The Psychological Image of Realistic Physical Quantities. The Psychological Speed of Aging

L. Végh

The article is dealing with psychological images of real physical quantities, such as time, length, etc. and with their interrelationship in general and in the scientific field in particular. It has been shown that the importance of the above is reflected by the possibility to influence or reshape, within certain limits, positively or negatively, the psychological images of real values, so as to meet the outlined or desired expectation. As shown, one of the possible practical application of the above phenomenon is the possibility to positively influence the speed of aging.This problem has been demonstrated in the article analytically, as well as graphically.

Keywords: real values, psychological image, biological vs. psychological age, psychological speed of aging.

1 The real physical quantities and their psychological images

The investigation of the psychological image of real physical quantities like time, distance, intensity of sound, etc. has a particular significance. Psychological quantities (the designation of psychological images of real quantities) are actually necessary components of our decision making. In reality, they exist even though they have a subjective character. The determination of psychological quantities and their dimensions has its specialities or rules, which are necessary to investigate and recognize, should they be correctly utilized or applied.

The knowledge of the regularities, which these rules are governed by, may be used for seeking or finding methods that take advantage of their positive sides. For example: the bringing near or drawing away of psychological images to or from reality. A good example, for instance, is the effort to positively influence the so-called "psychological speed of aging" or "psychological age", a phenomenon, which among others, this article deals with.

The real physical quantities such as time, age, length, mass, temperature and others, are relative values that are referred to an internationally chosen and accepted unit of a constant value. The real physical quantities are objectively measurable. In the past, similar samples of "local" units of constant values for measurements were used. An example of this was the so-called "Prague Elbow", used in the past as a constant unit of length of a steel rod for measuring the textile goods. It was fixed to the wall of the Prague city hall on Charles' Square. On the contrary, the psychological image of a real quantity is a subjective and variable value.

The real-actual physical quantities (PQ) are called real or global PQ, in short: RPQ or GPQ. *Real time is also designated as clock time, calendar time or global time.*

Next to the physical quantities for length, time, speed, space, etc., valid in global terms, *physical quantities exist also in cosmic or astronomical conditions*. They are generally multiples of RPQ. Global units in astronomy can hardly be used.

Similarly, like the existence of the global and space physical quantities or phenomena, it is possible to speak of *psychological quantities or phenomena and corresponding units* (in short PPQ). As it has been stated, psychological quantities are corresponding to the psychological images (sensation or phenomena) of quantities that exist in reality. The size or dimension of psychological quantities has a subjective character, but exists objectively. For example, one may be fifty years old but "feels" as a forty year old. The given case is referring to a so-called psychological image of *internal phenomena (sensation)*, for the evaluating subject is identical with the object of evaluation. The psychological image is dependent on variable influences like the age, biological or physical well-being, fatigue, health, IQ, and others of the evaluated person. Unlike quantities of real units, the units of psychological quantities are variable and subjective. A year, as a unit of time, varies psychologically in length for a young and aged person. Next to the psychological images of internal phenomena, which accord with psychological images of internal realities (for example, age), there are psychological images of external phenomena. The example illustrated is a plant or odour that one finds beautiful, while another finds displeasing. Warmth, coolness or a produced good, are other examples whose usefulness is for one individual advisable while for another harmful. Similarly, it can be a political party, religion, political system, government and others, whose nature is good for one, while unacceptable, harmful, even dictatorial, etc. for another. Psychological images of the external phenomena may be:

a) Uninfluencable phenomena (like the scent of flowers, the beauty of nature), or
b) Influencable phenomena, which can be a subject of various commercial, political or other interests.

It is possible in all cases to speak of the importance of the evaluation of the psychological quantities.

In conclusion, it can be stated that the existing three systems of physical quantities and the corresponding dimensions are:

Real or global physical quantities – PQ (RPQ, corresponding to the afore mentioned conditions).

Cosmic physical quantities – astronomical (CPQ).

Psychological physical quantities – PQ (PPQ).

The quantities expressed in the corresponding units can not and should not be interchanged.

2 The characteristics of psychological images of real physical quantities

RPQ are objective physical quantities that exist realistically and are objectively measurable. On the contrary, psychological images of real physical quantities have a subjective character and dimension. It has been stated that the psychological images are dependent on the receiving subject: on its age, IQ, memory, and on its specific conditions. The psychological image of an external phenomenon or quantity is with the receiving subject generally distinct from the real dimension of the PQ. The same real physical quantity with different receiving subjects can evolve generally different psychological images.

For example, different individuals psychologically observe one hour to be of various psychological quantities. In his publication [1] professor M. Nakonecny states about the psychological perception of time: "An elder individual perceives one hour to be shorter than a young individual perceives it to be." It is evident, that it is the dependence of the psychological perception or image of time on the age of the receiving subject that the author has on his mind. He concludes, that the psychological quantity of the elapsed time is dependent on age of the individual.

Psychological quantities can be divided into two categories:

a) The first category holds the realistic, easily controlled, and objectively uninfluencable psychological images of quantities and phenomena of the internal and external world. For example: biological data, age, objective natural and social phenomena of the external world, which are allowing to be physically, statistically, historically or economically explicitly identified. The psychological images of true inner phenomena (for example age, time) and true external, but media uninfluenced, phenomena and data (nature, weather, warmth, etc.) belong also in this category.

b) The second category possesses the psychological images of external phenomena and data that allow the media, commercial or other special-interest influences and evaluation, to influence the psychological image of the receiving subjects. For this purpose, psychological images of realistic external quantities can be influenced by media or be commercially biased with distorted information and statistical data. Simplified, the discussed evaluation is referred to as: "brain-washing".

The given reality as described above, is to some extent contiguous with the conception of democracy and principles of, "the freedom of individuals to create and evaluate their psychological images of external phenomena". An example is the paradox of various roles of alcohol in the time of war and peace as the means of influencing the psychological behaviour of warriors in the interests of authority. In past wars, soldiers on battlefields were given alcohol before attacking the enemy, so as to overcome their humane senses. Whereas in the time of peace, the interest is to keep the senses active to protect lives. Another paradoxical example is the bylaw that during the last 24 hours before the elections into the highest government offices prohibits the election campaign. Why precisely at the 24 hour mark, not more not less, is a psychological mystery.

The interrelationship between RPQ and PPQ is always a multi-parametrical dependence that cannot be generally, analytically, nor accurately expressed. However, it is possible to represent the mutual dependence of PPQ and RPQ in a simplified, single parameter form with the predominating parameter:

$$\text{a)} \quad \mathrm{PPQ} = f(\mathrm{RPQ}) \tag{1}$$

$$\text{b)} \quad \mathrm{RPQ} = p(\mathrm{PPQ}) \tag{2}$$

Just like there is an existing direct dependence between RPQ and its psychological image PPQ (2), it is also possible to speak of the dependence in the opposite direction (1), regarding the dependence of PPQ and GPQ, which is in general different from (2). However, here the mathematical reciprocity does not hold true. (An example is a varying possible testimony of witnesses during the police investigation of a punishable crime).

Psychological images of realistic quantities may play an important role in an individual's life. For a young woman around the age of twenty, the upcoming years of looking for a prospective partner are "long" and there is no "hurry" for the search of her partner. Nonetheless, the young woman does not need to be in agreement with the opinion of her parents or grandparents, who may assess the years to come far not so long. With her psychological evaluation of time, the young woman may "throw away" her time for the natural selection of a lifelong partner and due to time delay "lose her chance in life". Examples of faulty psychological evaluations of time are not unusual. An interesting, historically proven example is the psychological evaluation of time made by admiral Nelson before his victorious sea battle with Napoleon. He correctly assessed psychologically the right moment for launching the victorious sea battle.

PPQ may play a significant role in every decision-making process. However difficult the relationships between RPQ and PPQ may be, it is necessary to examine and recognize them.

3 The psychological speed of aging, the real (biological) and psychological length of time

The psychological speed of aging (in short PSA) denoted V_{px}, expresses the relationship between the real time T_x, measured by means of calendar or clock, and its psychological image T_{px}. Index 'p' indicates always the psychological image of reality.

$$\mathrm{PSA} = V_{px} = T_x / T_{px} \tag{3}$$

If PSA = 1, then the real value of the speed of aging is identical with its psychological image, i.e. if PSA = 1 then $T_x = T_{px}$.

The psychological speed of aging (PSA) expresses how many times faster or slower the psychological time elapses (runs out) in comparison with the real or clock-time.

For better understanding, a case may be introduced where the elder individual, whose value PSA = V_{px} is usually great.

Let us assume, that in a particular case, the psychological time at higher age elapses 3 times faster than the time measured by a calendar or clock. Therefore, the PSA of that individual is three times faster than the real time. PSA expresses that one calendar year, in the given case of high age, is psychologically equivalent to a period 3 times shorter, i.e. equivalent only to 4 calendar months of a younger middle aged individual (for him $T_x = T_{px}$). Therefore, PSA = 12 months/4 months = 3.

The psychological speed of elapsing time, or aging, (PSA = V_{px}) is in the given case multiplied by three in comparison to the speed of the real or clock time. It is as if the psychological time has shrunk to one third of the reality and therefore its contents are practically going to be one third only in comparison to contents of the real time. The theoretically forthcoming end of life (eternal rest) occurs when PSA is equal to infinity (PSA = ∞). While the opposite is true for a child, as its PSA is smaller than in reality and is theoretically equal to zero at birth. It is as though the corresponding psychological age for a child is infinitely long. Adulthood and demise are at birth out of sight.

In the above formulae is:

PSA = V_{px} … psychological speed of aging (elapsing of time)

T_x … the real (measured by the clock or calendar) time

T_{px} … psychological time (psychological image of real time)

A single parametric model of the dependence of PSA = V_{px} on the aging at the age between T_0 to $T_{x,\max} = 100$, may be graphically demonstrated, among others, with a trigonometric function in diagram 1. The maximum age is represented here with a chosen value of $T_{x,\max} = 100$ years. The boundary conditions for the function of PSA = V_{px} are empirically assumed.

The analytical expression of the function PSA = V_{px} is chosen in such a way that the function is continuous and satisfying the boundary conditions as well as the condition in one chosen intermediate point. A trigonometric function in the form of (4) satisfies the above conditions. However a logarithmic function could also be considered. As shown in the next, the intermediate point lies in 2 $T_{x,\max}$, for, at this point, for all values of the power z in Eq. (5) are $V_{px} = 1$.

PSA decreases with the reduction of age and increases with the increasing age within the theoretical limits from zero to infinity. This is confirmed by psychological experience. The boundary conditions are determined from the following consideration:

As the PSA is small at birth, it is assumed that theoretically for $T_x = 0$ is $V_{px} = 0$ (*to children, time goes by very slowly* and the length of a lifetime appears to be "infinite"). The tangent to the curve at this point is close to horizontal.

In contrast, *for a very old individual* (theoretically at the age of $T_{\max} = 100$) *PSA* = $V_{100} = \infty$. *Psychologically, at a high age, time goes by very quickly.* It is thus assumed that the boundary condition of the function (4) for $T_{\max} = 100$ has the value: *PSA* = $V_{100} = \infty$. The tangent to the curve is here vertical.

The diagram in Fig.1, showing the function of V_{px}, is a graphic aid in finding a method for slowing down of the psychological speed of aging (PSA) in the second half of the life-cycle period, i.e. between $2\,T_{x,\max}$ to $T_{x,\max}$, *and also method of lengthening of the so-called psychological age*.

The analytical function that satisfies the above-mentioned condition, is expressed by Eq. (4). Fig. 1. illustrates Eq. (4) graphically

$$V_{px} = f(T_x) = \left(\operatorname{tg} \frac{\pi}{2} \frac{T_x}{T_{x,\max}} \right)^z \tag{4}$$

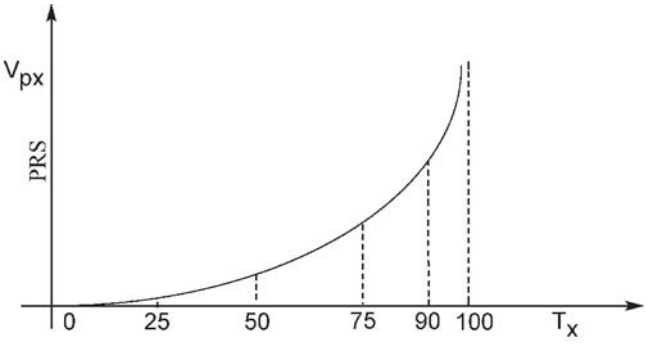

Fig. 1: Graphical illustration of the function V_{px}

In Fig.1 the horizontal co-ordinate axis is identical to the axis T_x and the vertical axis is identical to the axis PSA = V_{px}.

The exponent z determines the shape of the curve V_{px}. At the point $T_x = 2\,T_{x,\max}$ for all values of z, V_{px} is equal to one. Therefore,

$$V_{px} = \left(\operatorname{tg} \pi/4 \right)^z = 1 \tag{5}$$

From this it can be concluded that all curves, corresponding to various values of z, intersect the same point: (1/2 $T_{\max}$, $V_{px} = 1$). It is evident that PSA in the first half of a life-span never exceeds the real speed of aging. The values of V_{px} for (1/4, 1/2 and 3/4) of $T_{\max}$ are given in Table 1.

Table 1: Values of V_{px} for $z = 1$

$T_x/T_{x,\max}$	0	0,25	0,50	0,75	0,90	1,00
V_{px}	0	0,41	1,00	2,41	6,31	∞

Psychological Age (time): T_{px}

Similarly, as with the function (4), it is possible to express the dependence of the psychological age T_{px} (not speed of aging) on the real "calendar" age T_x. The dependence can be visualized with the following statement: "*The psychological length of a life-cycle (the expected life-span) is theoretically infinite (or is an unidentified value) at birth and falls gradually to zero at death.*" The function T_{px} is expressed in accordance with the equation (3) by the expression of (6) and demonstrated graphically in Fig. 2.

$$T_{px} = \frac{T_x}{V_{px}} = \frac{T_x}{\left(\operatorname{tg} \frac{\pi}{2} \frac{T_x}{T_{x,\max}} \right)^z} \tag{6}$$

The functions of (4) and (6) are interdependent. The moment at which the psychological and calendar age equalize, occurs in the middle of the span of a lifetime. Therefore,

when $T_x = 50$, then: $T_{px} = 2T_{x,\max} = 50$. According to the initial assumptions, T_{px} has the following boundary values: for $T_x = 0$, T_{px} is undetermined, for $T_x = 50$ is also $T_{px} = 50$ and for $T_{\max} = 100$ $T_{px} = 0$. The shape of the curve is dependent on the exponent z. The function of T_{px} in Fig. 2 is illustrated for the value of $z = 1$.

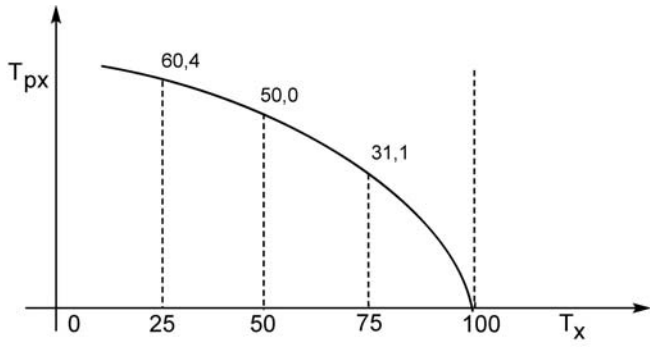

Fig. 2: The function of T_{px}

4 The interrelationship between real and psychological quantities

The quantities of RPQ and PPQ, are expressed in different units and therefore cannot be mixed. For example it is not possible to collect statistical data about the realistic aging of citizens from the psychological ages of individuals. A statistical quantity collected from realistic physical data is once more a realistic quantity. In contrast, the statistical quantity composed of psychological data is again only a psychological quantity. Should a group of individuals of the same sex with exactly the same biological age be standing next to each other, each individual is going to have a different psychological age. If an evaluation criteria for the determination of psychological age were to exist, it would be possible to determine the psychological age (PA) of each individual (for example by means of wrinkles, physical and spiritual activity, memory, and others). Also it would be possible to determine some sort of a statistical "index" in the entire society, which would characterize, "the average psychological age of the society".

Conclusion

To summarize the above analysis, two important concluding comments can be made:

1) In chapter 3, the course of the so-called psychological speed of aging (PSA) was analyzed. From the course of PSA arises that psychological aging (PA) may be extended by slowing down the PSA. From experience it is known, that the decreasing of PSA in a higher age is favorably influenced, among other factors, by the slowing down of the process of the reduction of physical and intellectual activities. Although "psychological rejuvenation" is not the same as "biological rejuvenation", an interrelationship does exist in this case. A favorable influence on the course of PSA can be achieved through correction of those influences that significantly affect the PSA, like intellectual activity and physical activity, as stated above. Analytically any positive change of PSA would be reflected by changes of the curvature of the function V_{px} in its right half. *The greatest danger in aging is the inactivity of the mind and body as confirmed by long-term experience*. That would certainly deserve more research in the given area.
   Practical experience with the post-retirement age and activities of university professors often prove the above statement.
2) Each attempt to apply one-sided intentional influence on the generation of psychological images of real events by individuals during their decision-making process has an adverse effect.

A numerical result in the elections does not give necessarily an exact picture of the voters' long-term stand-point. Under different psychological conditions, the same individuals could decide in a different manner. For that reason, each psychological one-sided influence of individuals in their decision-making process is hardly acceptable in a free society.

References

[1] Nakonecny M.: *The Basics of Psychology*. Academia Praha, 1998 and 2002, p. 251, 252

Prof. L. Végh, DrSc.
Doubravčická 10
100 00 Praha 10, Czech Republic

phone: +420 274 811 674
e-mail:vegh@mbox.vol.cz

Czech Technical University in Prague

