Bloodstain Shape vs. Height and Surface of Impact

**Background:**

In 1895 Edward Piotrowski used rabbit blood to understand how blood moved and reacted to impact. Blood drops are routinely observed on floor surfaces as well as on items of evidence located on the floor of crime scenes. Were these stains the results of passive dripping or some sort of impact? In this experiment we will examine how the size of a resulting bloodstain is related to the distance it has fallen. You will evaluate how the diameter of a stain is affected by the distance the drop has fallen and the target surface impacted. This experiment will acquaint you with how the variables of dropping distance and the surface texture being impacted will affect the resulting stain patterns. This experiment will further illustrate the factors which affect the size and appearance of passive drops of blood after they have struck the surface. It should be noted that it is generally not possible to make a direct correlation between drop sizes at a scene and the distance they fell because we do not know the original volume of blood causing the drop. This exercise will help you to begin to recognize patterns but realize you can’t make assumptions and must use more data to get an accurate picture.

**Knowledge Probe:**

1. What are drops made at a 90 degree angle called? Give at least 2 examples of how these might occur at a crime scene.
2. What 2 major forces act on blood drops? What do they do?
3. What are satellite drops?
4. What are spikes in terms of blood drops?

**Question#1**: What is the relationship between height of blood droplet and size of blood droplet?

**Question #2:** How does the surface in which blood is dropped on affect the shape of the blood drop?

**Investigation Plan:**

Height and Surface

1. Hold the dropper bottle upside down in a vertical position
2. Drop a single drop of blood by **gently** squeezing the dropper bottle from 15 cm onto your first target surface (paper). On your paper drops, label the height and allow it to dry to use as a reference.
3. On your data table (in observation section) make a sketch including any spikes or satellite drops and record the diameter of the blood drop in mm. **Do not include the spikes in the diameter measurement.**
4. Repeat #2 and #3 for heights of 30, 45, 60, 75, 100, and 150cm.
5. Once you have drops at each height on the paper, choose another target surface provided to you, and repeat steps #2 and #3 with the new target surface, just as you did with the paper surface.
6. Continue until you have completed drops at each height for 5 different surfaces.

Multiple Drops

1. Hold the dropper bottle of blood upside down in a vertical position at 30cm and drop a single drop of blood by **gently** squeezing the dropper bottle onto the paper. Sketch and measure the diameter in mm. DO NOT let this drop dry.
2. Now place your hand in the **exact same** location as you did for step 1. Drop a second drop on top of the first drop. Sketch and measure the diameter in mm. DO NOT let this dry.
3. Repeat this procedure until you have dropped a total of four drops on top of each other. Recording all data on data table.
4. Observe the stain made from the large volume pattern and record information on the data table.

**Observations:**

Record your observations in the data tables provided to you.

**Data Analysis:**

1. Create a graph on graph paper that illustrates the Drop height vs. Diameter for the blood drops on the paper surface. What pattern is created?
2. Using your graph, given the following diameters of blood drops approximately what height did they fall from?
   1. 8mm
   2. 14mm
   3. 18mm
3. Answer the following questions:
   1. How are the blood drops at different heights alike? How are they different?
   2. How does the surface texture being impacted have an effect on the blood stain diameter?
   3. How do the drops change as more drops fall in the same location?

**Explanation:**

Answer the two Questions by writing a ***claim, evidence, and reasoning*** for each.

**Evaluation:**

1. How confident are you in your results? Why?
2. Were there any sources of error? Explain.
3. What other questions do you have about blood drops and patterns?

**Application:**

1. Why is it important to know how blood patterns differ on different surfaces?
2. What factors would you need to know in addition to blood stain diameter and target surface texture in order to accurately assess the distance it fell prior to impacting the surface?
3. What information could be gained from a blood pattern that shows multiple drops?