Time Dilation Can be Emerged from Newtonian Time in One Case

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Abstract This study shows that time dilation supposed by Einstein can be derived from absolute time supposed by Newton if Newtonian space is sloped with motion where space of moving frames is sloped with respect to space of the stationary frame of reference. Slope of Newtonian space creates a new kind of energy that causes moving frames to experience slight resistance while moving to forward in Newtonian space; hence, moving frames reverse slightly backward in space. With respect to observers at rest, the sum of the distance that the light travels vertically during motion of the moving frame S' to forward $\left(x_v\right)_f$ and the distance that the light travels vertically during motion of the same frame to backward $\left(x_v\right)_b$ is equal to the distance (x_v') that the light travels vertically in frame S' from the perspective of the observers in the same frame S'. The motion of light through the reversed space dilates Newtonian time of the moving frames with respect to the stationary frame of reference, like a car that moves slowly because it is climbing a hill, the time of the moving bodies moves slowly because of the slope of Newtonian space. This work does not aim to prove slope or straightness of space; rather it aims to show that time dilation can be exists in nature as a result of a reaction between Newtonian time and slope of Newtonian space, therefore testing of slope's property must be included in the interests of applied physicists in the next days.

Keywords: *Newtonian Space, Newtonian Time, Time dilation, Dimensions of the Universe*

1. Introduction

In 1887, Michelson and Morley performed the well-known Michelson–Morley experiment to determine the speed of the earth relative to that of the luminiferous ether [1, 2], which was considered the fundamental substratum of space and believed to be the medium of light propagation [3]. The idea of the experiment can be summarized as follows: "The motion of the earth in the ether at velocity *v* generates an ether wind with the same velocity; therefore, if we succeed in measuring the effect of the ether wind on light motion, it will serve as a strong evidence for the existence of the ether."

The null result of the Michelson-Morley experiment is considered strong evidence against the ether theory [4] and is unexpected according to Galilean physics. In 1892, Lorentz first explained this null result in an attempt to conserve the ether theory; he suggested that the length of a body/object in the direction of motion contracts by an amount equal to γ (the Lorentz factor) because of a postulated similarity between molecular cohesion forces and electrostatic forces [5], The Lorentz transformations are a set of mathematical equations [6] used to correlate space and time coordinates of a moving system to determine the space and time of another system, when two observers (each in either system) are moving relative to each other. The Michelson–Morley experiment can be explained by these transformations; the length of an object along the direction of motion contracts (by a factor equal to γ) [7] while transforming to a moving frame. Consequently, the speed of light is identical in all frames, thus yielding the null result of the Michelson–Morley experiment.

Following this, in 1905, Einstein posited the non-existence of the absolute medium and introduced the "special relativity" theory, which is based on two postulates: first, the laws of electrodynamics and optics are valid for all frames of reference; second, the speed of light is constant regardless of the motion of the light source [8], Einstein deduced the Lorentz transformation from these two postulates. Consequently, he suggested that the length of moving bodies contracts along the direction of their motion and that the bodies undergo time dilation [9, 10]; therefore, the result of the Michelson–Morley experiment is negative. Special relativity introduces a different system in which space and time are not absolute for all inertial frames [11]. Rather, they are relative to the frame of reference [12] unlike in the Newtonian world, where space and time are absolute for all inertial frames. The purpose of this paper was to show that time dilation and its results (e.g. length contraction) can be one of the implications of Newtonian time if we postulate a specific hypothesis related to the geometry of Newtonian space.

1.1. Postulate

The following postulate considered herein:

-Space of moving frames is sloped relatively with respect to space of the stationary frame of reference (Fig.1).

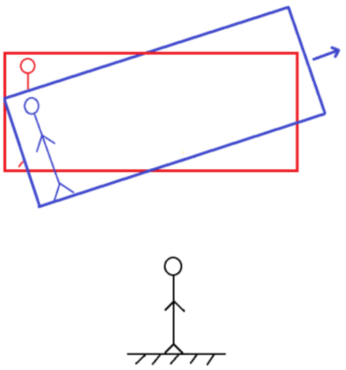

Fig. 1. The moving frame (the red one) is observed as sloped (the blue one) with respect to the observer in a stationary frame that is colored black

1.2. Research Summary

This study introduces the space–time continuum as an emerging phenomenon based on the absolute nature of space and time and the slope of space. To prevent confusion, this study provides a new analysis on the vertical motion of light in moving frames in case of slope of moving systems related to each other. A new theory on this concepts is also established without interfering with previous experimental work [13, 14, 15, 16, 17]. According to the mentioned postulate, new dimensions are created, these dimensions are referred to as reverse space–time, which is similar to the motion of cars along a hill in races, where cars suffer from resistance to move forward or slid backward during their motion to forward. The distance that the cars regress and the time that the cars delay to move forward consider the dimensions within which the cars exist. This study has the following idea: the absolute space supposed by Newton looks like a hill, this reflects on moving frames by making it sloped and tilted also with respect to observers at rest, the moving frames are also suffer from resistance to move forward in absolute space and time; hence, it reverse slightly backward in space and time, the motion of light during motion of the frame to forward and backward need to be considered

2. Results

I find there are many results can be obtained based on slope of space of moving bodies with respect to a stationary frame of reference.

2.1. Re-calculation of the distance that light travels between two relative moving systems according to Newtonian time and sloped space

This section describes the calculation of the difference, Δx_v , between the distances that light travels vertically in frames S' and S (frames in a uniform relative motion) according to the presence of a universal time between the two frames. In the next section, I will show and explain where light travels along this distance, Δx_v and explain the physical meaning or the physical name of Δx_v .

Suppose that a vertical light beam is emitted in the x' direction in frame S'. Thus, x'_v , which represents the distance that the light beam travels vertically in frame S' (Fig.2), can be given in the presence of absolute time, t_{ab} , as follows:

$$t_{ab} = \frac{x'_v}{c}, \tag{1}$$

$$x'_v = c\,t_{ab}. \tag{2}$$

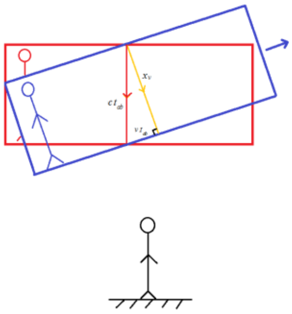

Fig.2. The red vertical line refers to the light motion in the moving frame S' that is colored red from perspective of the observer of the same frame who is colored red, while the yellow sloped line refers to the light motion in the sloped S' (that is colored blue) from perspective of the stationary frame of reference S that is colored black (observer at rest)

The transformed distance, x_v , which refers to the distance that light travels in frame S', from the perspective of the observers in frame S will not be represented mathematically as a triangle's string because according to the mentioned postulate, space of the moving frame S' is sloped with respect to the observers of the stationary frame S , therefore the transformed distance, x_v , will be represented mathematically as a triangle's rib while the distance , x'_v , will be represented mathematically as a triangle's string. Accordingly the transformed distance, x_v , can be given as follows in the presence of a universal time (absolute duration):

$$\left(c\,t_{ab}\right)^2 = \left(x_v\right)^2 + \left(v\,t_{ab}\right)^2, \tag{3}$$

$$c^2 = \left(\frac{x_v}{t_{ab}}\right)^2 + v^2,$$

$$\sqrt{c^2 - v^2} = \frac{x_v}{t_{ab}},$$

$$t_{ab} = \frac{x_v}{\sqrt{c^2 - v^2}},$$

$$t_{ab} = \frac{x_v}{\sqrt{c^2\left(1 - \frac{v^2}{c^2}\right)}},$$

$$t_{ab}=\frac{x_v}{c\sqrt{1-\frac{v^2}{c^2}}},$$

$$x_v=c\,t_{ab}\sqrt{1-\frac{v^2}{c^2}}. \tag{4}$$

The difference between the distances (Δx_v) that light travels vertically in frames S' and S is given as follows according to Eqs. (2)–(4):

$$\Delta x_v=x'_v-x_v, \tag{5}$$

$$\Delta x_v=c\,t_{ab}-c\,t_{ab}\left(\sqrt{1-\frac{v^2}{c^2}}\right),$$

$$\Delta x_v=c\,t_{ab}\left(1-\sqrt{1-\frac{v^2}{c^2}}\right). \tag{6}$$

We obtain the three following important equations based on the mathematics in this section:

$$x'_v=c\,t_{ab},$$

$$x_v=c\,t_{ab}\sqrt{1-\frac{v^2}{c^2}}, \tag{7}$$

$$\Delta x_v=c\,t_{ab}\left(1-\sqrt{1-\frac{v^2}{c^2}}\right).$$

2.2. Space of moving bodies is reversed with respect to the stationary frame of reference

If space is absolute in nature as Newton supposed, it should be determined why light travels vertically a shorter distance x_v in frame S compared to that x'_v in frame S' and where light travels along the distance Δx_v determined in the previous section. According to the mentioned postulate, which states that "Newtonian space is sloped with motion," the light in moving frame S' slightly slides backward with respect to the observers in the stationary frame S .This divides or classifies the distance that the light travels vertically in frame S', from the perspective of the observers in frame S into two kinds with two different directions: the distance that the light travels or progresses to forward $(x_v)_f$ and the distance that the light travels or regresses to backward $(x_v)_b$ or Δx_v .The sum of the two distances that the light travels vertically to backward and forward in frame S', from the perspective of the observers in frame S is equal to the distance x'_v that the light travels vertically in frame S' from the perspective of the observers in the same frame S'. By this explanation, the distance that the light travels vertically is the same for all the frames of reference regardless the motion (Fig. 3):

$$x'_v=x_v, \tag{8}$$

$$x'_v=(x_v)_f+(x_v)_b. \tag{9}$$

where,

$$(x_v)_f=c\,t_{ab}\left(1-\sqrt{1-\frac{v^2}{c^2}}\right), \tag{10}$$

$$(x_v)_f=\frac{x'_v}{\gamma}. \tag{11}$$

while,

$$\Delta x_v=(x_v)_b, \tag{12}$$

$$(x_v)_b=c\,t_{ab}\left(1-\sqrt{1-\frac{v^2}{c^2}}\right),$$

$$(x_v)_b=x'_v\left(1-\frac{1}{\gamma}\right). \tag{13}$$

where γ is the Lorentz factor. This phenomenon is named herein as "space reversal," which refers to the reversal of the space of moving bodies with respect to a stationary frame of reference because of the slope of Newtonian space.

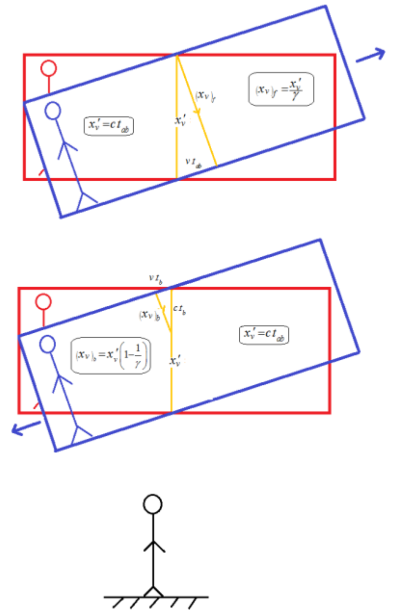

Fig. 3. The distance that the light travels vertically during motion of the blue frame S' to forward $(x_v)_f$ and the distance that the light travels vertically during motion of the same frame to backward $(x_v)_b$ are equal to the distance (x'_v) that the light travels vertically in the red frame S' from the perspective of the observers in the same frame S'

2.3. Time of moving bodies is reversed with respect to the stationary frame of reference

As mentioned in the previous section, the moving frame S' slightly slides backward because of the slope of space, thereby leading to the reversal of the time of frame S' with respect to the observers in frame S . The reversed time (t_b) of frame S' as measured in frame S can be derived using the following equations if the backward distance that light reverses in frame S' as measured in frame S is $(x_v)_b$:

$$(c\,t_b)^2=(x_v)^2_b+(v\,t_b)^2, \tag{14}$$

$$\left(c.t_b\right)^2=\left(c.t_{ab}\left(1-\sqrt{1-\frac{v^2}{c^2}}\right)\right)^2+\left(v.t_b\right)^2,$$

$$c^2=\left(\frac{c.t_{ab}}{t_b}\left(1-\sqrt{1-\frac{v^2}{c^2}}\right)\right)^2+v^2,$$

$$c^2-v^2=\left(\frac{c.t_{ab}}{t_b}\right)^2\left(1-\sqrt{1-\frac{v^2}{c^2}}\right)^2,$$

$$\frac{c^2-v^2}{c^2}=\left(\frac{t_{ab}}{t_b}\right)^2\left(1-\sqrt{1-\frac{v^2}{c^2}}\right)^2,$$

$$1-\frac{v^2}{c^2}=\left(\frac{t_{ab}}{t_b}\right)^2\left(1-\sqrt{1-\frac{v^2}{c^2}}\right)^2,$$

$$\sqrt{1-\frac{v^2}{c^2}}=\frac{t_{ab}}{t_b}.\left(1-\sqrt{1-\frac{v^2}{c^2}}\right),$$

$$1=\frac{t_{ab}}{t_b}.\left(\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}-1\right),$$

$$t_b=t_{ab}.\left(\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}-1\right),$$

$$t_b=t_{ab}.(\gamma-1). \qquad (15)$$

The reversed time of the moving frame S' with respect to the observers in frame S is determined using Eq. (15).This phenomenon is named here as “time reversal” (Fig.4), which refers to the reversal of the time of moving bodies with respect to a stationary frame of reference because of the slope of space. According to Eq. (15), the reversed time (t_b) of the moving bodies is relative depending on the velocity of the moving bodies from the perspective of the stationary observer. This finding is different from the nature of time or progressing time (t_{ab}) that is absolute for everyone everywhere (independent of the motion of the bodies). Therefore, “time moves forward absolutely (as Newton suppose) and backward relatively.”

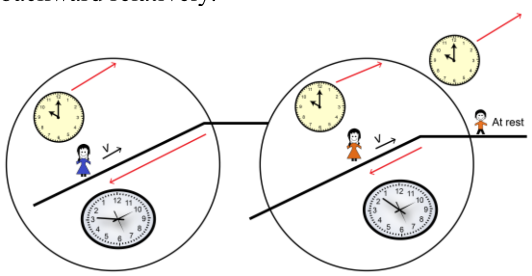

Fig. 4. The universal time of two different moving frames (t_{ab}) is reversed with respect to an observer at rest by different values (t_b) depending on the velocity of the moving frames, where $t_b=t_{ab}.(\gamma-1)$

2.4. Calculation of the elapsed time in the moving frames with respect to the stationary frame of reference "time dilation"

Like a car that moves slowly because it is climbing a hill, the time of the moving bodies moves slowly because of the slope of space. The total elapsed time (t) in the moving frame with respect to the stationary frame of reference can be calculated as follows:

$$t=t_{ab}+t_b, \qquad (16)$$

$$t=t_{ab}+\left[t_{ab}(\gamma-1)\right],$$

$$t=t_{ab}+\left(\gamma t_{ab}-t_{ab}\right),$$

$$t=t_{ab}+\gamma t_{ab}-t_{ab},$$

$$t=\gamma t_{ab}. \qquad (17)$$

According to Eq. (17), the elapsed time *t* in frame S' with respect to the observers in frame S becomes higher than the elapsed time t_{ab} in frame S' with respect to the observers in the same frame. This phenomenon is known as “time dilation” and it is the most important result of special relativity. This section shows how the result of “time dilation” can be obtained according to the “reversal of time” phenomenon. “Time in moving frames moves forward absolutely (as Newton suppose) and backward relatively, where the final result refers to the dilation of the elapsed time in the moving frames with respect to the stationary frame of reference depending on the velocities of the moving frames as measured in the stationary frame of reference (as Einstein suppose)”.

2.5. Dimensions of the universe

We describe the classification of the dimensions of the universe in this section.

2.5.1. Width-height continuum

First, according to the previous sections, the two dimensions; the forward time (t_f) and the forward length (x_f) of the moving frame S' as measured in frame S are equal to the time and length in frame S' (t',x'). Thus, both dimensions; time and length (t_f,x_f) are absolute:

$$t_f=t', \qquad (18)$$
$$x_f=x'.$$

While the two dimensions; the forward width (y_f) and the forward height (z_f) in frame S is not equal to the width and height in frame S' (y',z'). Thus, both dimensions; width and height (y_f, z_f) are relative between the two frames as follows:

$$y_f = \frac{y'}{\gamma}, \quad z_f = \frac{z'}{\gamma}. \tag{19}$$

Thus, the time and length are absolute between moving systems. It cannot be considered as dimensions as it moves (progresses) regularly for everyone everywhere while the width and height are relative so it can be considered as dimensions. The height with width form a new continuum called the "width-height continuum."

2.5.2. Reverse space-time continuum

Second, according to the previous sections, the space and time of frame S' are reversed with respect to observers in frame S (depending on the relative velocity of frame S'). The reversed space and time in frame S are measured as follows:

$$\begin{aligned} t_b &= t'(\gamma-1), \\ x_b &= x'\left(1-\frac{1}{\gamma}\right), \\ y_b &= y'\left(1-\frac{1}{\gamma}\right), \\ z_b &= z'\left(1-\frac{1}{\gamma}\right). \end{aligned} \tag{20}$$

where,

$$\gamma-1=1-\frac{1}{\gamma}. \tag{21}$$

Thus, three dimensions of the relative reversed space and one dimension of the relative reversed time are obtained. The four dimensions of space and time are called "reversed space-time."

2.5.3. Space-time continuum

Third, the final result of "Width-height continuum" and "Reverse space-time continuum" can be obtained as follows:

1. Regarding to time dimension (t), the time of the moving frame with respect to the stationary frame of reference is equal to the progressing or forward time t_f (time of the moving frame with respect to its observers t') and the regressing or backward time t_b. Thus, the time dimension (t) is relative, where the time of the moving frames dilated with respect to time of the stationary frame of reference:

$$\begin{aligned} t &= t' + t_b, \\ t &= t'(\gamma). \end{aligned} \tag{22}$$

2. Regarding to the height dimension (z), the distance that light travels vertically to forward and backward in frame S that are z_f and z_b is equal to the distance that light travels vertically in frame S' that is z'. Thus, the height dimension (z) is absolute, where the distance that light travels vertically is the same for all the frames of reference:

$$\begin{aligned} z &= z_f + z_b, \\ z &= z'. \end{aligned} \tag{23}$$

3. Regarding to the width dimension (y), the distance that light travels transversely to forward and backward in frame S that are y_f and y_b is equal to the distance that light travels transversely in frame S' that is y'. Thus, the width dimension (y) is absolute, where the distance that light travels transversely is the same for all the frames of reference:

$$\begin{aligned} y &= y_f + y_b, \\ y &= y'. \end{aligned} \tag{24}$$

Regarding to the length dimension, the total distance that light travels longitudinally to forward and backward is decreased where the length is contracted as a result of subtraction of the backward motion of the moving frame from the forward motion of that frame. Thus, the length dimension (x) is relative, where the length of the moving frames is contracted with respect to the stationary frame of reference:

$$x = \frac{x'}{\gamma}. \tag{25}$$

We obtain six dimensions of space and time (i.e., two dimensions of the "width-height continuum" and four dimensions of the "Reverse space-time continuum"). The six dimensions are called the "space-time continuum.

From perspective of observer at rest	t	x	y	z

The moving frame to forward	t'	x'	$\frac{y'}{\gamma}$	$\frac{z'}{\gamma}$
The moving frame to backward	$t'(\gamma-1)$	$x'(\gamma-1)$	$y'(\gamma-1)$	$z'(\gamma-1)$
The final result	$t'(\gamma)$	$\frac{x'}{\gamma}$	y'	z'

Tab. 1. Stationary observer in frame s records the events in the moving frame s' with coordinates (t, x, y, z).

From perspective of observer at rest	t	x	y	z
The moving frame to forward	Absolute	Absolute	Relative *Widthheight continuum*	Relative *Widthheight continuum*
The moving frame to backward	Relative *Reverse spacetime continuum*	Relative *Reverse spacetime continuum*	Relative *Reverse spacetime continuum*	Relative *Reverse spacetime continuum*
The final result	Relative *Spacetime continuum*	Relative *Spacetime continuum*	Absolute *Spacetime continuum*	Absolute *Spacetime continuum*

Tab. 1. Spacetime continuum is the sum of two continuums that are Widthheight continuum and Reverse spacetime continuum.

2.6. Calculation of slope of Newtonian space

In this section, we aimed to calculate the value of slope of Newtonian space of the moving frame with respect to space of the stationary frame of reference (Fig. 3) as the following equations show:

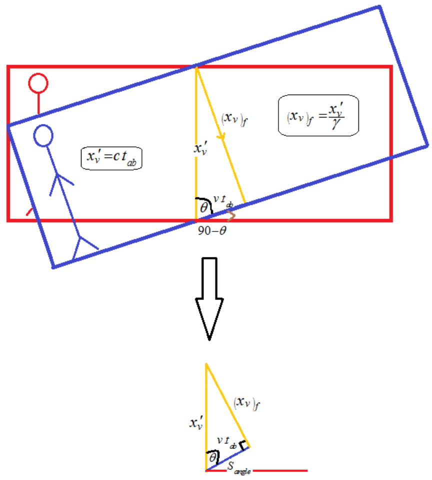

Fig. 5. The angle of slope (S_{angle}) of the moving space with respect to the stationary space

$$\theta = \sin^{-1}\left(\frac{(x_v)_f}{x'_v}\right), \tag{26}$$

$$\theta = \sin^{-1}\left(\frac{x'_v}{\gamma x'_v}\right),$$

$$\theta = \sin^{-1}\left(\frac{1}{\gamma}\right). \tag{27}$$

$$\theta = \cos^{-1}\left(\frac{v.t_{ab}}{x'_v}\right), \tag{28}$$

$$\theta = \cos^{-1}\left(\frac{v.t_{ab}}{c.t_{ab}}\right),$$

$$\theta = \cos^{-1}\left(\frac{v}{c}\right). \tag{29}$$

$$\theta = \tan^{-1}\left(\frac{(x_v)_f}{v.t_{ab}}\right), \tag{30}$$

$$\theta = \tan^{-1}\left(\frac{x'_v}{v.t_{ab}.\gamma}\right),$$

$$\theta = \tan^{-1}\left(\frac{c.t_{ab}}{v.t_{ab}.\gamma}\right),$$

$$\theta = \tan^{-1}\left(\frac{c}{v.\gamma}\right), \tag{31}$$

$$slope\ \ angle = 90 - \theta. \tag{32}$$

By Eq. (26, 28, 30 and 31), we can get the angle of slope of the moving frame (S_{angle}) as,

$$S_{angle} = 90 - \theta = 90 - \left(\sin^{-1}\left(\frac{1}{\gamma}\right)\right).$$

$$S_{angle} = 90 - \theta = 90 - \left(\cos^{-1}\left(\frac{v}{c}\right)\right). \tag{33}$$

$$S_{angle} = 90 - \theta = 90 - \left(\tan^{-1}\left(\frac{c}{v.\gamma}\right)\right).$$

From Eq. (32) the slope of space of a moving frame with respect to space of an observer who exists at rest is given by,

$$m = \tan(S_{angle}). \tag{34}$$

According to the previous equation, we find that space of moving frames is sloped negatively with respect to space of the stationary frame of reference.

3. Discussion

I find there is a simple method that by it spacetime continuum can be emerged from absolute space and time that is denied after special relativity. If absolute space is sloped with motion, time dilation and its implications (length contraction) will be the result. The study explains time dilation as follows: the moving frames experiences resistance while progressing to forward; thus, light slides slightly backward during its forward motion, leading to a delay in moving clocks with respect to stationary clocks, where the second in a stationary frame of reference precedes the second in the moving frames. Referring to this phenomenon as time dilation is not accurate because time runs regularly everywhere. Therefore, it is better to refer to it as time delay where time in moving frames moves forward absolutely (as Newton suppose) and backward relatively.

4. Methods

The theoretical analysis of emergence of time dilation from Newtonian time was performed in accordance with the constancy of the speed of light, regardless of the light source motion.

5. Data Availability

All data generated or analysed during this study are included in this published article.

6. Conclusions

I conclude that Newtonian space is sloped; this makes the moving frames to be sloped also where the observers at rest can experience the slope of Newtonian space by observation of the slope of surrounding moving frames. In addition to that, I conclude that if the time interval between two events in the moving frame s' is less than the reversing time of that moving frame as measured in frame s, the two events will be communicated with each other without need to time and if space interval between two events in the moving frame s' is less than the reversing space of that moving frame as measured in frame s, the two events will be communicated with each other without need to space .

7. Acknowledgement

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10. Conflict of Interest

There are no conflict of interest to declare.

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11. Author contributions

I was responsible for all the sections in this paper. I designed the study, discussed the results, derived the equations, and wrote the manuscript.