Conservation of momentum in one dimension Stuart Keech

**Question:**

How does a collisionbetween 2 objects in one dimension in an isolated system affect the momentum of each object?

**Hypothesis:**

If two objects have a head on collision then the final momentum of the two carts together will be the same as the sum of their initial momentums. This will happen because the first cart will transfer momentum over to the other cart but it cannot create new momentum.

**Materials:**

Refer to lab on page 258 of physics 12 textbook.

**Procedure:**

Refer to lab on page 258 of physics 12 textbook.

**Observations:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Trial | Mass C1 (Kg) | Mass C2 (Kg) | Vi  (M/s) | Vf  (m/s) | Initial momentum  m1Vi | Final momentum  (m1+m2)vf | Percentage loss= Pi -Pf \*100  Pi |
| 1 | 0.489 | 0.499 | 0.38 | 0.18 | 0.189 | 0.178 | 5.82% |
| 2 | 0.989 | 0.999 | 0.462 | 0.23 | 0.457 | 0.457 | 0% |
| 3 | 0.489 | 0.999 | 0.52 | 0.17 | 0.254 | 0.253 | 0.394% |
| 4 | 0.989 | 0.499 | 0.79 | 0.54 | 0.781 | 0.804 | -2.94% |

**Analysis:**

aii) The velocity decreased in each trial.

iii) This change in velocity did not change the momentum because when the velocity decreased to keep the momentum the same.

iv) The changes in momentum need to be considered instead of the changes in momentum because if only the velocity is considered then the mass of the cart will no be taken into account.

b) The momentum was conserved well in all of the trials. The only trend is that when the initial velocity is higher the final momentum is higher in comparison to the initial momentum. In the slower trial the final momentum is lower than the initial momentum. In the second fastest the final momentum was the same as the initial and in the fastest trial the final momentum was larger than the initial.

c) Momentum was conserved well, refer to table for percent losses.

d) If the dynamics track had not been properly balanced then gravity would have affected the velocity of the carts. Depending on which way it was slanted it may have made the carts gain momentum or lose momentum.

f) In order to reduce the impact with the car you should accelerate forward. This will reduce the impact because if your speed is closer to the speed of the other car then there will be a smaller change in your velocity during the collision. If the change in velocity is smaller there is less force exerted in the car.

g) The best option for reducing injury is to slow down as much as possible before the collision. Slowing down will make your velocity as close to theirs as possible which will minimize the force that you exert on each other. It is also a good strategy to turn the skateboard slightly so it is not a head on collision. If it is not a head on collision then your velocities will not be the same as each other at the end. This means that your velocity changes less and there was less force.

**Conclusion:**

In a head on collision between two objects the momentums of the individual objects changed but the total momentum stayed the same throughout the experiment. The hypothesis was correct in saying that the momentum would be conserved.