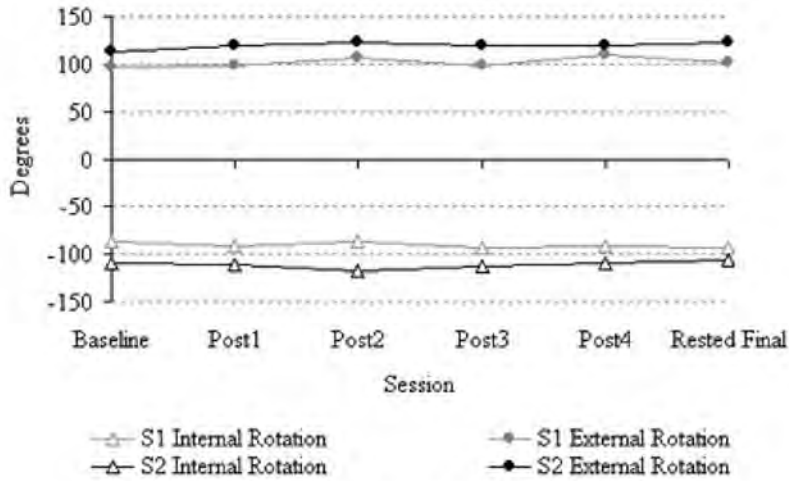


Figure 6. Internal Rotation & External Rotation, Range of Motion

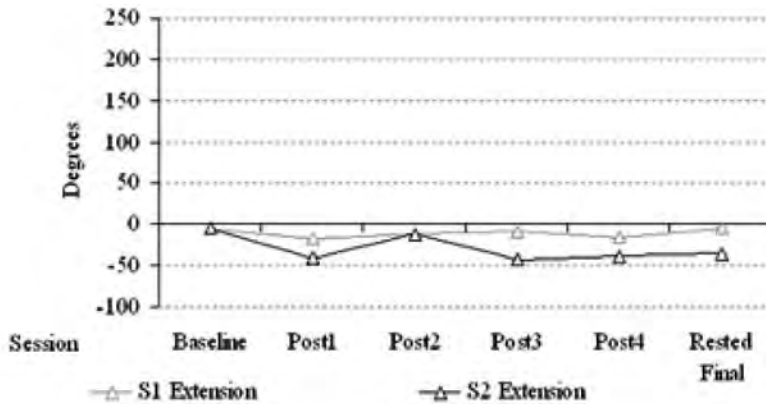


Figure 7. Extension & Range of Motion

Internal Rotation Peak Torque

Both subjects displayed a decrement in internal rotation peak torque immediately following the pitching bout (Figure 8). After Post 2, both subjects appeared to begin recovery. S1 did not fully recover until Rested Final and showed a varied recovery pattern, improving Post 3 and again demonstrating decrement Post 4 (- 17%). S2 recovered Post 3 and exceeded original baseline measures by approximately 7%. However at Post 4, S2's peak torque dipped slightly below baseline again (- 3%). Both subjects exhibited full recovery upon Rested Final testing. S1 was slightly above Baseline at 3%, while S2 well surpassed Baseline with a 19% improvement. This appears reasonable following S2's earlier adaptation on Post 3 where he exhibited a 7% increase over Baseline.

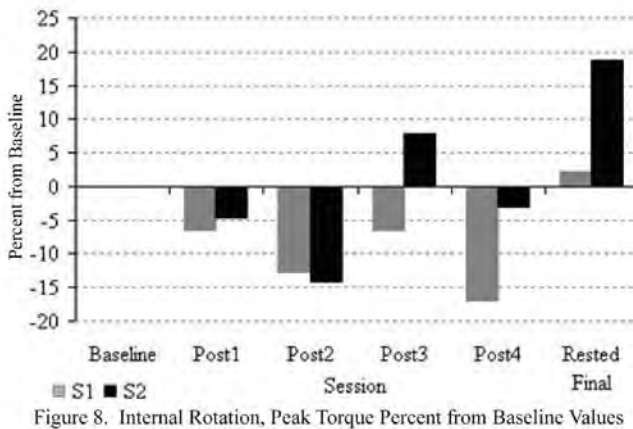


Figure 8. Internal Rotation, Peak Torque Percent from Baseline Values

Extension Peak Torque

Both subjects displayed a decrement in extension peak torque immediately following the pitching bout (Figure 9). After Post 2, both subjects appeared to begin recovery. S1 and S2 both required the entire study length to fully recover to Baseline peak torque values. S1 recovered slightly Post 3 (-12%) but the value again fell Post 4 (-23%). S2 showed a steady recovery pattern from Post 2 (-21%) until Rested Final with a peak torque 1% above Baseline. In all, full recovery time was beyond the hypothesized (5–7 days) for both subjects.

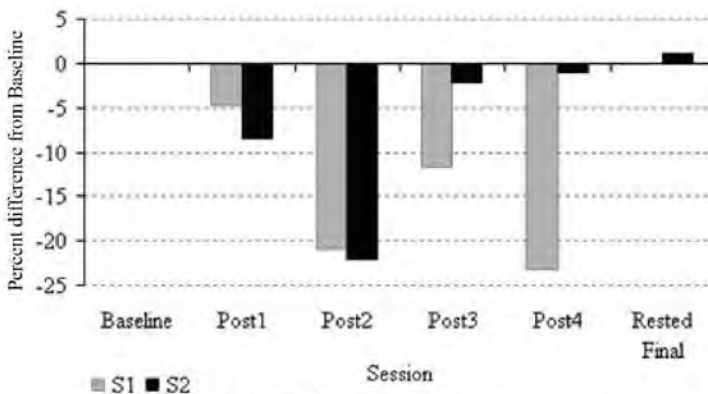


Figure 9. Extension, Peak Torque Percent from Baseline Values

External Rotation Peak Torque

S1 and S2 varied significantly in external rotation (Figure 10). S1's peak torque actually improved following pitching, while S2 displayed the expected decrement and recovery pattern. S1's peak torque improvement was close to 20% above Baseline during two sessions (Post 1 and Rested Final) following pitching. S2, on the other hand, demonstrated a maximal peak torque decrement Post 2 (-29%) and required the entire study duration to demonstrate recovery. Upon Rested Final testing, both subjects were substantially beyond the Baseline peak torque, with S1 at 20% and S2 at 28%.

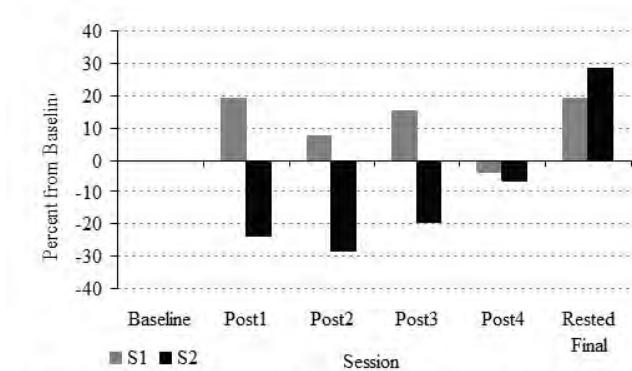


Figure 10. External Rotation, Peak Torque Percent from Baseline Values

DISCUSSION

The present results indicate that internal rotation and extension show similar decrements in peak torque production and comparable recovery patterns following pitching. Furthermore, peak torque values for both internal rotation and extension are greater than baseline values after full recovery. Much shoulder function research includes isokinetic internal rotation studies, but few have given equal attention to incorporated extension. Extension creates the same fatigue and takes the same recovery time so it should be included in examinations of shoulder function and recovery following pitching.

Another interesting finding is external rotation's subject-dependency in peak torque decrement and recovery patterns as S2's peak torque values increased above baseline, overall, while S1's showed a decrement and recovery pattern similar to those for internal rotation and extension. These findings support the notion that previous experience and/or throwing mechanics may play a major role in how fatigue occurs across the shoulder musculature because of pitching. Other key motions – specific to the subject – also need to be examined post pitching as they too are important recovery process evaluation.

Finally, peak torque values above Baseline over testing indicates the possibility of a learning effect. Even with systematic, anatomical positioning and practice trials included in the current protocol, as subjects used the Cybex-II day-to-day they improved in the tested motions and therefore generated higher peak torque values upon full recovery and, at times, even the day after pitching.

Internal Rotation

Internal rotation is the main force producing component during acceleration and so unsurprisingly produces fatigue (Prentice, 2003). Following a stressful throwing protocol as in this study, the shoulder musculature that produces internal rotation would be expected to demonstrate fatigue (Brumitt et al., 2005) and both subjects demonstrated a strikingly similar fatigue pattern during the first and second days following pitching.

On the other hand, internal rotation recovery patterns were different across subjects. Even though S1 and S2 both began recovery after the second testing session, S1 remained slightly below Baseline levels (- 6%; a 6% increase) while S2 exceeded Baseline levels

(7%; a 21% increase). Post 4 testing again showed signs of continued recovery for both as peak torques fell or remained below baseline. Finally, after 8 days or more of rest, both subjects reached or exceeded Baseline peak torque values.

It must be noted that differences in internal rotation peak torque recovery time between subjects may have been due to S1's non-participation in organized baseball following childhood that may have prevented adaptation and development for throwing requirements and stresses, unlike S2 who played until the first year of college. The mechanics each used may have also contributed to recovery differences. Depending on velocity and technique, S2 may have been more efficient in the throwing motion which may have allowed for a more rapid recovery.

Extension

In addition to internal rotation, extension plays a significant role in the throwing motion. It is logical to expect musculature that adds to force produced by internal rotation to accumulate fatigue during and following a pitching bout (Brumitt et al., 2005). This case study's findings support this and suggest that extension should be examined also when examining pitching fatigue and recovery.

Like the findings in internal rotation observation, S1 and S2's recovery patterns differed in extension. Once again this may have been related to previous baseball experience and/or differences in throwing mechanics and may explain S2's more rapid and steady recovery. Nonetheless, the second day following pitching, both displayed similar peak torque decrements: S1 with 21% decrement and S2 with 22%. Following Post 2 both began to recover.

DOMS Impact

For internal rotation and extension, each subject's largest peak torque decrement occurred on the second day, perhaps because of Delayed Onset Muscle Soreness (DOMS). Connolly et al. (2003) stated that DOMS-related strength loss usually peaks within 48 hours of dysfunction. Cheung et al. (2003) added that peak torque deficits occur maximally 24 to 48 hours following an exercise initiating DOMS. In this study, the peak torque findings from the second day appear to agree with how DOMS manifests itself in human force production. Further, this study's subjects both recovered in the five-day time frame identified by Connolly et al. (2003).

External Rotation

In external rotation, baseball experience and throwing mechanics may have played a significant role in peak torque production differences between subjects. Due to more throwing experience, S2 may have pitched with better mechanics and therefore a higher arm (and ball) velocity, with possible substantial deceleration actions from the eccentrically contracting external rotators during the follow-through phase, causing external muscle group fatigue (Manske et al., 2004). In fact, Post 2 testing for S2 coincides with Pettitt et al.'s (2005) report that the second day following an eccentric exercise exhibits the greatest DOMS. On the other hand, S1 may not have required the same deceleration actions from the external rotators due to a lower arm velocity and therefore less stressful eccentric mechanics.

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Learning

At Rested Final for three of the four motions as in several other sessions following pitching, considerable increases in peak torque above Baseline were observed, from from 15% to 50% above Baseline, from increases in muscle strength or subject learning. Generally, increases in strength from muscle hypertrophy are unlikely because of relatively short exposure with the isokinetic device (Prevost, Nelson, & Maraj, 1999). Learning, on the other hand, is more probable.

In all likelihood, subjects became more familiar with tests and requirements associated with each testing position and motion and each may have developed his own strategy for completing the tests with maximal effort. In this case study, all increases above baseline may have resulted from some form of learning. In fact, based on the extent of improvement we observed, it is possible subjects were learning even during recovery's early phases, which leads to the possibility that the peak torque decrements were actually less than they normally would have been, as the positive learning effect offset negative values. For future studies, a week of isokinetic familiarization should be instituted before Baseline values are collected to prevent excessive peak torque gains due to learning effects (Prevost et al., 1999).

Future Methodological Directions

In the future, several methodological considerations should be addressed. Using Electromyography (EMG) and isokinetics simultaneously may provide additional insight into neuromuscular pattern fluctuation during a similar fatiguing and recovery protocol. EMG might also be utilized during the throwing bout to gain physiological data about actual muscle firing patterns observed across the shoulder while throwing and compared to the isokinetic EMG data to see if muscle activity correlations exist between tested and real throwing motions. A learning study to determine the exact number of sessions required by subjects to adapt on the isokinetic device is needed to develop a familiarization program for subjects to normalize peak torque values before Baseline testing. Adding additional shoulder motions may prove beneficial, including horizontal adduction. Simply performing a similar study with its integration may provide insight on other fatigue aspects of throwing motion and function.

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The Effects of Violence and Competition in Sports Video Games on Aggressive Thoughts, Feelings, and Physiological Arousal

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ABSTRACT

This study investigated the effects of sports video games on aggressive thoughts, feelings, and physiological arousal in male college students. Four different sports video games were used. It was hypothesized that participants playing the violent competitive game would have higher heart rate and blood pressure, as well as higher scores on the State Hostility Scale and a higher ratio of violent words on the Word Completion Task. Significant effects found for blood pressure and heart rate did not support the hypothesis. No significant effects were found between groups on the State Hostility Scale or Word Completion Task.

The media tend to exert an unnatural and often unhealthy influence on our thoughts and actions. People are likely to mimic everything portrayed in the media, and this effect is especially worrisome when the behaviors are violent and aggressive. Numerous studies over the past few decades have documented the effect of violent content on behavior (Anderson, 2004; Thomas, 1982). Although the conclusions are not well accepted or even widely known among the public, the research indicates that violent media increase aggressive thoughts, feelings, and behavior.

Video games provide one example of media influence and may be particularly powerful due to their interactive nature. As more realistic games are created, it becomes important to understand how they affect behavior. One study reported that 71% of video games featured in arcades contained some form of violence (Lachlan, Smith, & Tamborini, 2005). Similarly, Dietz (1998) reported that 80% of the most popular Nintendo and Sega Genesis video games required the use of violence to attain goals. Lachlan, Smith, and Tamborini's (2005) analysis of the top 60 most played video games looked for violent content across genres, including sports, first-person shooter, fantasy, fighter-style, and racing video games. Violent characters and themes were presented in many of the games they analyzed.

The basic method used in experimental studies showing the effect of increased violent behavior was to use a fighter-style or first-person shooter game for the violent scenario and a puzzle game (i.e., Tetris) for the nonviolent scenario (Anderson, 2004; Anderson & Dill, 2000). The wide range of video games suggests, however, that results cannot be generalized to other game genres, for example nonviolent games that are not puzzles.

Researchers also have found that thoughts also become more aggressive following game play (Anderson & Dill, 2000; Carnagey & Anderson, 2005). Tamborini, et al. (2004), for example, found that participants who played violent video games scored higher on the Buss and Perry Aggression Questionnaire than participants who played a nonviolent game. Participants in another study self-reported having more aggressive thoughts and traits after playing a graphically violent video game (Uhlmann & Swanson, 2004).

Additionally, Carnagey and Anderson (2005) reported that participants created more aggressive words on a word fragment task after being rewarded for using violence in a video game. This study and others suggest that aggressive thoughts are more accessible to people immediately after they have been exposed to violent video games. A study by Bushman and Anderson (2002) provides further support for this conclusion by showing that participants had higher expectations that conflicts would be resolved aggressively after playing a violent video game.

Violent video games negatively impact emotions as well, resulting in players feeling more aggressive and hostile after playing. Arriaga, Esteves, Carneiro, and Monteiro (2006) measured state hostility as an indicator of aggressive affect and found that participants reported higher levels of hostility after playing violent video games. Furthermore, the study by Carnagey and Anderson (2005) reported that participants felt more hostile after playing a violent game regardless of whether or not they were rewarded for their violent acts. Other studies have found that hostility and aggressive feelings were increased more if a story line was present in the video game (Schneider, Lang, Shin, & Bradley, 2004).

Research has also looked at the impact of violent video games on physiological arousal. The results have shown that violent video games increase arousal as measured by heart rate, blood pressure, and skin-conductance response (Bushman & Huesmann, 2006; Arriaga, et al., 2006; Schneider, Lang, Shin, & Bradley, 2004). The interpretation of increased arousal as the output of aggression is supported by responses on behavioral measures, such as the reaction time task, and affective measures, such as state hostility scales.

The General Aggression Model (GAM) is a framework in which the effects of violent video games can be understood. The model incorporates person and situational variables (Anderson & Bushman, 2001). Violent media exert influence initially as a situational variable that influences the person's internal state (Bushman & Anderson, 2002). Aggressive

cognitions become more prevalent in the form of scripts and schemas learned through the game. In conjunction with aggressive thoughts and emotions, the video game may increase physiological arousal. Behavior may be immediately impacted if an appropriate situation in which to act out the aggression occurs (Carnagey & Anderson, 2005). The GAM suggests that, over time, exposure to violent media teach people new ways of perceiving events aggressively, and behaving accordingly (Anderson & Bushman, 2001).

The literature on video game effects suggests a link between violent content and aggression, but it is not comprehensive. For example, although increases in all measures of aggression appear general in their scope, only some people are led to extreme violence similar to what is illustrated in those video games. Most players do not engage in this type of behavior even if their aggression levels do increase after playing (Freedman, 2001). The violent behaviors modeled in

The literature on video game effects suggests a link between violent content and aggression, but it is not comprehensive.

most of the games studied may be too extreme for the average player to ever repeat. There is another type of popular video game, however, that models violent behaviors that are socially acceptable: sports.

Although some studies have found no difference between athletes

and non-athletes (Lemieux, McKelvie, & Stout, 2002), there is some evidence that athletes behave more aggressively than the average person. Wann (2005) found that athletes commonly use aggression during games to achieve goals and to harm other players. A study by Nucci and Young-Shim (2005) suggested that poor leadership and unhealthy competitive environments model aggressive behavior for athletes. The behavior is effective in the game, as well as encouraged, so athletes may learn and use them outside of the sport.

Based on the predictions of the GAM, situations that promote the development of aggressive scripts and schemas will lead to more aggressive behavior (Bushman & Anderson, 2002). A study by Anderson and Morrow (1995) found that people consider competition inherently more aggressive than cooperation. This suggests that competitive situations may be more likely to result in increased aggression than cooperative or noncompetitive situations. Because athletic events are generally competitive and may involve violence, they represent the type of situation that could result in more aggressive cognitions and affect.

This study examined the effects of sports video games on aggressive cognition, affect, and physiological arousal. Participants played one of four sports video games that contained varying levels of competition and violence. It was hypothesized that participants who played the violent-competitive game would have higher levels of arousal as measured by heart rate and blood pressure, aggressive thoughts as measured by the Word Completion Task (Anderson, et al., 2004), and aggressive feelings as measured by the State Hostility Scale (Anderson & Morrow, 1995) than those who played any of the other games. It was further hypothesized that the participants who played the nonviolent-noncompetitive video

game would have the lowest arousal, aggressive thoughts, and aggressive feelings. The other two video games, violent-noncompetitive and nonviolent-competitive, would result in arousal levels, aggressive thoughts, and aggressive feelings that fall between the other two types of games.

METHOD

Participants

Forty male students at Concord University voluntarily participated in this study. Three of the participants responded to signs posted around campus advertising the study and the rest were enrolled in Introductory Psychology and Sociology classes. The ages of the participants ranged from 18-27 years.

Materials

A Playstation 2 game system, a standard PS2 controller, and a 13-inch television set were used. Participants played one of four games, each representing a different combination of violence and competition. Tiger Woods PGA Tour 2004 was used as the nonviolent-competitive game and Fight Night 2004 was used as the violent-competitive game. The nonviolent-noncompetitive game was Tony Hawk Pro-skater 4 and the violent-noncompetitive game was Cabela's Deer Hunt: 2004 Season.

All participants signed an informed consent. They filled out a survey on their video game experience, which asked questions about how much they play video games and what types of games they play. A typed list of standard controls for each game was provided for each participant. Heart rate and blood pressure was measured using the Omron Automatic Extra Compact Wrist Blood Pressure Monitor.

The State Hostility Scale (Anderson & Morrow, 1995) was used to assess aggressive affect. This is a list of 35 statements describing how one might feel, such as "I feel angry." The scale is labeled Current Mood, so as not to bias the participants' responses. Participants must rank how much each statement describes them currently on a 5-point Likert scale. To measure aggressive thoughts, the Word Completion Task was used (Anderson, et al., 2004). This task requires the participant to create words from a list of 98 word fragments.

Procedure

Participants were randomly assigned to Group Golf, Group Boxing, Group Skateboard, or Group Hunt. After reading and signing the informed consent, the participant completed the video game experience survey. Following the completion of the survey, the experimenter immediately measured blood pressure and heart rate by placing the cuff on the participant's right wrist. The blood pressure cuff was then removed and the researcher informed the participant of what game he would be playing and gave him the appropriate control sheet. The researcher started the video game and left the room.

Blood pressure and heart rate were measured again immediately following 20 minutes of game play. Then the participant completed the State Hostility Scale. Afterwards, the participant was given three minutes to generate words on the Word Completion Task. The researcher then fielded any questions the participant had about the study and thanked him for participating.

RESULTS

The dependent variables in this study were heart rate and blood pressure before and after playing a video game, level of hostility after playing as measured by the State Hostility Scale, and the ratio of aggressive words to total words attempted on the Word Completion Task.

The mean difference in heart rate before and after playing the video game for Groups Skateboard, Hunt, Golf, and Boxing were 4.9, 2.0, 5.5, and -4.0 bpm (beats per minute), respectively. Pairwise comparisons were conducted and a significant effect was found between Group Golf and Group Boxing on difference in heart rate, $t(36) = 2.057$, $p = 0.047$. A minimally significant effect was also found on this measure between Group Skateboard and Group Boxing, $t(36) = 1.927$, $p = 0.062$. The comparison between the nonviolent video games (Group Skateboard and Group Golf) and the violent video games (Group Hunt and Group Boxing) also revealed a minimally significant effect, $t(36) = 1.899$, $p = 0.066$. No other significant effects were found for difference in heart rate, all t 's $(36) < 1.299$, all p 's > 0.202 .

Blood pressure was measured before and after participants played a video game. The mean pre-game systolic blood pressures for Groups Skateboard, Hunt, Golf, and Boxing were 119.1, 121.2, 128.3, and 119.2 mmHg, respectively. Post-video game mean systolic blood pressures for these groups were 113.9, 119.8, 120.4, and 118.4 mmHg, respectively. Multivariate tests were conducted and a significant effect was found for pre and post systolic blood pressures, $F(1, 36) = 1510.966$, $p < 0.001$, but no significant group interaction was found, $F(3, 36) = 1.798$, $p = 0.165$. For diastolic blood pressure, pre-video game means for Groups Skateboard, Hunt, Golf, and Boxing were 76.2, 76.5, 79.3, and 76.5 mmHg, respectively, and the post-video game means were 74.8, 70.1, 76.8, and 76.8 mmHg, respectively. Multivariate tests revealed a significant effect between pre and post diastolic blood pressure, $F(1, 36) = 7.652$, $p = 0.009$. There was no significant group interaction, $F(3, 36) = 0.841$, $p = 0.480$.

On the State Hostility Scale, the mean hostility levels for Groups Skateboard, Hunt, Golf, and Boxing were 77.3, 80.4, 72.2, and 87.7, respectively. Pairwise comparisons were conducted on the State Hostility Scale and found no significant effects, all t 's $(36) < 1.540$, all p 's > 0.132 .

For the Word Completion Task the mean ratios of aggressive words to total words for Groups Skateboard, Hunt, Golf, and Boxing were 21.23, 18.80, 18.69, and 22.48, respectively (see Figure 8). On the Word Completion Task, pairwise comparisons were also conducted and no significant effects were found, all t 's < 1.028 , all p 's > 0.311 .

Post hoc analyses also looked for the effects of competition in the games. Pairwise comparisons between the noncompetitive games and the competitive games found no significant effect on heart rate, blood pressure, the State Hostility Scale, or the Word Completion Task, all t 's $(36) < 0.827$, $p > 0.414$.

DISCUSSION

It was hypothesized that playing a violent competitive video game would result in more aggressive thoughts, feelings, and higher arousal than playing a video game with any other combination of violence and competition. This hypothesis was generally not supported and the results do not provide further support for the GAM (Anderson & Bushman, 2001) or for

past research on the effects of violent video games (e.g. Bushman & Anderson, 2002).

Furthermore, the significant effect between Group Golf and Group Boxing on heart rate was not in the hypothesized direction. Instead of increasing heart rate, which would have been consistent with past research (Bushman & Huesmann, 2006), the current study found that the violent video game *Fight Night 2004*, played by Group Boxing, decreased heart rate. Both of the nonviolent video games tended to increase heart rate. The other violent video game, *Cabela's Deer Hunt*, increased heart rate, but not as much as either of the two nonviolent games.

Blood pressure also yielded a pattern opposite from what was expected. Following exposure to the video games, participants showed a general decrease in both systolic and diastolic pressure that was significant and not related to which game was played. The only deviation of this pattern was in Group Boxing's diastolic blood pressure; a slight increase occurred after exposure to the video game.

Although it is not clear why the results did not reveal the expected pattern, a possible explanation is that participants had increased physiological arousal at the beginning of the experiment for any number of reasons. Anxiety about participating and recent exposure to certain substances, such as nicotine and caffeine, may have caused baseline blood pressure to be artificially high.

The county in which Concord University is located happens to have higher rates of cigarette smokers than the national average according to the West Virginia Department of Health and Human Resources (2004). West Virginia is also one of the leading states in prevalence of obesity, another cause of high blood

The scores on the State
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pressure (Centers for Disease Control, 2006). Without having health information on the participants, it is difficult to know how much these factors played a role in their physiological measurements.

The scores on the State Hostility scale were closer to the predicted pattern, but no significant effects were found. The Word Completion task added little information about any of the groups. One issue with the Word Completion Task is the ambiguity of some words and the fact that sometimes non-words can take on meaning. For instance, a majority of the participants responded with the "muggle" to one of the incomplete words, which is a non-word but may have meaning to many people because of its use in the popular Harry Potter books and movies.

The measures themselves may have been a problem due to lack of sensitivity. These measures may not have been sensitive enough to detect differences between the groups with such small sample sizes. If the effects of violent content in video games are relatively small for any one individual, more sensitive measures and much larger sample sizes may be necessary to detect differences.

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Competition in the video games used in this study appeared to have no effect on the participants. Post hoc analysis confirmed this. One possible explanation for the lack of impact on the participants is that the competition was not salient enough in these scenarios. For instance, playing against a computer may not have the same effect as playing against another person. Past research in this lab found no difference between playing against another player or the computer, but different hostility measures were used, so further research is still needed in this area (Bailey, 2006b).

Differences between the video games used that were not accounted for by the researcher may also have affected the results. Cabela's Deer Hunt, for instance, may have had less of an effect because the violence was against deer, not human characters. The participants were students from a location where deer hunting is a prominent pastime. Some of the participants may not even view hunting as violent.

The results of this study do not support the majority of findings on video game effects (Anderson, 2004). However, the findings are consistent with some past research (Scott, 1995). Of all the possible explanations for the lack of significant effects found here, sample size may be the most relevant. The majority of published research has reported sample sizes around 200 participants when significant effects are found (Anderson & Bushman, 2001).

Another important difference between this study and previous research is the use of a different genre of video games. Little research has been collected to understand the effects of sports video games specifically, although it seems that the GAM would suggest violent sports games would have an impact on players' aggression (Bushman & Anderson, 2002). Past studies have focused on fighter-style games, such as *Mortal Kombat* (e.g. Deselms & Altman, 2003), or first-person shooter games, like *Doom* (e.g. Uhlmann & Swanson, 2004), whereas the current study examined the effects of sports video games. Another study performed in this lab found some evidence that as the use of violence to win the sports video game increases, the players' hostility increases (Bailey, 2006a). The popularity of sports video games supports the effort to find out how the violence and competition in those games affects behavior.

Aside from violent content and level of excitement, the many differences between individual video games have been largely unexplored. This study sought to broaden the scope of the literature on violent video games. Much more research is needed in the area of sports video games to understand if and how they affect players. Judging from how much other types of video games influence behavior, such as learning and aggression, it is likely that sports video games impact players in some form.

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Landscape and Spirituality: *Orange Road, Tarpon Springs,* George Inness, 1893

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Among his final works, George Inness' (1825-94) painting *Orange Road, Tarpon Springs*, in the Indianapolis Museum of Art's collection, has not been previously considered in scholarly studies of the artist. Although many relevant concerns have been addressed in the context of other paintings, *Orange Road* is an exemplary work that should be considered to better understand Inness' painting and his spiritual life. Because it was painted in the last year of his life, this study claims that this work may indeed be considered finished, despite previous critics' opinions. Furthermore, Inness' process in *Orange Road* and use of formal elements, especially color, create layers of spiritual intimation and an emotional connection to the viewer that corroborate previous claims that his artistic practices were directly tied to his involvement with the Swedenborgian Church.

Since landscape painting's beginning, arguably commencing with the work of Albrecht Altdorfer (c.1480-1538), spirituality has been an integral aspect of the process and the visual experience. Altdorfer extended landscape from a simple supporting element to the whole, legitimizing independent landscape painting in Western Renaissance tradition. His small, intimate paintings gave the Northern Renaissance artists a link between icon painting (Northern Europe's form of religious painting) and the secular painting socially acceptable in their newly Protestant existence (Wood). This only began the relationship between



Orange Road, Tarpon Springs

George Inness
(1825-1894)

Indianapolis Museum of Art, Gift of Mrs. James L. Rose
In memory of her mother, Mrs. William A. Smith

landscape and spirituality that came to encompass artists such as Jacob van Ruisdael (c. 1628-82) and Jean-Baptiste Camille Corot (1796-1875). Although not directly connected to the same influences as Inness, Wassily Kandinsky (1866-1944), who painted landscapes but concentrated on colors and forms, also advanced the idea that “a work consists of two elements, the inner and the outer”—the inner the artist’s emotion and soul, and the outer a similar emotion evoked in the observer (Kandinsky; Bazarov 153). Kandinsky was most likely unfamiliar with Inness’ ideas and beliefs, but Inness was indeed a precursor to this value of emotion and the decline of specificity in landscape.

Although there may exist an inherent connection within each individual to a visual stimulant that provides a basis for understanding a particular work of art, there is also a social and material (Inness would also insist on “spiritual”) context prior to and during the creation. *Orange Road, Tarpon Springs* provides an opportunity for reflection in each of these ways. The context in which it was painted helps interpret its meaning, especially in considering Inness’ belief system and his development as a painter, but understanding or wisdom, in Inness’ view, is also available to the beholder within the painting itself, through its formal elements.

To help understand this painting’s context, a brief discussion of Emanuel Swedenborg (1688-1772) is needed. Inness is now known to have been a member of the New Church of Jerusalem, but prior to Sally Promey’s 1994 *American Art Journal* article documentation of his involvement in the Swedenborgian church, academics only linked his name to Swedenborg’s spiritual teachings. Swedenborg, scientist and visionary, appealed to Inness; his teaching on metaphysical nature and mysticism combined the hermetic Renaissance tradition and the less emphasized mystic traditions of spirituality including ecstatic experiences (Promey). There is some indecision as to when Inness actually discovered Swedenborg, but by 1867 he had been introduced to his work. Inness did not adhere to all of Swedenborg’s teachings but incorporated into his paintings those to which he did.

Inness’ career can be divided into three periods. The first shows his similarity to the Hudson River School, which was dedicated to descriptive detail, and the second consisted of a freer method of painting and an intimate view of nature, although with relatively solemn colors. The third stage, which includes *Orange Road*, shows an elimination of details to heighten the scene’s emotion. His concern for painting emotion and a subjective response to nature is ahead of its time, testifying to his genius as he combined meaning and form, elements often separated in contemporary work (Bazarov, Calvert, Smith, Stavitsky).

In *Orange Road, Tarpon Springs*, three trees stand dominant and more thoroughly described against a landscape of indistinct detail. Only the few dabs suggesting white flora and several vertical brushstrokes support the description of environment. A sunlit road winds from the lower right, dark foliage defining the interior edge, around the far left tree and back to the far left horizon. The paradoxes presented—the variation of description, the contrast of brushwork, and the spatial organization—leave one on the boundary of two worlds, the more literal being the meadow to the forest and the other a material world transitioning to the spiritual.

Every painting’s structure rests on composition, and Inness holds an interesting role in landscape composition’s history. Before his time, traditional landscape compositions set the horizon line at the page’s bottom third. Inness pushed up his horizon to the half mark and often further divided the sky in half to provide room for trees. This gave foliage three-fourths

of the composition and the sky only a fourth. In *Orange Road*, the horizon is indeed near the center mark and vegetation protrudes above the horizon and tree tops, rendering only half the sky visible. The canvas' division helps the viewer organize the painting's information. Inness' dedication to truly setting forth nature necessitates a recognizable element, in this case the structure, and some recognizable features to relate to. The familiar elements describe the material world and make accessible the spiritual, with which Inness is concerned, following Swedenborg, who emphasized and illustrated those worlds' connection.

Inness' illustration of the material and spiritual connection in *Orange Road* is similar to the Swedenborgian-influenced work of American philosopher William James (1842-1910) as he expresses visionary experiences

The color and forms begin to detach the viewer's conscious state from the familiar, encouraging inquiry. Are the lines in the background really trees? Do the colors really depict foliage, or atmosphere?

as ones that "soften nature's outlines and open out the strangest possibilities and perspectives." These possibilities give a form to the experience of the "first perception" of nature, which Inness sought to depict in his painting (Bell). He utilized brushstrokes to either define or leave forms ambiguous, illustrating both the known and unknown in a single composition, so the viewer could experience this "stream of thought." The color and forms begin to detach the viewer's conscious state from the familiar, encouraging inquiry. Are the lines in the background really trees? Do the colors really depict foliage, or atmosphere? The non-spatiality of Swedenborg's spiritual world reenters the analysis of *Orange Road* in the definition or confusion of space. Looking at an isolated area and its immediate context, the space makes sense. But as a whole, the painting seems to reverberate between a flat pictorial plane and a place that one could simply step into. Yet known forms, such as the trees, the substantive consciousness, the known organics, and the compositional structure counter the space.

The brushwork, another formal element, shows the most noticeable contrast, illustrating the difference between the spiritual and material realms. Inness utilized various brushstrokes, particularly in his later paintings (Stravitsky). This painting blatantly exemplifies the use of brushstrokes to illustrate the connection between the two worlds as the balance of loose strokes in background and foreground, compared to the controlled and articulate strokes composing the trees and foliage near the road, helps fuse subject and objective, material world and spiritual world, an interpretation that has been made of the brushstrokes of other Inness pieces (Bell). *Orange Road's* defining bold strokes meticulously describing the three trees compared to the mystifying forest, road and meadow, with no distinction of

boundaries, definition or spatial depth, present the communication and indistinct transition between nature and the divine.

Any visual description of this transition in the pictorial handling of the road is subject to several kinds of ambiguity, even though the painting's title suggests linguistic clarity, at least. The orange road—a somewhat neutralized orange—leads from the composition's lower right corner, in between the two left trees and back to the far left horizon line. It is so subtle that one's first impression might be that it is simply a path of light leading to an oddly backlit horizon. One could also diverge from the initial path, visually take it through the right two trees, and follow the broken brushstrokes describing the floor foliage and the forest through

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the blurring of sky and tree. These two passageways, although quite different in literal description, accurately show a transition from the familiar and superficial to the unknown and indistinct. The road's divergence is an issue to which we will return shortly.

Inness found light's effects highly intriguing, as seen in his consideration of its reflec-

tions between layers and effect on coloring and light source in his works. In *Orange Road*, the light interplay of the path creates another dimension for understanding, especially from a symbolist perspective. Consider the movement of light versus the flow of darks. The light follows the orange path's road, deepening as it approaches the forest, the source seemingly the brilliant light behind that same forest, which illuminates the sky. This first possible source shines through the forest, the unknown, and guides the traveler along the path, beckoning, much like the God of Inness' religious experience. However, the second, seen in the three trees' highlights, seems to come from a source behind the viewer. Light catches the trees and illuminates the white flowers. Perhaps this represents a spiritual vision within, allowing the path to be seen and God to be recognized in nature, in the ambiguity, in the ambience, the colors, and even the darkness, and between these two light sources runs a path, illustrating Inness' belief, like Swedenborg's, that nature is a divine manifestation of God. Through the road and the light, Inness gives a spiritual vision of the spiritual and divine in the material, in nature, to gain the understanding within.

Although he played with light's effects, Inness did not associate himself with the Impressionists. He was true to natural form (within the terms of his own philosophy), but his process and beliefs did not coincide with the plein air practice of Impressionism, because he believed that "You can only achieve something if you have an ambition so powerful as to forget yourself, or if you are up in the science of your art" (Inness 175). This science of art was one that Inness believed the Impressionists lacked. Inness believed that although

sketching from nature and knowing the natural forms is necessary, painting from memory provided the truest portrayal (Calvert, DeLue). George Calvert says, "He would study for days, then with a sudden inspiration would go at a canvas with the most dynamic energy, creating the composition from his own brain, but with so thorough an underlying knowledge of nature that the keynote of his landscapes was always truth and sincerity and absolute fidelity to nature" (46). Inness' considered painting from memory a way to "teach the world to see in a new light" (Calvert 51).

This also illustrates the Swedenborgian belief of "living motion," the flow of divinity from the spiritual realm to the material world that exists when one experiences enlightenment and obtains spiritual vision (Bell, DeLue, Rose). Inness recognized that "the true end of Art is not to imitate a fixed natural condition but to represent a living motion" (Stavitsky 11). As quoted in Promey, "The intelligence to be conveyed by it is not off an outer fact, but of an inner life. . . . Art is a subtle essence. It is not a thing of surfaces, but a moving spirit" (59). This being the case, it is appropriate to stress the applicable idea that a beholder looks at a painting as a painting. Although Inness' painting is a two-dimensional object instead of a representational reality, it presents an opportunity to see more within the confines of the frame and extends "beyond the pictorial edge into the realm of God" (Stavitsky 11).

The idea of living motion can also be seen in the comparison of place versus engagement (Bell). In *Orange Road*, the place is virtually unidentifiable. It could be any tree grove, forest, meadow, road. This non-geographical description of nature encourages the viewer toward a place of engagement rather than location—interaction with the emotional qualities, the search for understanding both within the frame's margins and one's own parameters, and the relations with nature itself. Once again, a focus not on direct description but the process of physical and mental engagement helps the viewer obtain spiritual vision and thus understanding.

Inness believed that each color held spiritual meaning and that one glazed over the whole work could change its entire mood. Thus color and tonality are two intertwined elements of Inness' work existing specifically in *Orange Road* (Bell, Inness, Stavitsky). Even with subtleties of color shifts, it is evident that Inness strongly considered his color usage. The blue of the sky, the orange of the lit road and forest, the red of the tree trunk and earth, and the green of the foliage create color contrast and a subtle sense of space. This use of color as an emotion has developed in importance since Inness' era, once again displaying his surprising innovation.

Paying attention to individual colors helps the layers of subtleties and exposes a deeper meaning. Inness' 1867 article "Colors and Their Correspondences" in the Church of the New Jerusalem's *New Jerusalem Messenger* critically analyzes the Swedenborgian interpretation of biblical texts discussing color significance in correspondence to spiritual meaning: "Red corresponds to love. Blue corresponds to faith, and yellow corresponds to what is natural and external" (qtd. in Promey 59). In the article Inness disputes Reverend Dr. Jonathon Bayley's Swedenborgian exegesis of Numbers 15:38-39, which centered on the ribband of blue worn upon the fringe of the garments of the children of Israel (Promey). Bayley claimed that the warm blue described in the ribband of faith text was created by adding red to blue. However, Inness believed otherwise:

Blue when tinged with red loses its value as blue, without attaining any great degree of warmth, and becomes purplish, tending to the color which corre-

sponds to royalty. Mingled with yellow it...becomes greenish, tending to the color of the natural...But tinge blue with both and the greatest warmth is obtained without altering its value as blue at all and ...it will bear a greater amount of white, which corresponds to light and to wisdom...Yellow is simply weakened by white without losing any value as yellow, and...corresponds to science, which never discovers God. Faith which blue represents must be warmed by love to God and love to man. These are bound in one by love to the Lord, in whom is equally of heaven and earth. The ribband of Israel is then warmed with orange, the color of ripeness, the color of the most delicious fruits, the color of the pure celestial flame that warms while it illumines. (qtd. in Promey 60)

In *Orange Road*, the significance of the blue sky is this warmth that resulted from the addition of orange to blue and of the under-painted grounds of black and white necessary to produce natural tones by either reflection or absorption of light (Inness, Promey). The curious distribution of blue shades within the sky shows most of the sky's blues tinted with either red or yellow, not both, creating subtle purples and greens. At the end of the orange road, the sky is bright white, symbolizing light and wisdom, important amongst the Swedenborgians. Compare this to the warm blues, symbolizing true faith, that are found among the trees in the far right forest. The blue shades's positioning provide a fascinating dynamic in relation to the road.

One must take most seriously that in the title *Orange Road, Tarpon Springs* the key word is "orange." Orange, as basic as this is, is made up of yellow and red. Looking at the individual colors's significance, man and God respectively, Christ is their unification. In Swedenborgian belief, Christ is the ultimate example of life and the ultimate expression of God—the divine role model. Putting oneself in a viewing position at a point on the road, the road of Christ, the Christian life (of which the daily living was a Swedenborgian focus that appealed to Inness) becomes the painting's. Wisdom and understanding lie at the journey's end. However, the second possible path, a visual direction more than a descriptive movement, leads to the warm blues of pure faith. Along that path are shades of green and yellow, but as the eye presses forward into the composition, the tones become warm oranges among the forest trees. Either way, orange is involved and thus is Christ, guiding the way to this place beyond the horizon, the light's brilliance and wisdom symbolized in the white and the spiritual world.

In terms of Inness' understanding of color relations, it is enthralling to consider the possibilities of combining these three primary colors and their meanings to create neutral tones. The delicate color in Inness' works comes from glazing techniques. For even the careful viewer, it is only gradually that the coloring's complexity makes its way to the surface—the layers upon layers of color, mixing the transparent layers and blending them to create unique colors, which are irreproducible without proper technique.

Considered the innovator of tonalism, Inness experimented with bands of light and dark in relation to the horizon line (Stavistky). Prior landscape painters understood that the tone directly in the middle of the darkest dark and the lightest light, or midtone, should occupy the horizon space. Inness approached the horizon from another angle, placing there both the darkest dark and the lightest light (Bell). In *Orange Road*, the bright white behind the tree line at the horizon, particularly at the composition's left side and the patches of the light blue

among the dark trees of the forest, illustrates the concept well. Attention to tone creates a transitional and poetic feel (Bell, DeLue). One notices in *Orange Road* a relatively even tone across the bulk of the composition, with only brief deviations into the lights and darks, as the movement allows.

The painting in gray-scale presents a large mid-tone mass in the middle, with the lights and darks spiraled around, meeting on the horizon line when it is visible. Without the contrast, it is difficult to differentiate form and organize space. The most ambiguous areas are those with similar tones, like the middle mass. Perhaps this disorientation is an aid to regain spiritual

Orange Road has no element of ordinary or domestic humanity, except for the title, and leaves one suspended in a place completely surrounded by creation and thus God.

sight forcing one to look deeper into the painting. The neutral tones accentuate the orange road and blue sky's significance to facilitate their impact and cement the composition's hierarchy.

The last decade of Inness' life has been described as the painting of "peaceful half-light," and justly so (McCausland). A unique, loose style characterizes the paintings from this decade. Works typically included in previous academic studies on Inness appear to be resolved to a higher degree of finish and very different in compositional style. Similar subject matter remains consistent in two other paintings of the same year considered highlights of his later works: *The Home of the Heron* (1893, The Art Institute of Chicago), which was also painted in Tarpon Springs, and *Hazy Morning, Montclair* (1893, Butler Institute of American Art, Ohio). Yet I must petition the case of *Orange Road* as another valid and full example of the spiritual found in nature. Unlike the above-mentioned pieces, *Orange Road* holds an air of mysterious familiarity. The other works depict images of wonder, suggesting a human presence—one with the sudden flight of a heron (perhaps startled by a footstep) and the other with a partially concealed barn and homes glimpsed along the horizon. *Orange Road* has no element of ordinary or domestic humanity, except for the title, and leaves one suspended in a place completely surrounded by creation and thus God. One might perhaps imagine a homestead around the break in the trees, or a rut in the path, but in a path of light the implication of the divine is more than evident. Regardless of whether the painting is considered "finished," there is a component of instruction written into the forms and a sense of inspiration. After all, wasn't it Inness' intention to evoke emotion in the viewers and to help them see with deeper understanding?

After Inness' death in 1894 (which occurred while he was watching a sunset in Scotland), unfinished paintings found in his studio were later sold in an executor's sale (Bell,

Cikovsky). *Orange Road, Tarpon Springs* could have easily been one of these discovered “unfinished” paintings. It was bought at the sale at New York’s Fifth Street Gallery February 12-14, 1895, and passed down through several generations until Mrs. James L. Rose donated it to the Herron Museum of Art, now the Indianapolis Museum, in 1947 (Tucker). Yet, looking at the painting, one cannot agree that it is unfinished, and only can feel astonishment at its neglect by scholars.

Inness himself, of course, might have considered the piece unfinished. This is no surprise. In all accounts, he is reported to have repeatedly painted over compositions, with up to 25 individual works on a single canvas (Bell, DeLue, Inness, McCausland, Smith). The practice of building up compositions in and of itself represents the Swedenborgian idea of living motion and spiritual sight. Peeling away layers of description and meaning underneath the surface to reveal truth and understanding was possible for a person only through true sight, when “unmediated vision was regained, as if, to Inness’ mind, to paint was to remember to see” (DeLue). Because the painting was produced so close to his death, he probably had not the time to paint the number of layers found on earlier canvases; the potential of *Orange Road, Tarpon Springs* may have been thus left unsatisfied. However, there is enough evidence to declare otherwise.

Considering the formal elements and their relationship to Inness’ strong Swedenborgian convictions, one may reasonably regard *Orange Road, Tarpon Springs* as a finished piece. It is also critical to remember that he worked on this painting during the last year of his life, when he was at the apex of his thought and process. His ideals united the spiritual and the scientific, the art theory and the theological, the technical and the conceptual (Bell, DeLue). Inness had been exploring these ideas through his brushstrokes, color meaning, tonality, and composition. All are managed with high skill and effectiveness here.

After years of studying the transition and correspondence of the spiritual and material, Inness was approaching an age where that transition was becoming more and more a personal and unavoidable reality. In trying to reach beyond the surface vision typified by the trees and other known forms, he sought to depict the unknown and instruct others through using light, ambiguity, and expression. *Orange Road* is particularly pertinent to this instruction because a road is a readily understood symbol of the journey to wisdom: the painted path leads to a point at the horizon that is almost seen, illuminated by the sky as a heavenly domain. What is beyond the tree line? The compositional movements lead the eye to the little piece of horizon clearly seen—one sweep forms the green leaves at the top of the left tree around the right corner and down through the forest, another beginning in the midst of the forest with the dabs of white flowers in the middle bottom which then push back along the path. Yet another movement begins from the lower right with similar colored darks flowing along the path’s side. Again, a grayscale image further emphasizes this movement, creating patterns of lights, darks, and mid-tones spiraling around the horizon point. After spending his life seeing the spiritual in nature, that spiritual becomes the reality, meeting at this one point.

Orange Road, Tarpon Springs is only one example of Inness’ works that formalize spirituality into a tangible, visual representation. It represents the culmination of his beliefs and painting and embodies numerous elements of his life, art, and faith. Every element overflows with theology and purpose, evoking emotion and instructing one toward heightened spiritual experience. *Orange Road* is a complete and compelling painting through which Inness enacted his spiritual understanding.

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Victor Frankenstein and the Theory of Individuation

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Frankenstein, written by Mary Shelley, is a work rich with symbolism and thematic elements that can be criticized in many different ways. Each of its three main characters, Victor Frankenstein, Robert Walton, and Frankenstein's creation, contains a breadth of literary archetypes and criticisms that can easily be identified. However, Victor Frankenstein is too often seen as one of many characters instead of as the central life force of the narrative; it is only through his actions and psychological development that other characters serve a purpose within Shelley's writing. They are characters portrayed through the psychological dilemma of Frankenstein's own mental development.

Percy Bysshe Shelley, Mary Shelley's husband and the co-creator of the work, espoused the powerful nature of the work and its ability to apply reason and thought to the human origin. His description of the novel is truly original: "We climb Alp after Alp, until the horizon is seen blank, vacant, and limitless; and the head turns giddy, and the ground seems to fail under our feet" (Shelley 1). It is precisely the complexity of the work that has caused extreme debate among literary critics over the true nature of the story.

Many classify it as a Gothic novel because of the time that it was written and its dark nature; however, even these theorists recognize anti-Gothic themes within the work (Sherwin 29). Ellen Moers makes the connection between *Frankenstein* and present-day literature, saying, "[*Frankenstein*] made over the Gothic novel into what today we call science fiction" (216). Some classify it as Realism because the story portrays the "myth of virtue,"

a central theme of realistic writing (Levine 209). George Levine says that *Frankenstein* was a preliminary force of the Realistic writers because it also portrays “possibility of accommodation to established power... [and] the possibility of resistance as well” (14).

The relationship of Victor Frankenstein and his monstrous creation has raised the interpretive topic of parent and child. It offers a dualistic view, comparing the comfortable and loving atmosphere that Victor was brought up in with that of his own offspring, the monstrous creation (Johnson 56). A. James Wohlpart continues this idea of relationship by saying that Victor is in essence the artist and the monster is his work of art. The plot of the novel is the slow acceptance by Victor of his role as the creator and father figure (1).

Feminist criticism has emphasized Victor Frankenstein’s repressed sexual role. Colleen Hobbs argues that Shelley “attributes a classically female malady to a male character” (1), evidenced by Victor’s recurring fainting and fevers that break out upon agitation (see also Oates 78). This idea of Victor’s repression of female qualities is also related to the birth myth. In this critique, Victor is seen as usurping the female role of birth simply out of his own selfishness (Poovey 85). Moers states that it is the way in which Victor can gain immortality, not through the prolonging of his own life but in the creation of a life by his own hands (220). Feminist theory sees this as a stripping away of the female’s natural role; the consequence is the creature’s horrid appearance and nature. Likewise, because birth is naturally given to the woman, Nature in essence punishes Victor by stealing away his only way of producing a true heir (Mellor 283).

Freudian critics explain Frankenstein’s actions by means of the Oedipal complex. In this view, Frankenstein takes on the role of the father when he creates his monster; according to Freud’s theory, the son or the monster would then endeavor to usurp the father’s power in order to possess the mother (Griffith 4). Similarly, Victor himself desires the love and affection of his own mother who has long since been dead. The creation of the monster is a futile attempt to reclaim this relationship and to fulfill his desire for the mother figure. Victor’s intense dislike of his creation occurs because he realizes that the creator embodies his inherent desires for the body of his dead mother (Franco 4).

Using Freudian psychology to explain the narrative and life of Victor Frankenstein can mar the true nature of the story. Many of the sexual interpretations are not well supported by the text and project a desire or frame of mind that is never given by the characters. By contrast, Carl Jung’s theory of individuation fully explains the thoughts and actions presented within the narrative and how they correspond and are initiated by the title character. Through the use of this theory, we can clearly see that the reanimation of life and the ensuing actions of murder and reasoning are pivotal points in Frankenstein’s process of self-realization.

A main concept that must be understood within individuation is the relationship between the conscious and the unconscious aspects of a person’s being. The elements of consciousness are known to the individual and can be reasoned over and accepted or rejected (Van Eenwyk 26). The opposing subject is the person’s unconscious, made up primarily of repressions and perceptions that have not been drawn into the consciousness (Sattler 3). The conscious and the unconscious are in a constant battle that results in neither side’s winning true control (Van Eenwyk 27). According to Jung, “the aim of Individuation is nothing less than to divest the self of the false wrappings of the persona on the one hand, and of the suggestive power of primordial images on the other” (Jung 148). It is the process by

which a person becomes an individual, accepting the true nature of his psyche; this results in self-realization. This is further described as bringing the aspects of the unconscious into the realm of the conscious (Sattler 5).

The psyche is made up of five concepts or images that must be realized and accepted. The persona is the “socially and personally acceptable mask that the individual presents to others” (Sattler 4). This is not who a person truly is or wants to be; rather it is the portrayal

The character of Frankenstein
encounters the divergence
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and what he truly wants.

of traits and conceptions that a person thinks that world wants to see. The ego is the opposite of the persona; it is the true nature of the person. The sum total of this nature is hidden from the world because its parts have been rejected or deterred at various times during the individual’s life.

Some people understand that their persona is simply an image that they portray, while others have created a persona that is so convincing to the world that it also convinces the person; dangerous consequences can result from this (Jung 167). In order for individuation to continue its process, a man must be able to “distinguish between what he is and how he appears to himself and to others” (169).

The character of Frankenstein encounters the divergence between what society wants and what he truly wants. From the beginning of the story it is understood that Frankenstein is drawn to the ideas of past alchemists and passes over the modern concepts of natural philosophy and sciences. At the University his professors reject his alchemistic views, saying, “Good God! In what desert land have you lived, where no one was kind enough to inform you that these fancies which you have so greedily imbibed, are a thousand years old, and as musty as they are ancient?” (41). He dutifully removes this aspect of his persona and moves it into his unexpressed ego. Because his desire for the reanimation of life is based on this displaced aspect of his persona, Frankenstein also conducts his projects and experiments in secret. Wohlpert states that “Victor continually emphasizes not only that he is creating his monster in an atmosphere of isolation and solitude but that his isolation is of specific kind; from family and friends which leads to the neglect of feelings and affections” (2). Harold Bloom also recognized this aspect of character by saying that Frankenstein is “the mind and emotions turned in upon themselves”; as he further develops the creation he becomes a solitary character caught up in his own thoughts and grief (4). This effect can be seen again when his youngest brother dies and Frankenstein endeavors to hide his feelings from his father. When this becomes impossible to accomplish, he instead removes himself from his father in order to hinder the revelation of his true feelings (Shelley 81).

While his ego is hidden from society, in his dealings with his creation Frankenstein allows his true ego to come out, embracing his scientific beliefs and his creation. His countenance is seemingly changed from the weak, simplistic man he presents to his family and

friends to one with great vehemence and determination, shouting, "That I may trample you to dust! And, oh! That I could, with the extinction of your miserable existence, restore those victims whom you have so diabolically murdered!" (88). Mary Poovey presents this concept well: "The 1831 *Frankenstein* seems quintessentially a victim, like the monster, who now more precisely symbolizes what this kind of individual is rather than what he or she allows himself or herself to become" (96).

The shadow is the third concept; this is a unique concept that is tied into the idea of the persona and the ego. The shadow consists of the dark attributes of a person's psyche, attributes that a person does not want to acknowledge are his, whether good or bad. Yet attributes contained in the shadow must be realized by the person before individuation can continue.

Joyce Carol Oates recognizes the shadow entity within the narrative when she says that a parody can be seen with *Frankenstein* and his monster. Although *Frankenstein* creates the monster, he has no control over "his demon" (69). Significantly, when piecing together the body of the monster, *Frankenstein* expresses reservations about his task: "I kept my workshop of filthy creation: my eye-balls were starting from their sockets in attending to the details of my employment. The dissecting room and the slaughterhouse furnished many of my materials; and often did my human nature turn with loathing from my occupation" (49). *Frankenstein* wants to finally break free and create what society has told him is not acceptable, but he also acknowledges the concerns of society and feels an uneasiness about the process. The monster is the embodiment of his shadow; it is a representation of his every dark desire; as George Griffith says, the two are essentially equal although one lives on in secret (3). This duality of character is further identified by the monster himself at the time of *Frankenstein's* death. The monster cries, "That is also my victim! In his murder my crimes are consummated [...] I, who irretrievably destroyed thee by destroying all thou lovest" (193). The monster's death comes after and in part due to his master's death. He says, "My work is nearly complete. Neither yours nor any man's death is needed to consummate the series of my being, and accomplish that which must be done; but it requires my own" (196). Because he is the embodiment of *Frankenstein's* ill ways, he serves no purpose when *Frankenstein* no longer exists.

An interesting concept is raised when *Frankenstein* is invoked by the monster to make for him a female companion of equal hideousness. *Frankenstein* at first consents because of pangs of compassion coupled with ominous threats by the monster; however, he does not see this through to the end, but destroys the female near the end of the process. Having seen the effects of his work the first time and having taken responsibility and guilt on for them, *Frankenstein* makes an effort to recognize his shadow and hinder its further destruction. Oates comments on this by saying, "The monsters we create by way of an advanced technological civilization are ourselves as we cannot hope to see ourselves—incomplete, blind, blighted, and most of all, self-destructive" (75).

The fourth Jungian concept, the anima, is the "eternal image of woman" that a male assumes within his mind. According to Jung, every man has feminine qualities and traits that he hides from the world; these traits are accumulated within the unconscious. Since the man cannot truly express these traits, he is drawn toward women in his life that exhibit the same qualities that he possesses within his unconscious; this process is referred to as projection. In early life the object is generally the mother figure; in later life the choosing

of a wife is influenced by the anima. Jung says the man needs to “become conscious of his invisible system of relations to the unconscious, and especially of the anima, so as to be able to distinguish himself from her” (169).

Frankenstein exhibits several feminine traits throughout the text that are either hidden completely from public view or expressed only when under intense stress or derangement. A recurring theme already noted is his fainting and fevers expressed in conjunction with the actions of the monster. He seems to have a delicate disposition that cannot stand up to any type of threat. He frequently makes statements such as “I trembled excessively,” “this state of mind preyed upon my health,” and “I wept bitterly.” Such feelings and actions are sometimes portrayed in the presence of his family. Upon seeing such behavior, his father admonishes him to repress his emotions.

The second half of the anima, the women to whom the male is drawn, is shown primarily in Frankenstein’s mother and his sister-cousin Elizabeth. His mother is depicted with tremendous admiration and careful thought. Her death causes a great sense of loss and confusion. Of Elizabeth, who takes the place of his mother and becomes his constant in life, Frankenstein says, “No word, no expression could body forth the kind of relation in which she stood to me—my more than sister, since till death she was to be mine only” (31). He increasingly refers to her as a stable presence in his life, the one thing that can make all others seem right. Elizabeth, he says, “alone had the power to draw me from these fits; her gentle voice would soothe me when transported by passion, and inspire me with human feelings when sunk in torpor” (168).

The last of the five concepts is at the heart of the psyche, the self. The self is made up of the previous four concepts and is the true identity of the person. It exists in the unconscious unless the person is able to accomplish individuation and come to self-realization. The full range of the self is not known until after “each facet of the personality must itself develop fully, or individuate, through the individual bringing it into consciousness” (Sattler 5). The self is not a concept that is depicted in Shelley’s work; this is because Victor Frankenstein never completes the process of individuation begun in the narrative.

It is quite clear how Frankenstein’s process of psychological development progresses through the narrative and how obstacles in the process contribute to his obsession and inevitable death. The process starts with the death of his mother, who embodies the feminine characteristics that he has repressed into his unconsciousness because of societal constrictions. With her loss, he is left floundering without the feminine influence that he not only has been accustomed to but also needs to complete his own feminine needs. His sister-cousin Elizabeth has been a close companion and influence but has not yet been elevated to the high position that his mother had in his life.

This sense of personality loss contributes to the strife Frankenstein experiences as he begins to confront the duality concerning the mask that he wears for the world around him and the truth of his personality. The subjects of his ego consume him, leading to a further isolation from society. Since society has rejected his ideas of science, he keeps his workings mute, relying on his persona for the minimal societal contact that he initiates. By reconnecting with his ego, he is in a sense trying to reconnect with the mother image that he has lost; his efforts at reanimation are a futile attempt to create a substitute for the societal connection that his late mother provided for him. Leaving behind Elizabeth, who was the last of his projected anima, makes him desolate, with no one to “temper [his] searching after truth.”

It is precisely the instant that the monster opens his eyes that Frankenstein realizes the mistake he has made. In the monster he recognizes the evil that underlies his ego, the shadow. His misdirected desires are to create someone who could care for him and show him the devotion of his mother: “A new species would bless me as its creator and source; many happy and excellent natures would owe their being to me. No father could claim the gratitude of his child so completely as I should deserve theirs” (48).

With Frankenstein’s duplicate running around the countryside, the reader is able to witness the frustrations and desires present in Frankenstein’s psyche. While Frankenstein does not truly want to kill his friends, younger brother, or wife, these murders are conducted through a reaction to societal terms. The monster experiences ostracism in the same way that Victor feels ostracized by society. Victor sympathizes with the monster at certain times during the monster’s life

narrative; he says that the monster’s words “had a strange effect upon me. I compassionated him, and sometimes felt a wish to console him” (131). These bouts of compassion correspond to points in the narrative that show society’s refusal of the monster and his exclusion from hu-

His efforts at reanimation are a
futile attempt to create a
substitute for the societal
connection that his late mother
provided for him.

man contact. It seems at first that Frankenstein will recognize and accept his shadow as he increasingly takes responsibility for the deaths of those close to him; however, he loses sight of this goal and instead blames the entirety of the endeavors on the monster. This pushing away of the shadow contributes to his obsession over the capture of the monster and also to his own death.

Frankenstein reaches out near the end of the novel, trying to reconnect with society and to establish a new projection for his anima. His attachment to Elizabeth becomes stronger as the narrative progresses, and he increasingly leans on her for sanity and a reason to live. This is why he consents to marry her even though he knows that the monster will reappear on his wedding night. As Jung says, the man often enters marriage seeking the mother’s protection once again (172). When the monster ends this sought-after connection by killing Elizabeth, Frankenstein’s hope for reconnection is dashed forever, sending him into a fit of passion and obsession. Here Victor’s process of individuation is forever broken off.

The true self of Victor Frankenstein is not known within the text because the process is not completed. If the ego cannot face up to its own shadow, the process will be halted until this realization can be made (Van Eenwyk 163). Instead we are shown the effects of thwarted individuation, a soul lost in the world and controlled by obsessions. Frankenstein’s acceptance of his shadow would have meant taking complete responsibility for the deaths of his loved ones, a step with consequences too great for him to take. When such failure happened within Jung’s patients, he was quoted as saying, “It is often tragic to see how blatantly a man bungles his own life and the lives of others yet remains totally incapable of

seeing how much the whole tragedy originates in himself, and how he continually feeds it and keeps it going" (De Laszlo 10).

Jung's theory of individuation is functional as an explanation for Mary Shelley's narrative. Through the levels of its process, it is easy to understand the meanings behind Victor Frankenstein's actions and the causes of his obsession and death. Through the character of Frankenstein an understanding of the secondary characters can be reached; they function within the frame of Frankenstein's psychological development and play certain roles within the process. Jung's theory illuminates the mental struggles of Frankenstein and highlights the difficult process of development that his psyche endures.

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“Girls Want to Work”: Industrial Working Women of York County During World War II

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Bob and Ethel Senft lived in York County, Pennsylvania, when Pearl Harbor was bombed. After war was declared, Bob continued work at York Ice Machinery Corporation, now called York Corporation, on the incoming defense contracts until he received his draft notice and left. He sent most of his earnings home, but Ethel had to go to work to meet household expenses. She filed blueprints where her husband had worked, but willingly left when he got home in 1946 and never returned to full-time work (McClure).

Ethel was only one of hundreds of women in York to work outside the home. In fact, women there were asking to work before there was a labor shortage. As early as 1941, before Pearl Harbor was bombed, York companies considered hiring women at manufacturing plants. According to a York County labor power survey, shortages were critical in some areas but York had managed to maintain a balance of labor supply and demand. The report stated, “In weighing the available supply against the potential demand of the workers, irrespective of restrictive factors, present indications point to the ... probable necessity

Editor’s Note: This is a condensed version of a much longer study that makes generous use of the primary sources on the history of working women in York, Pennsylvania, in the 1940’s.

for importation of workers from other areas or the utilization of female workers in defense occupations" ("Labor Market Survey"). Not wanting to import laborers, York turned to its women. Like those across the nation who flooded into industry in unprecedented numbers, despite the sacrifices required, York County women wanted to do everything they could to fulfill their patriotic duties to help win the war.

Men and women experienced World War II similarly in terms of events but were affected differently because of society's placement of the gender-based responsibility of family maintenance on women. During World War II, women were able to modify those traditional positions in the workforce and at home. Women's role during the war has been intensely studied by historians. Many have noted that the desperate need for labor gave many women an unprecedented opportunity in higher-paying manufacturing jobs (Hartman, Gluck). With regard to their reception in such positions, Alan Clive found that women were welcomed and encouraged at Michigan industrial plants; however, Nancy Gabin studied the same factories and concluded that they were welcomed at first but pushed out after the war as if they had never been capable of physical labor at all.

This paper examines the experience of York County women to illustrate and test other researchers' findings about women's roles in World War II. Like other American women, York County's held their own while working in factories and maintaining households, and left industrial work at the war's end.

Entering the Workforce

Single, divorced, and widowed women had always been in the workforce, but worked at traditional feminine jobs such as clerking or waitressing. When World War II increased manufacturing demand and took men away into the military, women already working eagerly switched to the higher-paying industrial war jobs, although they were not immediately welcomed. In early 1942, the War Department did not encourage defense producers to hire women until all men had been placed in available jobs, a mentality carried over from the Depression when many men were unemployed. But as more men joined the military and demand for labor rose, the nation inevitably looked to women to ensure production (Hartmann 55-56). The increased wages of war work compared to pay for traditional work for women was important because the military stipend sent home by the soldiers was not adequate to cover household expenses, or pay off Depression-era debt. These factors plus more opportunities made defense jobs irresistible.

Single women in their late teens were the most recruited group, as they were expected to leave work to marry at the war's end, and local newspapers helped in the recruitment (Gluck 101). The *York Dispatch* carried articles with such headlines as "Girls Want to Work in War Industries," "Need for 500 Women," and "War Workers Needed." Since York distrusted outsiders, women were hired not necessarily because of their abilities but for their availability. As the *Dispatch* put it, "York should be able to meet its labor needs without importing any large group of workers from the outside area. This would only add to our housing, sanitation, transportation and school facility problems" ("Need"). York eagerly avoided problems it saw in other cities by doing what it could with what it had.

At defense plants, women were asked to keep supplies moving to the front. S.P. Edwards, York Safe and Lock Company personnel director, paid "high tribute to the ability of the women now employed in war work by his company" ("Need"). York did not regret

its decision to hire women. The real test would be women's ability to balance performance goals and short- and long-term expectations once they began working.

In the Workforce

Women had to prove their abilities while remaining feminine and maintaining their social roles. They were expected to replace men only temporarily, retain their femininity while performing masculine jobs, and work only to bring the men home more quickly and make the world safer for their children (Hartmann 23). They were also encouraged to think of their factory work as merely an extension of the domestic work they already did, including even crocheting and embroidery (Wise and Wise xiii). Once at work, women were largely treated as

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the men had been treated. Glenn L. Martin told his 4,000 women employees, "You'll do a man's job and you'll get a man's paycheck, but you'll be treated as the men are treated" (Norton, ed., 351).

Women in York faced the same challenges as others across the nation. But they were able to meet the demands. York's motto was "Do what we can with what we have," and it didn't take long for Yorkers to get used to the idea of women working in the defense industry. A York Ice Machinery newsletter article began, "It isn't news any more when a cute young co-ed emerges from the employment office as a truck driver or when a dainty debutante winds up as an artist in sheet metal." (*Shop News* 2.5 [1943]: 11). While this statement might have been exaggerated for aesthetically pleasing purposes, it still could have been true. There has been no evidence, to date, that contradicts the findings that women in York were welcomed and accepted into the workplace with regularity on the factory floor or in the office as they moved to wherever they were needed.

But it was not until women workers became "essential to the conduct of the war, [that] increased attention was paid to special needs, including maximizing worker efficiency and reducing absenteeism and turnover," as women coped with such problems as inadequate housing and childcare arrangements (Gluck 241, Wise and Wise 108). The *Labor Management News* included a cartoon of a munitions factory worker explaining her two children's presence: "It's either that, or time off until a day nursery is organized!" Employers accommodated women by "adjustments in working conditions, wage scales, benefits, and . . . the productive process itself because they viewed them as essential to maintaining a work force capable of achieving production goals" (Hartmann 60). H.E. Goodling Electric Company of York, for example, provided a kitchen so that the workers could make lunch or snacks (Dispatch June 1943). C.B. Yost's Meat Market in York County sponsored a booklet on meat

scarcity: “A little ingenuity in the kitchen, Mrs. Homemaker, will go a long way toward solving that wartime problem of stretching the limited meat supply so that the hungry family will be satisfied every day” (McClure 58). York Ice Machinery’s publication included the column “Strictly Feminine,” offering fashion tips and hints on cooking simple, quick, nutritious meals (*Shop News* 11 [1944]: 11). York citizens, led by city school Superintendent Arthur Ferguson, visited Harrisburg and learned about a statewide program to establish nursery schools (McClure 38).

The media, the public, and historians later asked, “How were you treated by your colleagues and superiors?” There was a balanced response (Wise and Wise 88). Mrs. Wintermyer of York said, “I haven’t had any training except that of being a mother, but with the training I received in the shop I believe I can do pretty well now . . . I still have responsibilities at home, but I find every minute of it fun” (*Shop News* 2.5 [1943]: 11). Some women were featured in the local newspaper. Bessie Elicker operated an overhead crane high up at the fire weld department at York Corporation in the summer of 1943. She was the first “of her sex to ever raise a hook here at York Ice” referring to the operation of overhead equipment at York Corp (*Shop News* 2.4 [1943]: 9). Wilburda Murphy, a mechanical engineering graduate from Bucknell who pursued more training at the company, was noted as “York’s first female engineer and she wants to be a real honest-to-goodness engineer, not just a ‘slip-stick’ specialist” (*Shop News* 3.3 [1944]: 8). Nathalie Engdahl operated a small machine on the second floor of her family’s shop making precision tool parts used to repair war planes (Poist-Reilly). Mrs. Marie Green, the dean of women workers at the West York plant for the York Corporation, made maritime parts, keeping the United Nations supplied with “arms, equipment and food” (*Shop News* 2.3 [1943]: 7). York was proud of the job it was doing for the nation and it was proud if the job its women were doing. A *Shop News* cartoon emphasized the quality of the women working in York and displayed the pride felt by York Corporation to have such diligent workers in its factories, implying that some other factories were not so lucky (3.3 [1944]: 6).

Nationally, women experienced significant material gain and satisfaction from their work. In the fall of 1942, the National War Labor Board “ordered equal pay for women who did ‘work of the same quality and quantity’ as that of men” (Hartmann 57). The most impressive gain was in factory work, especially defense plants, largely because they replaced men who went to war rather than competing against men for those jobs. Susan Hartmann notes, “Between 1940 and 1945, the female labor force grew by more than 50 percent... by 1945 they formed 36.1 percent of the civilian labor force” (21).

In York, the percentage was somewhat less, at least in defense plants. A 1945 census of defense plants workers showed that one year earlier there had been 6,363 women working as plant employees and 19,516 men. By 1945 there were 19,379 men and 6,553 women (Employee Summary, June 1, 1945, the York County Heritage Trust York Plan Collection 887, Box 1. 132). More than 25 percent of York County workers were women. These women were celebrated for the work they did but, for the most part, they were not expected to remain there.

Leaving the Workforce

When the war ended after V-E Day and V-J Day, the defense factories transitioned to peacetime work or closed altogether. Most rehired the men who used to work there or hired new men, blatantly forcing “placeholder” women out of their jobs. Many women were

glad to go back to a lifestyle which provided stability and rebuilding by allowing men to once again dominate industry while women returned to the home (Wise and Wise xiii-xiv).

It was recognized that some women would have liked to keep their jobs and could have used their seniority to try to do so, but, as Sherna Gluck says, “were not willing to challenge the cultural expectation that women were there only for the duration. They accepted the layoff and sought other work” (262). Nancy Gabin argues that woman simply consented to losing their industrial jobs instead of fighting to define their economic interests (369). Some histori-

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ans contend that women voluntarily left their wartime jobs because they were “uninterested in challenging the sexual segregation of occupations and were left with no other recourse (Gabin 367).

There were women, however, who “resented the fact that they were asked to do their part for the war and then pushed aside, without proper appreciation or recognition, once the men returned” (Wise and Wise xi). Women who had worked before the war wanted to retain their new jobs, which not only paid better but often were more interesting than their previous work (Wise xiv). Women felt they had proven their ability to “successfully perform work formerly considered too difficult, dangerous, or complex for women” and despised to leave their hard-won jobs (Wise and Wise 168). Women who chose to stay “found their earnings reduced as they moved back into traditionally female jobs in light industry”(Hartmann 24). Nationally, by June and September of 1945, a quarter of women workers had been dropped from factory jobs.

The women who stayed were “jarred by the change in attitude toward them, from one of acceptance to much greater resistance as they became much more of a minority and were viewed as taking jobs that rightfully belonged to men”(Wise and Wise 88). The memory of the Depression, when men were unable to find work and could not properly provide for their families, was still fresh. The general public now believed women belonged in the home and should allow men to be sole bread winners.

Some York women were eager to return home. Florence Snyder of the York Corporation even wrote a poem about it:

When this is over, I want to see
Dresses on women at the knee.
Instead of slacks and grimy hands,
High-heeled shoes and wedding bands.
Feminine hair do's and feminine talk,

Feminine ideas and feminine walk
 Housewives and mothers at home again
 With the “bread and butter” up to the men.
 Sugar and gas and ration cards gone.
 Plenty of canned goods for brides to start on.
 Tires for the asking, shoes for the same.
 If we get it all back we cannot complain.
 Peace world-wide, and on the Capitol dome.

Won't it be grand when our boys come home? (*Shop News* 2.4 [1943]: 3)

York Corp. addressed the topic in a 1944 issue of *Shop News*. Of the six women interviewed, four wanted to remain at work and two of these were married; the other two, married women, said they wished to return home (3.5 [1944]: 3).

York Safe and Lock and the York-Hoover Body Co. plant reduced the number of employees, and most of those laid off were women. If they and other companies increased the number of employees, they would hire men. York Corporation was an exception. Its 3,492 employees included 693 women, and projections called for an additional 500 workers and no

Women in York experienced the same kind of recruitment as other American women and faced the same problems, including finding adequate childcare and caring for their household while working full time.

layoffs. The demand for refrigeration and cooling equipment offset cutbacks in defense work (McClure 113-14). Women were able, if they were willing, to remain on the factory floor. However, they usually moved within the company to lighter, less labor intensive work, if encouraged.

Conclusion

York County women were exceptional in some ways and traditional in others. Like women throughout the country, they were not immediately welcomed into the workforce. Once their value was realized, however, York County welcomed them to the manufacturing plants and celebrated their worth. The women in some ways became the symbol of the York Plan and York's motto to “Do what we can with what we have.” They were willing and available to work and maintain their households as their patriotic duty; they realized that femininity was important to the preserve the social structure and made that accommodation while helping the war effort. When the war was finally over, women recognized their duty to leave when it was appropriate and their opportunity to stay where it presented itself. Overall, York County provides an example of how a typical American community did its part to help win World War II with the help of eager and able women.

This paper's goal was to examine women's role in World War II, using York County to test the findings of other historians. For the most part, York was largely compatible with what is considered the conventional wisdom on the topic. The popular perception is that World War II brought about an enormous amount of change for women, especially in finding work. However, recent historians have begun to argue that the change was only more of a slight shift--the women who worked during the war were working before the war and continued working after, because the only change was the type of work that changed significantly. Women in York experienced the same kind of recruitment as other American women and faced the same problems, including finding adequate childcare and caring for their household while working full time. This period also inspired those women to instill the same values of hard work and achievement in their children, who became the largest generation in American history.

However, York did differ significantly in one particular area: job classification. Women there were doing highly skilled jobs alongside men. In Detroit and other major industrial centers, women were segregated and worked at more feminine jobs. In York, the most capable worker did the job, even if the worker was a woman. Because York factories were small, segregating workers into different plants according to gender, as in other cities, was not practical and could have led to delays and strife that the industries wanted to avoid. York was also conservative and preferred women workers rather than men from other places. The women there thus shared with other American women the experiences of breaking into the workforce, working and fulfilling domestic duties, and leaving industrial work when World War II ended.

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