

**The Effect of Upright Posture
On Human Decomposition:
A Senior Honors Thesis**

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Abstract

Decomposition studies have elucidated many different factors affecting the rate and process of decomposition. However, no study has previously investigated potential effects of posture on the decomposition process. The following study involves a research project conducted at the Anthropological Research Facility at the University of Tennessee-Knoxville to determine whether the upright posture affects the rate of decomposition. The project began on June 15, 2011, and was conducted for a period of approximately sixty days. The study included three different bodies, each placed in a different sitting position. The first was placed against a constructed, plywood wall and sat on the ground. The second body was placed in a camping chair which was nailed into the ground. The final body served as a control for the experiment, and was laid flat on the ground. The results of this study provide more information regarding the possible effects of different variables on the decomposition process and expected rate of decomposition. Furthermore, the study provides a base study for further human decomposition research in the area of posture and body position.

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I. Introduction

The recent budding and subsequent boom of forensics has been attributed to the expansion and research carried out in many different fields within the general forensic discipline. The study of decomposition has been essential to the study of forensic anthropology for the past half century. The development of the field of taphonomy has helped to provide answers to many questions surrounding the decomposition process. Taphonomy is the field of study that examines all the processes that alter biological organisms after death (Haglund and Sorg, 1997). Although these processes have been found to follow a fairly common procedure, different variables have been found to have different effects on the decomposition process.

The main purpose of decomposition studies is to determine the effect a particular variable or variables may have on the process. Not only is the determination of an effect important to such studies, the way in which the difference may affect subsequent estimations and analyses is also essential in describing the variable. For the most part, decomposition research helps to provide experts with knowledge about the way in which a variable may affect the post-mortem interval. PMI is important in helping to provide a time line for death. Any possible discrepancy in the expected decay rate may affect the estimation of PMI and subsequently affect any determination or conclusion made in regards to that information. Possible determinations that could be affected by an inaccurate PMI include identifying witnesses and victims to a crime and positive identifications on unidentified individuals using missing person reports.

Starting in the early 1960s, studies began to be conducted to help to establish a basic trend in the decomposition process and the effect that insects have on the decomposition process. Jerry Payne examined the decomposition rate of infant *Sus scrofa* in an attempt to examine the general process of decomposition. The development of six basic stages (fresh, bloated, active decay, advanced decay, dry,

and remains) of decomposition provided a starting point for further research into the decomposition progression and process (Payne, 1965).

For the next ten years, taphonomic research remained focused on the process as it related to animals. Although articles were published on the human decomposition process throughout the 1960s and 1970s, many of these articles focused on particular case studies as they related to a morgue setting. It was not until Bass began the Forensic Anthropology Center at the University of Knoxville that taphonomic research began focusing on the ways in which the human body decomposes in an outdoor setting.

Throughout the 1980s, and 1990s, the focus of decomposition research remained on decomposition rates and insect activity. Rodriquez and Bass's insect study helped to provide a correlation between the succession of insects present throughout decomposition and the rate of decay. Furthermore, studies in the effect that particular climates and environments may have on the decomposition process helped to identify causes of differentiation seen throughout the United States (Galloway, 1989).

In 1990, Mann, Bass, and Jantz published an essay in the Journal of Forensic Sciences that noted and described the basic variables affecting decomposition rates. Some of the most important variables included in the study were temperature, access by insects, and burial and depth. Each variable was given a rank in terms of its importance and relative effect it has on the decomposition process. Variables such as trauma, carnivore activity, size and weight of the body, clothing, and embalming were also included in the study.

Subsequent to this study, many studies began focusing on the discrete effect different variables had on the rate of decay. From the effect that cloth has on the process (Dautartas, 2009) to the effect that sunlight has on the process (Srnska, 2003) different variables have been intensely studied. The

importance of examining each variable individually has been essential to the development and further understanding of decay rates and the decomposition process.

Recently, many scholars have turned to finding a “fit-all” formula or standard to help determine how these subtle and multiple variables can be combined to describe a general pattern of decomposition and determine the post-mortem interval accurately (Vass, 2011). The *Daubert v. Merrell-Dow Pharmaceuticals, Inc.* case established the necessity for scientific data used in court to have statistical error rates associated with it, thus the necessity of quantitative data in decomposition research has spurred this field of study forward. These current studies examining the post-mortem interval tend to revolve around the ways in which different variables affect the decomposition rate which in turn affects the PMI estimate and the implementation of quantitative data to use for statistical analysis. Methods that incorporate scoring in decomposition determination have also been studied due to the differential decomposition that may occur in different areas of the body (Megyesi, 2005).

The major purpose of this research is to identify whether the upright position has any effect on the known decomposition process. The upright posture is identified in this project as a sitting position. Sitting is a “rest position supported by the buttocks or thighs where the torso meets the legs” (“sitting”). While there are many different upright sitting positions, the two used in the study are the sitting position where an individual is on the floor with his or her legs straight in front and an upright sitting position in a chair where the lower legs are bent at a 90° angle to the upper legs.

The hypothesis is that the upright posture will have an effect on the decomposition process. Due to gravity and other factors, it is proposed that the individuals placed in a seated position will decompose at a slower rate. The use of a complete body analysis rather than an analysis of particular body areas may have an effect on the way in which the body is subsequently categorized, but it is suggested that there will still be some smaller, more specific changes in particular areas that will have

been affected by the individual's posture and body positioning.

The determination of whether an upright position has an effect on the decomposition process is important due to the number of individuals dying in their homes due to unexpected circumstances and the possibility that these individuals are dying on sofas and in chairs. In 2006, 18,048 Americans died at home amounting to approximately one American dying at home every 29 minutes (Xu, 2007). In some cases, these individuals may have spent a significant amount sitting in a recliner or sofa while the decomposition process began and took place before the body was found. The importance of determining whether the upright posture could affect the rate of decomposition is essential to understanding the ways in which other estimations made from the rate of decomposition may be affected.

Using a comparative analysis of three different bodies in three different positions, an analysis of the differences in a qualitative rate can be determined. Temperature data was also taken for each body and analyzed to determine whether there was any significant difference between the body temperatures for each body.

II. Methods and Materials

This study was conducted at the Anthropological Research Facility at the University of Tennessee in Knoxville from June 16, 2011 to August 16, 2011. The facility is located in an area that is approximately 2.5 acres and is surrounded by a large wooden fence and some wire fencing to prevent extreme amounts of scavenging by large carnivores such as wolves and other carnivorous predators that may be found in the East Tennessee woodland area. The amount of plant life was relatively low compared to other years due to severe storms that ravaged the area in April and May of 2011. However, some plant life remained in the area. This included deciduous trees, shrubbery, and other ground cover.

The study included three, fresh cadavers. The differences between individuals were kept to a

minimum to prevent extraneous compositional differences from being a factor in the study. Each individual was from the same ancestry and same age group. Two of the three cadavers were female while the other was a male. However, the difference between sexes should not have affected the decomposition rate since males and females have been shown to decompose at a relatively same rate. The effect of mass on the decomposition process has shown that larger individuals decompose at a quicker rate. There was a minimal difference in the weight of each individual with the male being somewhat larger than the two women.

Each cadaver was placed in a different upright position. The first body was sat against a wall made of plywood. The plywood was approximately one inch in thickness and was nailed to the wooden fence so that a corner was made for the body to be placed against. The second body was sat in a basic, blue camping chair that had arm rests. The chair was nailed into the ground using camping stakes so that the chance of the chair tipping would be kept at a minimum. The third body was used as a control for the experiment. The utilization of at least two different sitting positions was used to help determine whether a chair may affect the decomposition process and whether any amount of elevation from the ground affected the way in which the bodies decomposed.

Before being placed, each body was kept in the freezer to slow down the decomposition process before placement. All three bodies were kept in a freezer at the Anthropological Research Facility for at least a month before placement, so the internal temperature of each individual should have been approximately the same once exposed to environmental elements. The bodies were allowed to thaw for one day prior to placement to allow for each body to be positioned in the individual and different upright postures described above.

The cadavers were placed at the Anthropological Research Facility on June 16, 2011 at 3:30 P.M. The placement of each body was near each other to ensure that each body was exposed to the

same temperature and environmental conditions. The bodies were not protected by any wire cage, so scavenging was a possibility throughout the experiment. Temperature probes were inserted into each individual's anus to help monitor the change in internal temperature throughout the decomposition process. These differences in internal temperature help to provide additional information that may help to describe the changes seen throughout the project. Furthermore, a temperature logger was placed in a central location to monitor the daily temperature throughout the entire experiment.

Once placed, the bodies were monitored on a daily basis by the researcher. Pictures and notes were taken describing and detailing the general rate of decomposition and any major differences or peculiarities. The bodies were left exposed and undisturbed for a period of sixty days. The pictures and notes were taken at approximately mid-afternoon every day.

Three game cameras were used to capture images of the bodies throughout the project so that minimal changes in the decomposition rate and differences in the process could be noted at particular times throughout the project. Pictures and videos were taken every hour, every day to document these changes. These images also helped to provide a means with which the process could be viewed at an hour interval for the entire two months.

Peculiarities seen in each body that did not follow suit were noted and taken account of as deviations from the standard decompositional process or as a deviation from the way in which the control or the body itself was decomposing. Such differences included repeated insect infestation, exposure to sitting water, and scavenging by predators.

III. Results

The results of the experiment were broken down to include a qualitative analysis of each individual. Individual 1 was used as the control. Individual 2 was placed in the upright position against a wall and seated on the ground. Individual 3 was placed in a camping chair. Temperature data was also

collected from each individual and the ambient temperature for the area was also recorded.

Individual 1 (Control):



Figure 1: Individual 1 on day 1.

Individual 1 did not show significant skin slippage or active larvae until day three of the project and remained categorized as fresh. On day three, color change, skin slippage, and maggots were apparent. Skin slippage began at the head and shoulders with some slippage occurring in the arms and hands. Maggot masses were visible in the face, hair and pubic area (Figure 2).



Figure 2: Individual 1 showing some color change, skin slippage of the upper torso, and maggot masses on day 3.

By day five, the body showed signs of high dehydration with extreme discoloration. There was no significant bloating occurring, but the first signs of skeletonization were occurring at the occipital area of the skull (Figure 3).



Figure 3: Skeltonization is visible at the back of the head and extreme discoloration is visible by day 5.

Within twenty-four hours, some cervical vertebrae and the left radius were visible with some bloating occurring in the upper abdomen. Major maggot activity was occurring in areas in contact with the ground, pubic area, the neck, and body folds. Throughout the second week, various skeletal elements in the skull and upper torso became visible. The body continued to dry out and discolor. However, in the second week, maggot masses could be seen at the ground level by the legs which had remained fairly intact throughout the first week.

By the end of the first two weeks of the project, Individual 1 was fairly dehydrated and discolored (Figure 4). Much of the upper torso and abdomen were black and deflated. The lower body was a reddish-yellow color. No maggot masses were seen, but some beetles were visible and seen on



and around the body.

Figure 4: Individual 1 on Day 15 showing severe signs of dehydration and some skeletonization in the skull and upper torso.

Throughout weeks three and four, flies and beetles were seen around the body, but no major maggot masses reappeared. The mummification of dried skin and tissue began to be heavily noted with various amounts of discoloration noted. The body continued to blacken, and the exposed skeletal elements became drier. Some of these exposed skeletal elements included some of the occipital, temporal, scapula, clavicle, cervical vertebrae, left carpals, and ribs (Figure 5).



Figure 5: Individual 1's skeletal elements on day 30. Most elements are considered dry.

At the start of the fifth week, scavenging was noted on Individual 1. The skull had been pulled away from the body exposing more of the upper torso and exposed skeletal elements (Figure 6). This type of scavenging is rarely seen at such a late stage in the decomposition process (Haglund, 1989). At this point, the body was considered in the mummified state with very little active decay occurring. Usually, predators prefer to scavenge when the body is considered fresh. This scavenging episode occurred for the next four days with the skull and mandible becoming disarticulated and the left arm being pulled slightly away from the body to a different position.



Figure 6: Individual 1's scavenging episode. The skull is pulled away from the body and the base area of the skull is visible.

Individual 1 continued to dry out throughout the rest of the sixty day period. From week 6 to week 8, the body would slightly change color from an off gray to the classic dark, mummified black. Most of the color change was noted after storms and when puddles were able to form on the body.

Individual 2 (Wall):



Figure 7: Individual 2 in the sitting position against the constructed wall.

Individual 2 was propped up against a constructed plywood wall. For the first few days, some marbling was seen in the legs and maggot masses were visible in the genitalia, ears, and face. The marbling, which was unique to this individual, may have been due to the prior freezing the body had been through and the coagulation and freezing of blood in the legs along with light coloration.

By day 5, Individual 2 had major maggot masses occurring in the pubic area, the face, and along areas that were in contact with the ground. Skin slippage was beginning to be seen in the upper torso area especially near the arm pits. On day 7, major areas of wetness could be seen around the body.

Against the wall, there was a distinct discoloration of the plywood. Dark decompositional matter could



be seen forming and extending from the upper leg and buttocks region (Figure 8).

Figure 8: Individual 2 with decomposition matter around the lower body and seeping underneath the wall.

At the beginning of week two, the body began to slump forward. Major maggot activity could still be seen in the pubic area, face, feet, legs, and arms. The face had begun to mummify with very little visibility of any facial skeletal elements. The torso area was a distinctly different color and only slightly distended. The body continued to change from a yellowish-green color to a more dark red-

black color suggesting drying and mummification.

Day ten was the first day that any sign of skeletal elements could be seen. The skeletonization process was occurring in the arm (radius), left hand (metacarpals), the right hand (distal phalanges), and in the facial area (Figure 9). Most of the exposed skull was in the facial area which was distinctly



different from Individual 1.

Figure 9: Individual 2 showing signs of skeletonization in the left hand and in the lower arm.

By week three, Individual 2 had begun to significantly dry out and mummify. The individual's skin remained fairly dry with flaking being seen all down both arms and around the upper torso (Figure

10).



Figure 10: Individual 2 showing signs of mummification with flaking seen on the left arm.

While the first two weeks were dominated by moisture and wetness and the formation of foam, by week three much of this had dried up. The areas that had been exposed to the body's decompositional fluids were visible and noted by either dried organic material or discoloration as seen on the plywood (Figure 11).



Figure 11: The wall with demarcation showing where the body was in contact with it.

At the beginning of week three, some maggots could be heard inside the body and beetles and flies could be seen around and on the body. At the end of the week, the maggots were no longer heard although flies and beetles continued to be seen around the body. It should be noted that the hair mat was still attached at this point in the project.

Weeks four through eight were predominately marked by continued drying and flaking of the skin. Very little skeletonization occurred, and only a few insects were seen throughout this period. The body did experience one episode of scavenging, but it was very minimal and only affected a foot. This incident occurred during week five of the project. Although some wetness around the body did occur

after rainfalls, for the most part, the body remained fairly dry and some adipose formed around the areas that were in contact with the ground. The head continued to fall forward, but it never separated



from the body or touched the abdomen (Figure 12).

Figure 12: Individual 2 on day 55 with the head slumped forward and continued drying and blackening of the skin.

Individual 3 (Chair):



Figure 13: Individual 3 on day 1 in the sitting position in a camping chair.

Individual 3 began showing insect activity by day one. Maggot masses were seen in the chair and between the toes with some swelling occurring in the lower leg. The chair that the individual was placed on had condensation. By day two, there were very active larvae in the face, hair, shoulder, armpit and eggs in the skin rolls (Figure 14). Skin slippage was beginning along with discoloration and continued swelling in the legs. The right arm had fallen off the chair at this point.



Figure 14: Individual 3 showing signs of skin slippage with major maggot activity occurring in the upper torso and face area along with some activity in both arms and in the right leg.

Day three showed more signs of skin slippage and the body continued to slowly move from the original upright position. A drip zone began to form around the right arm where it had fallen off the chair. On day 4, a puddle in the chair was noted. This puddle that Individual 3 was sitting in included maggots, organic decomposition material, and rain (Figure 15).



Figure 15: Individual 3's “decomposition puddle” after the first few days.

This puddle was a common recurrence throughout the project and would go through periods of completely filling the chair to periods of complete dryness. The puddle helped to support multiple maggot infestations of the lower body and continued decomposition throughout the entire sixty days.

By day four, different areas seemed to be decomposing at different rates. While much of the head, and torso region had major maggot masses, the leaning right side of the body seemed preferred and showed signs of advanced decomposition, especially in the right arm that was off the chair. Day five showed no major changes in the process, but the first skeletal elements were seen (mandible). The

body continued to perspire with condensation being seen on the back of the chair. The drip zone by the right hand continued to grow and the puddle in the chair remained present.

On day six, the front facial skeletal elements were visible and the stomach area had begun to inwardly distend. No major amounts of bloating occurred prior to this distention with the only viewed swelling having occurred in the lower legs. Major maggot masses could still be seen around the shoulder, neck, chest, pubic and upper thigh areas. Foam had begun to occur in the chair with condensation being seen on the back of the chair. The drip zone by the right arm continued to grow and some signs of drying were occurring on the left side of the body and in the lower legs.

During week two, signs of more skeletonization were visible with maggot masses still visible in the chair and a drip zone still occurring by the right arm. Throughout the week the ribs, clavicles, scapulae, vertebral column, sternum, phalanges, left humerus, metacarpals could be seen. While none of these elements were fully exposed to the point of dry skeletonization, they were definitely visible in the body (Figure 16).



Figure 16: Individual 3 showing signs of skeletonization in the facial area and in the upper torso area.

The foam that had been in the chair began to recede although maggot masses were left in the pubic areas and in the upper legs. Drying also began to occur in the upper torso area where the previously mentioned skeletal elements were visible. While there was some blackening of the upper torso, the rest of the body remained a yellow color. The lower legs began to be infested throughout the second week with the lower legs and feet being targets for maggot infestation. By the end of the two weeks, the tibia was visible.

Throughout week three, Individual 3 continued to dry with new insects seen around the body,

but the puddle in the base of the chair allowed for another influx of maggots and active decomposition. Beetles were seen on day 15 of the project with flies also being noted around the body. The puddle that remained in the chair did not completely fill the chair, but maggots could be seen swimming in and out of the lower legs and lower torso in the “decomposition puddle”. The decomposition puddle during this time period did not contain the foam seen during the first two weeks, but changed to a darker brown color (Figure 17). Rain fall did contribute to the growing of the puddle with a major rainstorm being noted on day 21.



Figure 17: The “decomposition puddle” after a few weeks. Insects are visible.

Week five was the first incident of scavenging. The scavenging was seen on the right leg. The calcaneus and the tibia became visible due to the scavenging and the body had been slightly pulled

downward toward the ground (Figure 18 and Figure 19).



Figure 18: Individual 3 showing signs of scavenging on the right leg.



Figure 19: Individual 3's right leg and foot with the exposed fibula after an episode of scavenging.

The right arm was pushed into a right angle. Throughout week five scavenging continued to occur at the right leg and right arm.

Weeks four through week six were marked by the drying and pooling of water and other materials in the chair. This pooling allowed for repeated infestations of the areas in contact with the chair, mainly the pubic area and upper legs. Initially, maggots and pupae casings were noted, but as the

puddle would dry, beetles and flies became more commonly seen in the area. The body continued to dry out and no increased skeletonization of other body parts was noted.

Weeks seven and eight were categorized as continued drying, mummification, and slight skeletonization. No more scavenging was seen to take place. Much of the body, especially the torso, continued to become darkly discolored with little to no insect activity seen around the area. The only areas seemingly affected by any insect activity during this period were the upper leg and pubic area. The insect activity was only noted whenever the puddle in the chair was present.

Temperature Data:

Temperature data was taken for each individual. The data helped to provide another means with which to examine the effects of the upright position. Temperature data was taken on an hourly basis and recorded by a Tiny Tag detector. Each graph shows the change in temperature as a function of time. The temperatures taken during the first 24 hours are severely low due to the prior freezing of each body, thus the first day of data was disregarded and temperature measurements began on June 17, 2011.

The major temperature fluctuation seen regularly is the change in temperature throughout the period of approximately 24 hours. While each body did have daily temperature fluctuations, Individual 3 experienced the greatest amount of temperature difference and fluctuation throughout the period of a day and the project. A sample of temperature data from day 7 was used to provide a more detailed representation of the daily temperature changes seen in the bodies.

Individual 1 (Control):

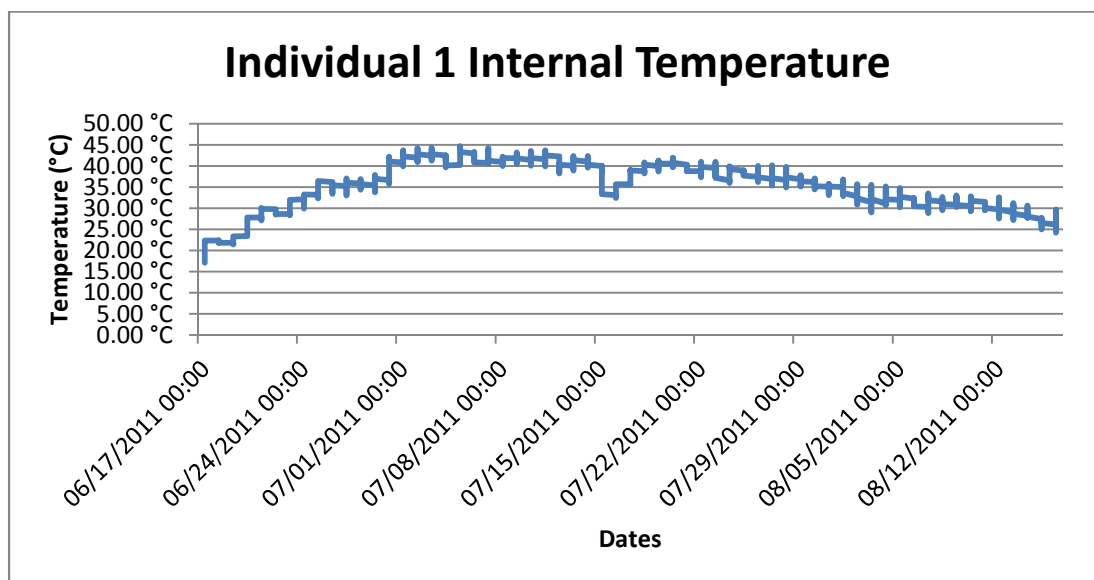


Figure 20: Graph of Individual 1's internal temperature from June 17, 2011- August 16, 2011

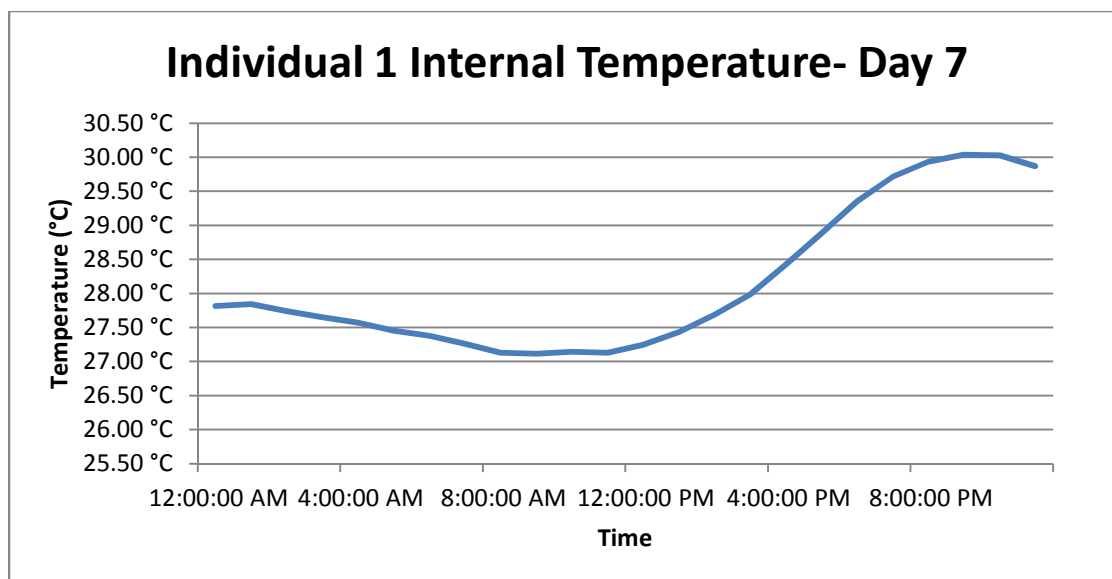


Figure 21: Graph of day 7 temperature for Individual 1

Individual 2 (Wall):

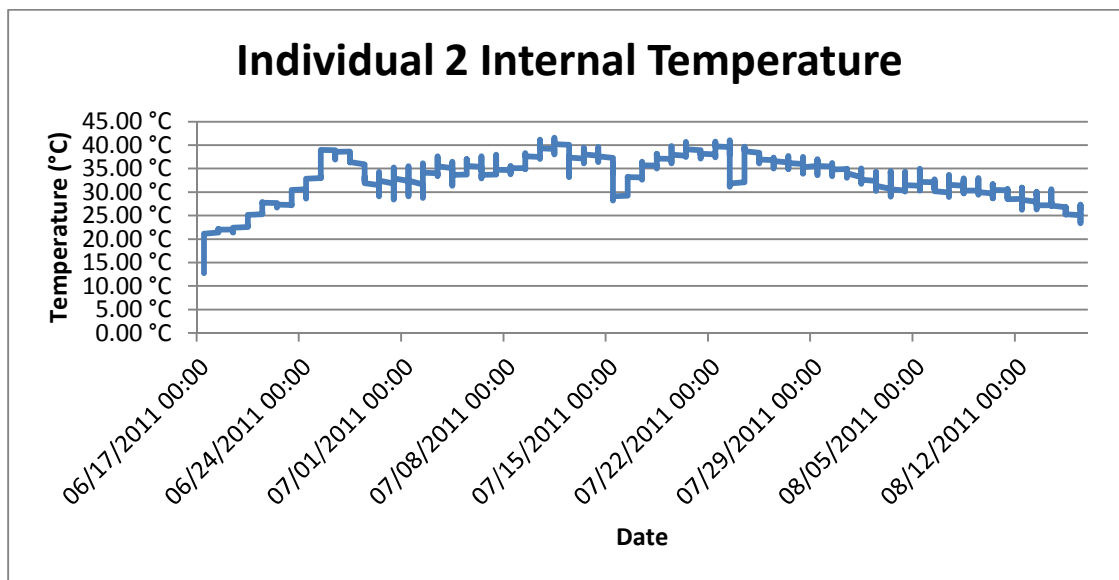


Figure 22: Graph of Individual 2's internal temperature from June 17, 2011- August 16, 2011

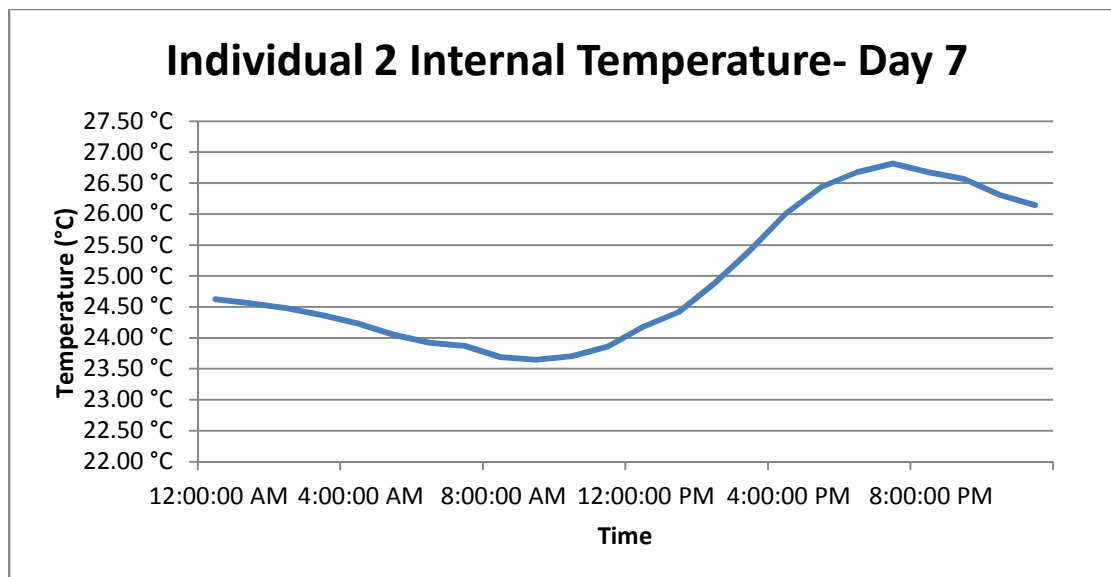


Figure 23: Graph of day 7 temperature for Individual 2

Individual 3 (Chair):

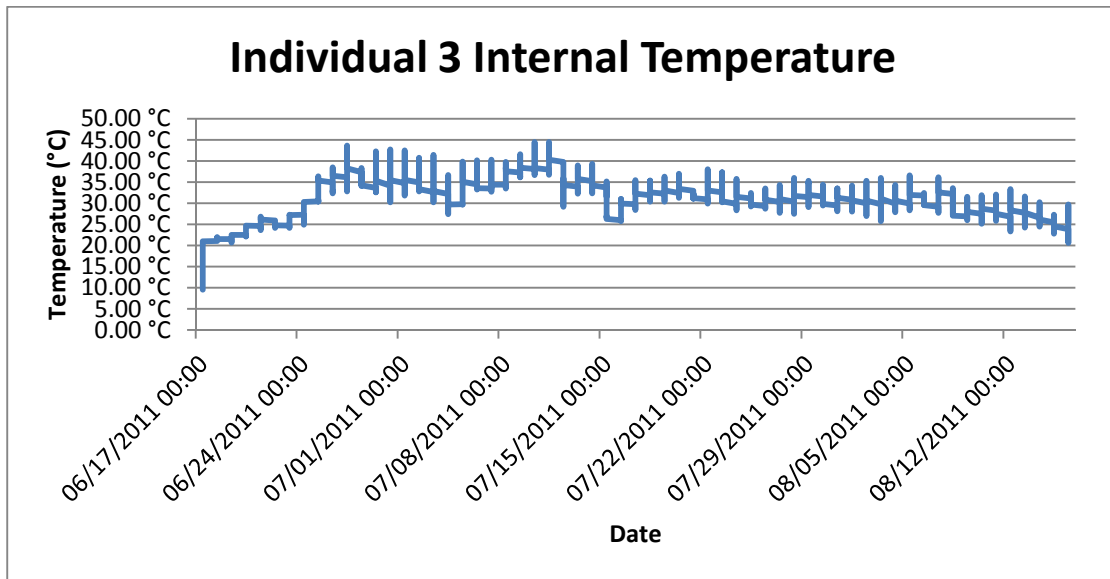


Figure 24: Graph Individual 3's internal temperature from June 17, 2011- August 16, 2011

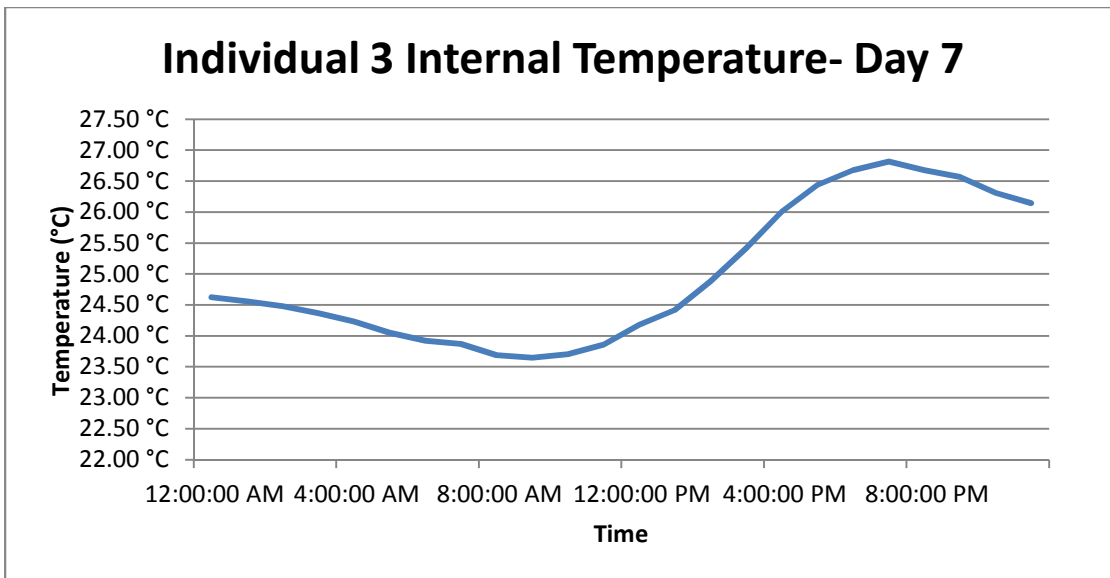


Figure 25: Graph of day 7 temperature for Individual 3

A comparison between the internal temperatures of each individual was also made to help visualize the temperature differences between each.

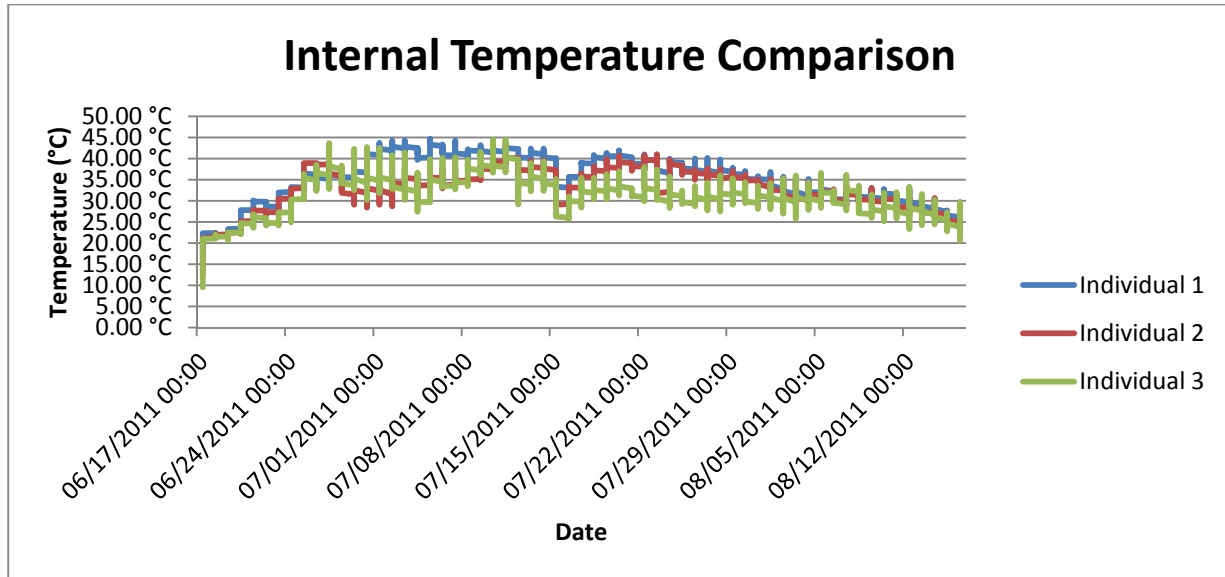


Figure 26: Graph comparing the internal temperature of Individuals 1-3

The ambient temperature was also recorded on an hourly basis throughout the project.

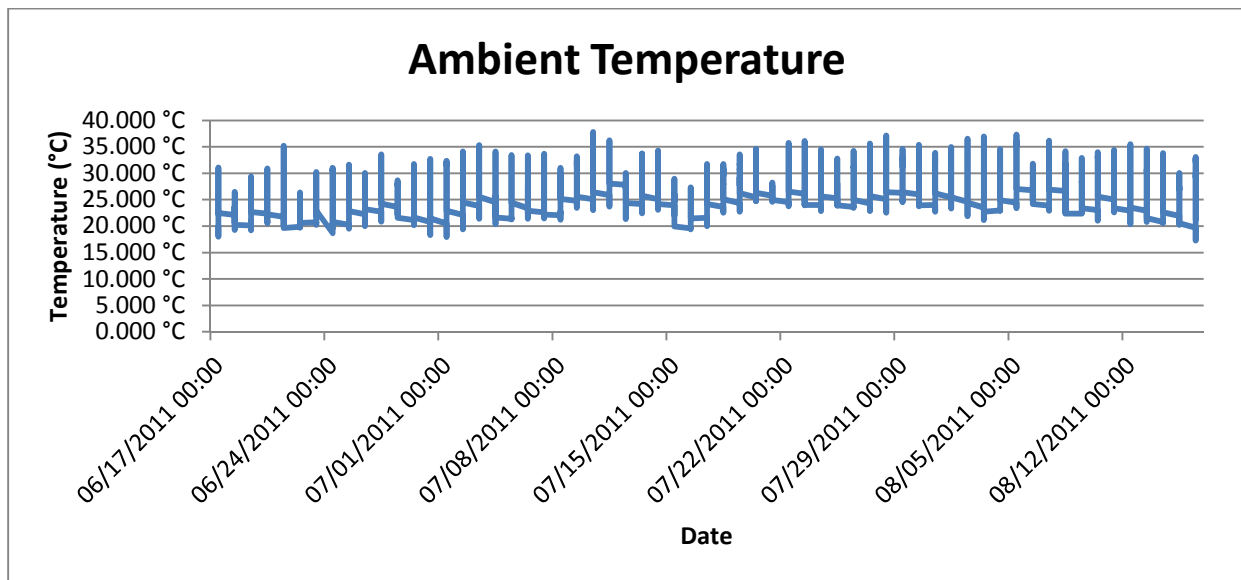


Figure 27: Graph showing ambient temperature for June 16, 2011- August 16, 2011

IV. Discussion

Comparative analysis between individuals shows that while some decompositional differences are seen between the bodies, most of these differences are limited in their effect on basic decomposition categorization of the individual. The process of decomposition for each individual was an on-going process, but mainly ceased after the first two weeks of exposure. While some minor differences were noted between the bodies, the body coloration, amount skeletonized, and the insect activity, major differences were less notable.

Individual 3 experienced much greater skeletonization and a greater amount of insect activity was visible on this individual for the entire two months. The difference in insect activity between Individual 3 and the other two bodies can be attributed to the puddle seen in the camping chair. While the puddle did go through multiple rounds of drying and then reappearance, it provided a better breeding ground for insects. The puddle which was a mix of organic, decomposition material and rain water attracted more bugs and provided a safe haven for many of the insects that may have remained within the body. The multiple insect infestations did not have an extreme effect on any macroscopic changes, but it did provide for a more complete decomposition process to occur especially in the pubic area and the upper legs that were around the chair.

The amount of skeletonization seen in Individual 3 was not predicted and was contrary to what was expected. Since Individual 3 was positioned in an upright seating position, it was thought that gravity would affect the insects located higher up on the body and decomposition of the upper torso and facial area would remain incomplete. While the individual's hair mass remained intact throughout the project and the skull remained attached to the body, the individual experienced roughly the same amount of facial and upper torso decomposition as was seen in Individual 1, the control.

The chair provided not only a breeding ground for insects and attracted more insects to

Individual 3, the chair also helped to contain many of the maggots and other insects that were on the body. While many insects were seen falling off the upper torso and face area, the insects would simply fall back into the chair and back on a lower area of the body. The chair was a contained area conducive to the decompositional process. While supporting insects, especially maggots, that were victims of gravitational forces, the chair allowed for these insects to never truly fall away from the body and remain near the individual for long periods of time. Furthermore, the chair provided for insects to continue to move up the body and back to areas where decomposition rates are high especially in the first two weeks of exposure. The upper legs and pubic area that were constantly exposed to the puddle showed greater amounts of decomposition. Individual 3 was the only individual to show some amount of skeletonization in these two, particular areas.

Individual 2 did not exhibit any major signs of deviating from the normal decomposition process. While some minor differences were not noted during the two months, none of the differences seemed to have a major effect on the process, nor were they a special incident relating solely to Individual 2. Individual 2's hair mass did stay attached for a much longer time than the control and the individual saw more skeletonization occur in the areas that were in contact with the ground, especially in the lower arms and in the legs. The skeletonization that was seen was never complete, and the individual dried and mummified between weeks 2 and 8.

The hair mat and skeletonization differences seen in Individual 2 were in part due to the upright posture the individual was in. While Individual 2 and 3 did not lose their hair masses for an extended amount of time (1-2 months), Individual 1 lost the hair mass within the first two weeks. The lack of complete skeletonization of the occipital and frontal areas of the skull affected this. Gravitational pull most likely had an effect on this with both Individual 2 and 3 not having their heads near the ground nor touching any part of the ground and having the head at some significant difference off the ground.

The gravitational pull affected insect's ability to remain for long, sustained periods at the highest point of elevation and without the ground, the insects were not able to use any extra support to remain near that particular area of the body.

The difference in skeletonization between Individual 2 and Individual 1 was minimal. Although Individual 2 seemed to be skeletonized in more areas than Individual 1, posture and height from the ground seemed to have little effect on these particular individuals. The lack of any skeletonization occurring in the torso, pubic area, and the legs was common to both bodies. For the most part, the individuals both continued to dry, deflate, and mummify throughout the project.

The lack of any macroscopic decompositional differences between the individuals provides a base on which to understand the effects of posture and height from the ground on the decomposition process. The microscopic changes noted normally affected only particular areas of the body and usually had little consequence on the major classification of the body within the general four descriptions usually used by forensic anthropologists.

Problems with the research include a small sample size of only three individuals, the lack of complete control over all possible variables, and the two month study period. The small sample size used in this project is not abnormal in decomposition studies. However, the use of more individuals would provide more data and a greater amount of analysis that is needed in such research.

While complete control over all variables is ideal in any research, this is not always possible in decomposition research. Some bodies were exposed to more sunlight or more shade than others and not all bodies may have been exposed to the exact same ambient temperature throughout the project. One individual was noted as being slightly heavier than the other two and this may have also affected the rate of decomposition. There is no possible way to completely determine the exact effect each possible variable may have on the decomposition process. In the future, a study that can completely isolate only

one variable in decomposition research would be ideal.

The two month period could also be extended to allow for individuals to completely skeletonize. While the two month period provided an adequate view of the ways in which the decomposition process is affected in early stages of decomposition, the later stages, especially skeletonization, were not studied as much. Since all three individuals experienced some amount of mummification, there was little analysis in the way in which complete skeletonization may occur and how quickly it may occur in each different scenario.

Further research that utilizes statistical and quantitative data may help to shed more light on the ways in which posture may affect the decomposition process. While no major macroscopic differences were noted, the microscopic differences could have an effect on the way in which a body is categorized using different methods of determining the amount of decomposition seen, especially methods that utilize scoring of different areas of the body or percentage of the body that has decomposed.

Future research could also focus on an indoor versus outdoor setting. Since most individuals who die in sitting positions usually die indoors, this could provide a new and different dimension to the study. Moreover, a study that included various types of seating and different postures could help to elucidate more of the effects that an upright posture may have on an individual. Incorporating more realistic seating devices such as couches or recliners that would be used in an indoor setting would be useful and would provide more information to possible ways in which the decomposition process may be affected.

V. Conclusion

The effect of upright posture on the decomposition process was analyzed in this project. Three individuals were placed in three different positions to examine the ways that the decompositional process may be affected by differences in posture. The use of a chair and sitting on the ground was the

two main variables in the project. All three bodies were left exposed in the Anthropological Research Facility for a period of two months. Internal temperature data was collected from each body for the entire sixty days along with the ambient, hourly temperature. Notes and pictures were taken on a daily basis and a basic decomposition category was given to each body daily along with notes taken on any peculiarities or differences seen on the body or among the bodies.

While no major differences were noted between the basic categorization of each body, smaller, minute changes were visible. The chair provided the biggest difference seen among individuals allowing for a puddle to develop in the seat and the seat to provide an area that encapsulated many the main factor of decomposition, insects. This puddle allowed for multiple insect infestations to occur and the seat also provided a net helping to catch any insects that may have fallen off of body parts that were located at higher elevations due to the sitting position.

The study provides a base study for further study into the ways in which posture may affect the decomposition process. Although limited by its qualitative analysis and its small sample size, the use of such a research project allows for further investigation into the decomposition process and the different variables that may have an effect on the process and the ways in which other estimations made from decomposition may be affected.

The use of actualistic decomposition studies is important to enhancing the knowledge of forensic experts. Although previous research has helped to illuminate the different effects a specific variable may have and the possible variations from what is expected, the further study of other aspects and variables that may affect the taphonomic processes studied by such experts is essential in developing and furthering the knowledge and information garnered by such research.

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