

## Jocaxian's Train

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### Short Commentary

This article presents two simple and analog situations related to classic mental experience known as “Einstein’s Train”, which explains the temporal dilatation regarding special relativity theory, and then it points a logical contradiction between them.

### Einstein’s Train

This experiment is common to every student of relative theory restricted to mental experience which shows temporal dilatation which occurs when invariance of measurement of light speed is postulated [1-4] (Figure 1).

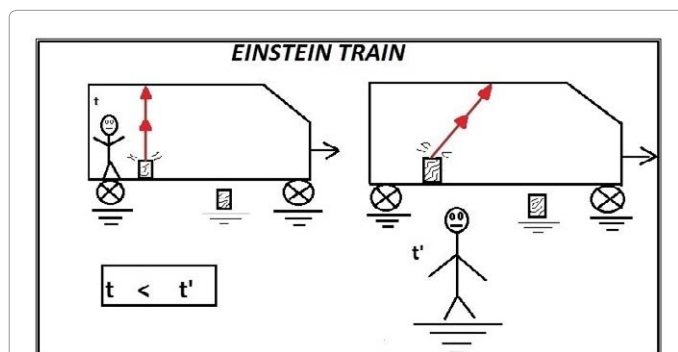
As we can see with these classic examples (picture above), the observers who see flash of light going back and forth to its referential point, i.e., when source of light is standing regarding itself (at these examples, the observer who is at the wagon where light source is found as well), he calculates a lower time for the path of light than it’s calculated from observer who sees the light making a longer path (observer at the station).

For this reason you can say that observer’s watch whose source of light is standing regarding him (in the wagon) walks slower than the observer’s watch of the station, who sees moving source of light within the wagon, measuring, then, a bigger path of light. So, in order to have the same light speed ( $=c$ ), the time must be also higher for observer who measures a bigger path of light.

This phenomenon is known as “temporal dilatation”. So, the person who sees the light making a smaller path experiences “temporal dilatation”-at our example, the person who is within the train in movement-with light source standing regarded itself, very didactic and simple. Then, “Jocaxian’s Train” arises.

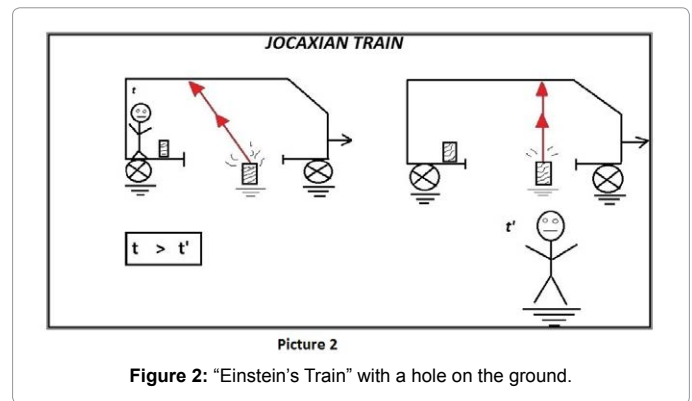
### Jocaxian’s Train

Jocaxian’s train (JT) is nothing more than the old “Einstein’s Train” with a hole on the ground! We also added a source of light on the station floor close to the rails (the same source of light of the train of the previous example (Figure 2).



Picture 1

Figure 1: Relative theory restricted to mental experience which shows temporal dilatation.



Picture 2

Figure 2: “Einstein’s Train” with a hole on the ground.

When the train moves, the source of light, standing at the station floor, issues a flash, which passes by the hole on the train floor and enters in the moving train, which reflects on mirrored ceiling and gets back to the flashlight which emitted the beam on the ground. i.e., as JT moves, the light enters on the hole placed at the ceiling of train and gets back to the flashlight, a back and forth similar to the Einstein Train, but now, who is on the station, outside of the wagon, is the person who sees the light going back and forth to the same path (the shortest path!).

The observer who is on the moving train sees the flash of light making a longer path as part of a “triangle”. i.e., at this JT, who is on moving train sees a “bigger” path of the flash of the light than the observer standing at the station.

So, as the two observers shall measure the same speed for the light, the time, within this JT concept, passes faster for observer who is on the station and sees the light making a shorter path!

So, in this case, the observer on the station, who is out of the train, experiences temporal dilatation.

i.e., the time passes faster for the observer in the moving train: the person who sees the light making a longer path.

### Paradox

So, this mental experience shows we have a paradox in the restricted relativity, because the same physical train and the same observers experience a temporal dilatation which depends on where the light comes from, whether it comes from the train (when the source is going to the train) or outside of it (when the source is standing at the station).

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