

## Forces explained.

Have you ever pondered over the expression: "Every action has a reaction"? The majority of children do not know that this is actually a scientific theory - 'The Three Laws of Motion' - which was proven by Sir Isaac Newton. According to the theory, every action (or force) that occurs has an opposite reaction. To illustrate this, you might think of a spring. As a spring is compressed (squashed down), a resistant force can be felt acting against the pressure that has been applied to it. The greater the 'push' on the spring; the greater its resistance. Hence, the resistance (the reaction) responds to the push (the action). However, does the 'action and reaction' theory apply identically to all forces?

### Balanced and unbalanced forces

Interestingly, there are two main kinds of forces within Newton's theory: balanced and unbalanced forces. Balanced forces are created by two forces, which act against one another equally. Objects experiencing balanced forces will not move because neither force is stronger than the other. Therefore, the immobility of the object is the reaction to the balanced forces acting upon it: action and reaction! In contrast, unbalanced forces do not act equally against one another - they are unbalanced - because one of the two forces is stronger than the other. An object that experiences one stronger force against one weaker force will move. The strength of the dominant force determines the pace of the movement. Do unbalanced forces always cause movement?



Balanced forces acting on a toy



Unbalanced forces causing a toy to move

### Friction

Often, unbalanced forces change, prevent or reduce movement as well as increasing and causing it! Friction is a clear example of this. When two surfaces rub together in opposite directions, a frictional force is felt. Friction reduces speed and makes movement more challenging. Typically, friction is the force used when controlling the speed of movement because it can be accurately adjusted and manipulated to create specific reactions from its opposing action (movement). Reducing friction results in an increase in the speed of the moving object; whereas an increase in friction would have the opposite effect of reducing the object's speed. Is there a way of resisting or preventing friction?

### Air resistance

Occasionally, friction can be a hindrance and it can be necessary to attempt to reduce it. For example, bicycle racers experience a type of friction caused by the air pushing against them as they move. Air resistance! Air resistance is an undesirable frictional force because it results in a reduction of the bicycle's speed. The faster the bicycle: the stronger the air resistance. Preventative steps, therefore, must be taken to reduce the air resistance acting upon the bicycle. Unfortunately, it is not possible to stop air from pushing against a moving object. What is the solution? Simply, by making the moving object aerodynamic. Aerodynamic objects allow the air to pass freely around them, which reduces the frictional force felt. Air passes far more easily around objects which are streamlined and have a smaller surface area.

### Summary

In summary, "Every action has a reaction"! Without a doubt, every force will have another force acting upon it. In the instances where forces are balanced, the object being affected will not move because the two forces will be equal. In contrast, where forces are unbalanced, the movement of an object will be changed.