Flipping Physics Lecture Notes:
How to Wear a Helmet
A Public Service Announcement from Flipping Physics

Newton's 2nd Law: $\sum \vec{F} = m\vec{a} = m\frac{\Delta \vec{v}}{\Delta t} = m\left(\frac{\vec{v}_f - \vec{v}_i}{\Delta t}\right) = \frac{m\vec{v}_f - m\vec{v}_i}{\Delta t}$ & $\sum \vec{F} = \frac{\Delta \vec{p}}{\Delta t} = \frac{\vec{p}_f - \vec{p}_i}{\Delta t} = \frac{m\vec{v}_f - m\vec{v}_i}{\Delta t}$

Impulse Approximation: during the short time interval of the collision, the force of impact is much larger than all of the other forces, therefore we can consider the other forces to be negligible when compared to the impact force and the net force is approximately equal to the force of impact.

$$\vec{F}_{impact} \approx \sum \vec{F} = \frac{m\vec{v}_f - m\vec{v}_i}{\Delta t} \Rightarrow \vec{F}_{impact}\Delta t = m\vec{v}_f - m\vec{v}_i$$

Looking at the variables on the right hand side of the equation. Mass, final velocity, and initial velocity of my head: none of these variables depend on whether the helmet is on my head or not. In other words the right hand side of the equation is constant. This is the concept of Impulse and is also equal to the change in momentum of my head.

$$\vec{F}_{impact}\Delta t = m\vec{v}_f - m\vec{v}_i = \Delta \vec{p} = Impulse$$

Wearing a helmet during a collision will increase the time it takes for my head to stop and therefore decrease the force of impact on my head, even though the impulse is constant. That is why you should buckle your helmet, so that it stays on your head, increases the change in time during the collision and reduces the force of impact on your head.