On the sheep-goat effect as the manifestation of phase-dependent mind-matter modulation: A hypothesis

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Abstract: The sheep-goat effect cannot be explained without considering mind of specific states. This work speculates mind-matter interaction, as was inferred by many including Erwin Schrödinger, for entertaining analytically-flavored “phenomenological” interpretation of the sheep-goat effect. A fundamental construct of this theory is the operation of mind-matter events in a spatial-temporal-attentional domain, which reduces to the spatial-temporal domain wherein purely objective events are registered, at the vanishing of the effect of attention. Attention is quantitated as a non-uniformly interspaced discrete index that depends solely on the number of live neurons that function in a coherent state for a purpose of the mind. A spatial-attentional “information” domain is assumed to be operable by hinging it with the spatial-temporal “energy” domain along the spatial dimension, to form a vivo-dynamic complex. Operations of an event function with respect to attention is assigned to assimilate those with respect to time. Domain operators are defined to specify the domain of temporal or attentional attribution used for assessing an event and identify the outcome of domain-coupling on the registration of an event. Time-dependent Schrodinger’s equation is then treated as a lower-dimensional case of a higher-dimensional mind-matter-event equation elaborated in the spatial-temporal-attentional complex. The resulted mind-matter-event function defined in the vivo-dynamic complex degrades to an objective-event function in the spatial-temporal domain at zeroing of the attention or the first-order

derivative of the function with respect to attention. The mind-matter-event equation leads to simple traveling-wave-type solutions that combine temporal presentation and attentional perception. The auto or cross interaction of mind-matter event functions creates “information-energy” coupling terms presumed to be amenable to instrument probing in the spatial-temporal domain as is the objective-event term. The domain-coupling when modulated by the phase difference between the temporal and attentional dimensions, can enhance or inhibit the deviation of the event registration in the spatial-temporal domain from its baseline probability. The outcome is akin the sheep-goat effect. The phase-dependency of the event-coupling may also elucidate why it is difficult to replicate psi. Such theoretical manipulation offers new insights to phenomena that manifest mind-matter interaction.

Keywords: Sheep-goat effect, mind-matter interaction, consciousness, theoretical model, psi.

“So with all due acknowledgement to the fact that physical theory is at all times relative, in that it depends on certain basic assumptions, we may, or so I believe, assert that physical theory in its present state strongly suggests THE INDESTRUCTIBILITY OF MIND BY TIME.”

-----Erwin Schrödinger, Mind and Matter, Cambridge University Press, page 87, 1958.

I. Introduction

The sheep-goat effect (Schmeidler and Murphy 1946) is a variable not to be missed in the studies of anomalies with psychic orientation (Drinkwater, Denovan et al. 2018) or consciousness attribution (Radin 1989). *“Belief, interest, enthusiasm, and the like are conducive to high scoring,”* while *“negative attitudes, withdrawal, and the like are associated with low scores”* (Pratt 1973). *“Statistically significant scoring above mean-chance-expectation (MCE) or “psi-hitting” is assumed to be the product of attempts on the part of sheep to ‘prove’ the psi hypothesis”* (Palmer 1971). On the other hand, tests on the part of goats may score at either the MCE to “manifest” the absence of “psi-effect” or statistically significant scoring below MCE, i.e. “psi-missing” to “disprove” the psi hypothesis (Palmer 1972). Any mechanistic explanation of the sheep-goat effect is unlikely plausible unless it addresses some sort of interaction between mind or consciousness with matter or process (Stapp 1991, Hut 2006, Acacio de Barros 2017) upon which an object-based outcome can be defined to allow assessment (Jahn 1982), if the case involves either a sheep or a goat but not both. When both sheep and goat are associated with an object-based observation, any accounting of the deviation from MCE in the psychophysical sense (Jahn 1982) is likely futile if disregarding the coupling that may exist between the two minds in their collective interaction on the target.

With the ever-increasing excitement to brain-machine interface (Nierhaus, Vidaurre et al. 2019), direct brain-to-brain communication (Jiang, Stocco et al. 2019), and neuromorphic intelligence (Ielmini and Ambrogio 2019), it may become relevant to re-examine the association between mind and matter that has long been questioned (Meehl 1956), albeit continuously inquired about (Jamali, Golshani et al. 2019). Among the many minds that had suspected a connection between mind and matter, Erwin Schrödinger was easily acknowledgeable for his obsession with

the idea of the unification of mind and matter (Schrödinger 1958). Through Schrödinger's following statement, "*Subject and object are only one. The barrier between them cannot be said to have broken down as a result of recent experience in the physical sciences, for this barrier does not exist.*", one may begin to wonder if mind could be brought to somehow function together with matter. Should Schrödinger's another statement of "*the indestructibility of mind by time*" be taken literally, one may be enlightened to consider the reverse aspect of that statement-----What if time can be destructed, or at least disturbed, by mind? If so, how?

In this essay I would like to entertain the plausibility of mind-matter interaction, as was inferred by some but uncomfortable to others (Stapp 1982, H. 2001, Freris 2013, Radin 2016, Tremblay 2019, Pederzoli 2017), for the amusement of offering a new interpretation to the sheep-goat effect from an analytical "phenomenological" perspective. The analyses are evolved upon an expanded dimension for event registration, by noting that some kind of dimension-expansion for registering an event of any association with mind is perhaps unavoidable in addressing phenomenal entities that cannot be understood in the standard domain of spatial-temporal characteristics. "*Psi is not bound by space and time*" (Pratt 1973). A new dimension that could conceivably accommodate the effect of mind is needed for the deliberation of mind-matter interaction. Constructing a dimension for the mind to be able to effect matter does not incur a new paradigm (Hameroff 2001, Hameroff and Penrose 2014); however, how to make a new dimension to work for the mind to possibly effect matter when and only when the mind is poised to do so, as is approached in this work, may be a refreshing solution that deserves consideration and extension to more situations.

2. A fundamental construct: the spatial-temporal-attentional domain for mind-matter interaction

All life forms, including the conscious human being, become merely physical objects that abide to all known physical laws, at the loss of the life factor. It is thereby reasoned that, a law governing non-contact two-body interaction between a life form including a living human with a lifeless physical object must become the law governing the non-contact two-body interaction between two lifeless physical objects when the life factor disappears from the physical entity corresponding to the human-side. Conversely, it is argued that, the law governing non-contact two-body interaction between a living human with a lifeless physical object must be the extension or expansion of the law that governs the non-contact two-body interaction between two lifeless physical objects by injecting the life-factor into the physical entity corresponding to the human-side. Consequently, *“if it is to me acceptable, however, a completely new metric of space-time needs to be developed, a metric which will account not only for the facts to be explained, but also for the known laws of physics which can be fully understood without it. Remember the principle of extensibility (Margenau 1965)”*. What is the life factor that could deterministically and uniquely distinguish a living human from the physical bodily existence of a human being, for it to become a candidate variable for the extension of space-time metrics? Whereas no consensus has yet to be reached regarding what consciousness is (Penrose 2001, Hameroff and Penrose 2014), everyone’s own experience may be able to attest that “attention” (which may be regarded as the action of an “intention”), as is presented or practiced while one is alive, be it involuntarily or purposely (intentionally), can in a definite sense relate to the state of consciousness, the presence of mind, or the state of being alive (the state of being alive could alternatively be associated with organic

metabolic activities characterized by chemical reactions, but that chemical reactions must exist for the support of a minimal level of consciousness that is yet to specify).

Attention is hereby solicited to the lower horizontal framed arrow in **Figure 1** that denotes the complex of the non-contact (and perhaps non-relativistic) two-body interactions between physical (i.e. life-less) objects at both the macroscopic and microscopic scales. That two-body interaction is adequately and unambiguously quantifiable by the known laws of physics including but not limited to Newtonian mechanics, classical electrodynamics and quantum mechanics. In terms of the two-body interaction between two live human beings, in order for the cause and effect pertinent to an event or observation be discriminated, the mind as was inferred by Schrödinger may have to be counted in. For an individual, the presence of the mind or the practice of the mind would effectively produce an “attention”, no matter how involuntary/unconsciousness or weak it might be. It is thus postulated, according to the forgoing arguments, that non-contact two-body interaction between a live human being with a lifeless physical object is governed by the “laws of physical-attentional interaction” as marked by the two oblique framed arrows in Figure 1, and those laws must resort to the “laws of physical-physical interaction” governing the non-contact two-body interaction between two lifeless physical objects in the case that the life-factor is removed from the physical entity corresponding to the human-side. Conversely, the “laws of physical-physical interaction” that governs non-contact two-body interaction between two lifeless physical objects shall form the basis of the “laws of attentional-physical interaction” governing the non-contact two-body interaction between a live human being with a lifeless physical object, in the sense that the life-factor is injected into the physical entity corresponding to the human-side. In other words, the “laws of attentional-physical interaction” governing the non-contact two-body interaction between a live human being with a lifeless physical object is the one-side upgraded

version of the “laws of physical-physical interaction” governing the non-contact two-body interaction between two lifeless physical objects. A further postulation then becomes wanting: the “laws of attentional-attentional interaction” governing the non-contact (and non-sensory) two-body interaction between two live humans such as what an “energy/psychic” healer is presumed to do on a healee (Kristoffersen, Stub et al. 2019), how a goat may antagonize a sheep in the effect on an event of randomness, and why twin minds demonstrate inexplicable bound, as marked by the upper horizontal framed arrow in the figure, is the two-sides upgraded version of the “laws of physical-physical interaction” governing the non-contact two-body interaction between two lifeless physical objects.

Time is not absolute as we know of now when assessed within the spatial-temporal domain. Time is also reported to be perceived differently by a human being when in extreme states of mind or consciousness (Arstila 2012, Noreika, Falter et al. 2012) such as the near-death situations (Martial, Cassol et al. 2017, Martial, Charland-Verville et al. 2017). The latter aspect of alteration of the temporality specifically enchants the plausibility that time perception is influenced by the status of mind, an idea that can indeed be speculated from Schrödinger’s projection of *the indestructability of mind by time*. A further pressing of the mind-time association to the extremity is then inescapable: Could mind take over time completely to cause time-less perception? Such a “time-less” state of the mind has actually been entertained by Schrödinger (Schrödinger 1958).

Should time be affected by mind, an event to which a mind status is associated with no longer exists in only the spatial-temporal domain that is accustomed by events developed exclusively by lifeless physical objects. Should time be affected by mind, an additional dimension of operation that accounts for the effect of mind would have to be brought to “intercept” with the spatial-temporal domain within which the laws of physical-physical interaction prosper. Should

time be affected by mind, the need of an additional dimension of operating the mind that however must remain connected with the spatial-temporal domain can perhaps be configured by using the spatial dimension to hinge the temporal and the attentional dimensions, as **Figure 2** illustrates. The spatial-temporal domain is wherein physical-physical interaction or an object-event is probed, whereas the spatial-attentional domain may be perpetuated by attentional-attentional interactions and is beyond the reach by objective-event that does not contain any attentional perspective. However, an event with presence in the spatial-attentional domain may be able to influence another event in the spatial-temporal domain should they share the spatial dimension and the spatial-temporal phase, then the occurrence of the spatial-temporal event could be disturbed by an entity associated with attention which is presumed to be perceived intuitively by mind.

3. Conjectures in analytical form

There is no doubt that “*consciousness is linked up with certain kinds of events in organized, living matter, namely, with certain nervous functions* (Schrödinger 1958)”. “*The rare and spectacular poltergeist events, or so-called recurrent spontaneous psychokinesis (RSPK), which in the magnitude of their effects, and in the demonstrated correlations with neurologically extraordinary adolescents, seem to offer rich, yet largely unutilized opportunities for insight* (Jahn 1979)”. To foster possible future analyses of the connection that may reside between a neurological state and a psi manifestation and to deduce any neurofeedback mechanism that may correlate with psi, it becomes imperative to define a variable quantity that is uniquely determined by the mind or associated with a specific state of the mind (Fuermaier, Groen et al. 2019, Groen, Fuermaier et al. 2019, McGough, Sturm et al. 2019). In terms of facilitating analyses, it will not be undesirable to have treatments with respect to this new variable to function at the level in par with those

performed with respect to time—a dimension that conceptually has a smaller number of freedom than the dimension of space.

3.1 Attention as a discrete index of the mind

The mind for a living individual is associated with an ensembled action of live or intact neurons. There is a finite total number of neurons for any living individual (or the entirety of living population-----hereafter to be referred to as “individual” for simplicity), which is let to be denoted by $\#NEURON_{total}$. The number of live neurons of an individual that can be activated (i.e. being able to produce action potential (Hodgkin and Huxley 1952) is denoted by $\#Neuron_{live}$. At any given TIME of a living individual, we have $\#Neuron_{live} = [0, \#NEURON_{total}]$. Note that the condition of $\#Neuron_{live} = 0$ would definitely mark the death of an individual. For an individual living subject whose mind presents a purpose, whether via involuntary or voluntary mechanism, a group of neurons have to be activated in certain manner of synchronicity (Amari, Nakahara et al. 2003) for that “purpose”. The neurons activated in that synchronous manner can be said to be in a “coherent” state for that “purpose” of the mind. The number of neurons in that coherent state for that specific purpose is denoted by $\#neuron_{cohe}$, which physically must not exceed $\#Neuron_{live}$, and $\#Neuron_{live}$ is also not to become greater than $\#NEURON_{total}$. The $\#neuron_{cohe}$ is thus bound by $\#neuron_{cohe} = [0, \#Neuron_{live}] \in [0, \#NEURON_{total}]$.

I consider a ratio between the number of neurons of a living individual that are in the “coherent” state for a specific “purpose” and the number of neurons of that living individual that are not in that “coherent” state for that specific “purpose”, which makes $(\#neuron_{cohe})/(\#NEURON_{total} - \#neuron_{cohe})$. This ratio amounts to discrete numbers of monotonically increasing or decreasing (depending upon whether the number ascends or descends)

non-integer intervals over a semi-infinite range of $[0, \infty)$ as is depicted in **Figure 3**. A zero number of this ratio would correspond to either $\#neuron_{cohe} = 0$ or $\#Neuron_{live} = 0$, meaning that no neuron is available or activatable toward a “purpose” of the mind. This condition essentially marks the complete diminishing of the minding ability. An infinite number of this ratio, on the other hand, corresponds to $\#neuron_{cohe} = \#NEURON_{total}$, a condition impossible to reach as that requires all neurons of an individual be synchronized for the same “purpose”. The number that this ratio conveys can thus be regarded as quantifying how strong the mind acts for a specific “purpose” through the coherent physical status of the neurons producing the mind or upon which a state of mind may reside. I hereby define “attention”, represented by $@$, as a point with the mind characteristics as:

$$@ = \frac{\#neuron_{cohe}}{\#NEURON_{total} - \#neuron_{cohe}} \text{ } \mathfrak{S} \quad (1)$$

The attention as is defined in Eq. (1) has been assigned a numerical value of $(\#neuron_{cohe})/(\#NEURON_{total} - \#neuron_{cohe})$ and a unit of $\mathfrak{S}$ or “purpose” that is to be abbreviated as “pur”. A 1 pur represents the state when exactly 50% of the total number of neurons of an individual are activated in synchrony for an objective of the mind.

3.2 Domain expansion and domain operator

Consider a function Ψ that has presence or can be assessed in two domains, each of which is characterized over two dimensions as is depicted in **Figure 4**. One domain with the two-dimensional characteristics is called the $\alpha\beta$ domain, and the other is called the $\alpha\gamma$ domain. The two domains are supposed to share the α dimension through which the $\alpha\beta$ domain is intercepted with the $\alpha\gamma$ domain. The presence of Ψ in the $\alpha\beta$ domain is represented by $\Psi_{\beta}(\alpha, \beta)$, and the presence of Ψ in the $\alpha\gamma$ domain is expressed by $\Psi_{\gamma}(\alpha, \gamma)$. Such a function Ψ thus has the

dependency on α, β , and γ , and can be denoted as $\Psi(\alpha, \beta, \gamma)$. However, unlike the correspondence between a spatially three-dimensional object with the projections of it to its spatially two-dimensional cross-sections as for computed tomography (Oldendorf 1978) or other projection/reconstruction applications (Grant 1972, Turner, Zacharakis et al. 2005), the presence of a function Ψ in both $\alpha\beta$ and $\alpha\gamma$ domains, as is configured in Figure 4, is defined in this work as the following:

$$\Psi(\alpha, \beta, \gamma) = \Psi_\beta(\alpha, \beta)\widehat{\beta\beta} + \Psi_\gamma(\alpha, \gamma)\widehat{\gamma\gamma} \quad (2)$$

where $\widehat{\beta\beta}$ and $\widehat{\gamma\gamma}$ are termed domain operators. These domain operators are assigned to take the following rules of “welding”, which are depicted in **Figure 5**:

$$\widehat{\beta\beta} \cdot \widehat{\beta\beta} = \widehat{\beta\beta} \quad (3a)$$

$$\widehat{\gamma\gamma} \cdot \widehat{\gamma\gamma} = \widehat{\gamma\gamma} \quad (3b)$$

$$\widehat{\beta\beta} \cdot \widehat{\gamma\gamma} = \widehat{\beta\gamma} = \widehat{\gamma\beta} = \widehat{\gamma\gamma} \cdot \widehat{\beta\beta} \quad (3c)$$

The rules given by the set of Eq. (3) simply confine that an intra-domain production of two operators leads to an entity in the same domain, and an inter-domain production of two operators causes a coupling of the entities between the two domains. Additionally, the following definitions are necessary:

$$[\Psi_\beta(\alpha, \beta)]^2 = \Psi_\beta(\alpha, \beta) \cdot \Psi_\beta^*(\alpha, \beta) \quad (4a)$$

$$[\Psi_\gamma(\alpha, \gamma)]^2 = \Psi_\gamma(\alpha, \gamma) \cdot \Psi_\gamma^*(\alpha, \gamma) \quad (4b)$$

What Eq. (4a) represents is the probability of probing a function that is excited exclusively in the $\alpha\beta$ domain. Similarly, what Eq. (4b) represents is the probability of perceiving a function that is expressed exclusively in the $\alpha\gamma$ domain. I now consider the following two event functions:

$$\Psi_1(\alpha, \beta, \gamma) = A_1\widehat{\beta\beta} + B_1\widehat{\gamma\gamma} \quad (5a)$$

$$\Psi_2(\alpha, \beta, \gamma) = A_2\widehat{\beta\beta} + B_2\widehat{\gamma\gamma} \quad (5b)$$

The interaction between these two event functions is defined as the following:

$$\begin{aligned}
 [\Psi_{12}(\alpha, \beta, \gamma)]^2 &= \Psi_1(\alpha, \beta, \gamma) * \Psi_2^*(\alpha, \beta, \gamma) = (A_1 \widehat{\beta\beta} + B_1 \widehat{\gamma\gamma}) \cdot (A_2 \widehat{\beta\beta} + B_2 \widehat{\gamma\gamma})^* \\
 &= A_1 A_2^* \widehat{\beta\beta} + (A_1 B_2^* + A_2^* B_1) \widehat{\beta\gamma} + B_1 B_2^* \widehat{\gamma\gamma}
 \end{aligned} \tag{6}$$

where the domain operators defined in Eq. (3) are set to be immune to the complex conjugation.

The terms of Eq (6) can be interpreted respectively as the following: $A_1 A_2^* \widehat{\beta\beta}$ is the probability of simultaneously probing event 1 AND event 2 in the $\alpha\beta$ domain, $B_1 B_2^* \widehat{\gamma\gamma}$ is the probability of coherently perceiving event 1 AND event 2 in the $\alpha\gamma$ domain, and $(A_1 B_2^* + A_2^* B_1) \widehat{\beta\gamma}$ is the probability of correlating the probing of event 1 in the $\alpha\beta$ domain and the perceiving of event 2 in the $\alpha\gamma$ domain.

3.3 The physical domain in association with the spatial-temporal dimensions as the special case of a vivo-dynamic complex associated with spatial, temporal and attentional dimensions

As was speculated in the previous section, any attempt of addressing the effect that the mind of a human being might have on a matter of objectiveness or another mind of a live human being shall be subject to the following constraint (i.e. *extensibility* (Margenau 1965)): the principles accounting for the non-contact interactions between two entities with at least one life form shall resort to the principles for the non-contact interactions between life-less entities at the disappearance of that “life” factor in the formulism. The analytical presentation of this constraint is straightforward: an equation applying to lifeless objects must be contained in any new equation assumed to accommodate mind-effecting interactions. In other words, an equation applying to lifeless objects is ought to remain as the special case of the equation accounting for mind-effecting interactions, at the vanishing of the mind-effect. The vanishing of the mind-effect can be reached in two ways, one is the loss of the “mind” that marks zeroing of the attention index along the

dimension conferring mind, and the other is in a steady-mind-state that is equivalent to zeroing of the first-order derivative of a mind-associated entity with respect to the attention index along the dimension whereby mind acts. The consideration of the first-order derivative of a mind-associated entity becomes appealing and indispensable, should one refer to the “inductive” phenomenon common to psi (Jahn 1982) and the observation that “*both high and low intentions yield correlated departures from expectation*” (Nelson 2018) as the latter one clearly directs to properties of mind that differ from the intensity (the attention as is defined in this work reveals the salient intensity of the mind) for registering the departure of an event from MCE under psi. The consideration of the first-order derivative of a mind-associated entity also aligns with the statement by Schrödinger that strongly suggest a “differential” feature of the mind in operation when affecting matter-outcome: “*Any succession of events in which we take part with sensations, perceptions and possibly with actions gradually drops out of the domain of consciousness when the same string of event repeats itself in the same way very often. But it is immediately shot up into the conscious region, if at such a repetition either the occasion or the environmental conditions met with on its pursuit differ from what they were on all the previous incidences. Even so, at first anyhow, only those modifications or “differentials” intrude into the conscious sphere that distinguish the new incidence from previous ones and thereby usually call for ‘new considerations’* (Schrödinger 1958).”

The practice of reducing an entity that operates in a domain with higher-number of dimensions to its special case presented in the sub-domain having lower-number of dimensions by zeroing of an idle dimension or zeroing of the first-order derivative with respect to that idle dimension is pedestrian. Examples are ample: the linear movement along x direction in a cartesian coordinate of the space is the reduction of higher-dimensional movement on the xy plane at a fixed y coordinate, the rotational movement on xy plane in a cartesian coordinate of the space is the

reduction of higher-dimensional movement in the xyz volume at a fixed z coordinate, the degradation of a fixed object over time is the reduction of the change of the object in the spatial-temporal domain at a fixed spatial location, and the non-relativistic dynamics is the reduction of the relativistic dynamics at a low-speed that is so small compared to the speed of light that the relativistic effect is negligible.

Figure 6 specifies that the physical “objective” domain characterized by the spatial and temporal dimensions can be treated as the reduction of a “vivodynamic” complex associated with spatial, temporal and attentional dimensions, at the loss of the dependency on the attentional dimension. The loss of the dependency of an event on the attentional dimension can be constructed by two mechanisms: (1) zeroing of the attentional dimension so there is no involvement of attention in the event probed in the spatial-temporal domain, (2) zeroing of the first-order derivative with respect to that attentional dimension such that an event probed in the spatial-temporal domain is associated with a steady-state condition of the attentional dimension that causes no perturbation of the event in the spatial-temporal domain whatsoever. A vivodynamic entity/event defined in the spatial-temporal-attentional complex is assumed to consist of two parts: (1) an energy-sensible or physical part presented in the spatial-temporal domain that can be detected by instrument probes acting as the extensions of human sensory receptors; (2) an information-perceptible or intuitive part that is perceived in the spatial-attentional domain by attentional interaction through means that are *not presently explicable in terms of known science* (Jahn 1979). The following quotes are supportive of the notion of an information-energy complex in association with psi (Jahn 1979): “*For purposes of constructing a concise dialogue, I shall define psychic phenomena to include all processes of information and/energy exchange which involve animate consciousness in a matter not presently explicable in terms of known science. By*

psychic research,the field may be roughly divided into two major categories: (1) extrasensory perception (ESP), which includes such information transfer processes as telepathy (perception of another's thoughts or emotions), clairvoyance (perception of hidden objects or events), precognition (perception of future events), and various animal ESP indications (homing, trailing, group consciousness, etc.); (2) psychokinesis, which subsumes a variety of effects wherein energy is transferred to a physical system, either in controlled or spontaneous efforts, and over a wide range of energy levels. (A few types of psychic process, such as ...psychic healing..., while not fitting these categories quite so neatly, actually involve aspects of both at a more fundamental level.) Note that in this subdivision, the field conforms to the two major thrusts of present-day science and high technology, i.e., the extraction, the processing, transmission, and storage of information, and of energy.”

The spatial dimension of this vivodynamic complex is indexed by a location $\vec{r}$ [unit: meter]. The temporal dimension of this vivodynamic complex is indexed by a moment t [unit: sec]. The mind dimension uniquely encompassed by this vivodynamic complex is indexed by an attention $@$ [unit: pur] as defined in Eq. (1). The vanishing of the effect of the attentional dimension of a vivodynamic entity will have the entity reduce to a physical objective entity presented in the conventional spatial-temporal domain so it may be interrogated by an instrument probe and the measurement outcome of it will follow MCE for a random process. It is hypothesized that the attentional aspect of a vivodynamic entity can be sensed by an instrument probe, only if the attentional aspect causes an “information-energy” coupling between the spatial-attentional and spatial-temporal domains by the domain-conjugation principles initiated in Eq. (6). It is also postulated that the attentional aspect of a vivodynamic entity will be perceivable by a live being

who functions in the spatial-attentional information domain in a form that is inaccessible in the spatial-temporal energy domain.

4. Event function expressed in the spatial-temporal-attentional complex

The arguments heretofore suggest the construction of a function to represent an event in the vidodynamic complex with the spatial-temporal-attentional properties. This event function, however, shall resort to the one in the spatial-temporal domain that represents purely objective physical event at the vanishing of the effect of the attentional dimension. An approach to such constructive formulism is attempted in the following, whereby time-dependent Schrodinger's equation is treated as the reduction of a mind-matter-event equation that operates in the spatial-temporal-attentional complex, at the absence of the dependency upon the attentional dimension.

The Schrodinger's equation concerns a probability-inferring function $\Psi_t(\vec{r}, t)$ in the spatial-temporal domain as the following:

$$\left[j\hbar \frac{\partial}{\partial t} \right] \Psi_t(\vec{r}, t) = \left[-\frac{\hbar^2}{2m} \cdot \nabla^2 + V(\vec{r}) \right] \Psi_t(\vec{r}, t) \quad (7)$$

where j is the imaginary constant $\sqrt{-1}$, $\hbar$ is the reduced Planck constant, m is the mass, and $V(\vec{r})$ is the potential function that depends on only the spatial location of the mass. The operator at the left-hand side (LHS) of Eq. (7) contains the energy quanta $\hbar$ with the unit of [J·s] multiplied by the 1st-order derivative with respect to time, leading to a composite dimension of [J]. The operator at the right-hand side (RHS) of the equation corresponds to the total energy that also depends upon the spatial dimension alone. An energy operator with only the spatial-dependency, $\tilde{\mathbb{E}}(\vec{r})$ can thus be used to temporally rewrite the RHS of Eq. (7) as

$$\left[j\hbar \frac{\partial}{\partial t} \right] \Psi_t(\vec{r}, t) = \tilde{\mathbb{E}}(\vec{r}) \Psi_t(\vec{r}, t) \quad (8)$$

Consider that $\Psi_t(\vec{r}, t)$ is a part of a higher-dimensional function $\Psi(x, t, @)$ of the following, which has a dependency on a dimension $@$ besides $\vec{r}$ and t as is illustrated in Fig. 6:

$$\Psi(\vec{r}, t, @) = \Psi_t(\vec{r}, t)\hat{t}\hat{t} + \Psi_{@}(\vec{r}, @)\widehat{@@} \quad (9)$$

Assume that $\Psi_{@}(\vec{r}, @)$ is the eigen-function of the following operation in association with $\tilde{\mathbb{E}}(\vec{r})$:

$$j\hbar_{@}\frac{\partial}{\partial @}\Psi_{@}(\vec{r}, @) = \tilde{\mathbb{E}}(\vec{r})\Psi_{@}(\vec{r}, @) \quad (10)$$

where $\hbar_{@}$ needs to have a unit of [J·pur] to cancel out the unit of [1/pur] introduced by the first-order derivative with respect to $@$. Now Eqs. (8) and (10) can be combined via Eq. (9) as

$$j\left[\hbar\frac{\partial}{\partial t} + \hbar_{@}\frac{\partial}{\partial @}\right]\Psi(\vec{r}, t, @) = \tilde{\mathbb{E}}(\vec{r})\Psi(\vec{r}, t, @) \quad (11)$$

of which Eq. (8) explicitly becomes a subset. The $@$ dimension of Eq. (11) can be completely inhibited to banish any effect to be transferred to the spatial-temporal operation, at the condition of $\frac{\partial}{\partial @}\Psi(\vec{r}, t, @)=0$ for $\hbar_{@} \neq 0$. This is because $\hbar_{@}\frac{\partial}{\partial @}\Psi(\vec{r}, t, @)=0$ for none zero $\tilde{\mathbb{E}}(\vec{r})$ within Eq. (10) must lead to $\Psi_{@}(\vec{r}, @)=0$, and this will reduce Eq. (11) that is expressed in the spatial-temporal-attentional complex to Eq. (8) that is presented in only the spatial-temporal domain. The LHS of Eq. (11) contains two operations parallel to each other, one having the first-order derivative with respect to the temporal index t , and the other taking the first-order derivative with respect to the attentional index $@$.

Now consider $\Psi_t(\vec{r}, t)$ and $\Psi_{@}(\vec{r}, @)$ that respectively has the following form:

$$\Psi_t(\vec{r}, t)=\psi(\vec{r})\phi(t) \quad (12t)$$

$$\Psi_{@}(\vec{r}, @)=\psi(\vec{r})\Omega(@) \quad (12@)$$

where $\psi(x)$ is a function of the location $\vec{r}$ only, $\phi(t)$ is the function of the time t only, and $\Omega(@)$ is the function of the attention $@$ only. The involvement of the same $\psi(x)$ in $\Psi_t(\vec{r}, t)$ and $\Psi_{@}(\vec{r}, @)$ is consistent with the requirement that they are two parts of the same global vivo-

dynamic event that is (partially) accessible in both the $(\vec{r}, t)$ domain and $(\vec{r}, @)$ domain. Substituting Eqs. (12) into Eqs. (8) and (10), and dividing both sides with $\psi(\vec{r})\phi(t)$ or $\psi(\vec{r})\Omega(@)$ as appropriate lead to

$$j\hbar \frac{1}{\phi(t)} \frac{\partial}{\partial t} \phi(t) = \frac{1}{\psi(\vec{r})} [\tilde{E}(\vec{r})\psi(\vec{r})] \quad (13t)$$

$$j\hbar @ \frac{1}{\Omega(@)} \frac{\partial}{\partial @} \Omega(@) = \frac{1}{\psi(\vec{r})} [\tilde{E}(\vec{r})\psi(\vec{r})] \quad (13@)$$

The LHS of Eq. (13t) is a function of t only, the LHS of Eq. (13@) is a function of $@$ only, and the RHS of Eq. (13t) that is identical to the RHS of Eq. (13@) is a function of $\vec{r}$ only. Consequently, the LHS of Eq. (13t), the LHS of Eq. (13@), and the RHS of Eq. (13t) or Eq. (13@) must be equal to the same constant. By defining this constant for separating the variables as E , Eqs. (13t) and (13@) decompose to the following three equations:

$$j\hbar \frac{\partial \phi(t)}{\partial t} = E\phi(t) \quad (14t)$$

$$j\hbar @ \frac{\partial \Omega(@)}{\partial @} = E\Omega(@) \quad (14@)$$

$$\left[\nabla^2 + \frac{2m}{\hbar^2} (E - V) \right] \psi(\vec{r}) = 0 \quad (15)$$

The solutions to Eqs. (14t) and (14@) take the classical exponential form of a sinusoidal wave and can have an arbitrary ratio of amplitudes between the two. “*The anomalous effect is very small but statistically significant over many replications*” (Nelson 2018). It is thus reasonable to project that the amplitude of $\Omega(@)$ for the “mind” aspect is significantly smaller than that of $\phi(t)$ for the “matter” aspect. The solutions to Eq. (14t) and (14@) can thus be scaled on their amplitudes prefixing the respective phase components as the following:

$$\phi(t) = Z(1 - \xi) \cdot \exp\left(-j \frac{E}{\hbar} t\right) = Z(1 - \xi) \cdot \exp(-j\omega t) \quad (16t)$$

$$\Omega(@) = Z\xi \cdot \exp\left(-j \frac{E}{\hbar @} @\right) = Z\xi \cdot \exp(-j\omega @) \quad (16@)$$

where Z is a real positive constant (should it be negative or complex, its phase can be absorbed into the temporal phase part to form a constant phase-shift), $\xi = [0,1)$ is a real number that is to be called the “psi” scale (which can be regarded as an indicator of the giftedness of the individual in manifesting psi or alternatively it may relate to the individual’s faith in the mental ability to interact with matter), ωt is the temporal phase with a continuous temporal frequency [unit: 1/s] of $\omega = E/\hbar$, and $\omega_{@@}$ is the attentional phase with a discrete effective attentional frequency [unit: 1/pur] of $\omega_{@@} = E/\hbar_{@@}$. Now if $\psi(\vec{r})$ is evaluated in an unbounded spatial dimension and with a constant spatial potential function $V(\vec{r}) = V < E$, Eq. (15) has the following general solution

$$\psi(\vec{r}) = A \exp[j\vec{k} \cdot \vec{r}] + B \exp[-j\vec{k} \cdot \vec{r}] \quad (17)$$

where A and B are real positive constants (should they be negative or complex, their phases can also be absorbed into the spatial phase part to produce a constant phase-shift), and

$$k = \frac{\sqrt{2m(E-V)}}{\hbar} \quad (18)$$

is a wave number. The total general solution for the so-called mind-matter-event function, after absorbing Z into A and B for simplicity, then becomes

$$\begin{aligned} \Psi(x, t, @) = & A(1 - \xi) \cdot \exp[j(\vec{k} \cdot \vec{r} - \omega t)]\hat{t}\hat{t} + B(1 - \xi) \cdot \exp[-j(\vec{k} \cdot \vec{r} + \omega t)]\hat{t}\hat{t} \\ & A\xi \cdot \exp[j(\vec{k} \cdot \vec{r} - \omega_{@@})]\widehat{@@} + B\xi \cdot \exp[-j(\vec{k} \cdot \vec{r} + \omega_{@@})]\widehat{@@} \end{aligned} \quad (19)$$

This mind-matter-event function is the domain-combination of terms that function as traveling waves. The first/second term of the RHS of Eq. (19) presented in the spatial-temporal domain is a wave traversing in the $+\vec{r}/-\vec{r}$ direction as the time increases. The third/fourth term residing in the spatial-attentional domain resembles information propagation in the $+\vec{r}/-\vec{r}$ direction as the attention increases. The A and B coefficients must be determined by boundary conditions over the

spatial dimension. Assume that the boundary condition will reject the second and the fourth terms of Eq. (19), the following vivo-dynamic event function is reached:

$$\Psi(x, t, @) = A(1 - \xi) \cdot \exp[j(\vec{k} \cdot \vec{r} - \omega t)]\hat{t}\hat{t} + A\xi \cdot \exp[j(\vec{k} \cdot \vec{r} - \omega_{@@})]\widehat{@@} \quad (20)$$

The intra-action of this event function with its complex conjugate gives rise to

$$\begin{aligned} |\Psi(\vec{r}, t, @)|^2 &= \Psi(\vec{r}, t, @) \cdot \Psi^*(\vec{r}, t, @) \\ &= A^2[(1 - \xi)^2\hat{t}\hat{t} + 2\xi(1 - \xi)\cos(\omega t - \omega_{@@})\widehat{t@} + \xi^2\widehat{@@}] \end{aligned} \quad (21)$$

where $A^2 = |\Psi(\vec{r})|^2$ is the total probability of corroborating the event in the spatial-temporal-attentional complex at a specific spatial location $\vec{r}$. The first term in the square bracket and identified with $\hat{t}\hat{t}$ refers to the purely “matter” aspect of the event probed in the spatial-temporal domain. This first term is set to be objectively detectable by an instrument probe. The third term in the square bracket and identified with $\widehat{@@}$ specifies the entirely “mind” aspect of the event that is perceivable in the spatial-attentional domain. This last term is assumed to be beyond the detection by an instrument probe and is perceivable only over the attentional dimension by *intuitive* properties unique to mind. The middle term in the square bracket and identified with $\widehat{t@}$ defines the “mind-matter-modulation” aspect of the event that is the result of the coupling between the spatial-attentional “information” domain and the spatial-temporal “energy” domain. This domain-coupling term is assumed to influence the physicality (i.e. the spatial-temporal aspect) of the event and thus will perturb the instrument response of probing the event in the spatial-temporal domain.

An event expressed in the spatial-temporal-attentional complex shall also satisfy a HARD condition of normalization as the following

$$\int_{-\infty}^{\infty} |\Psi(\vec{r}, t, @)|^2 d\vec{r} = 1 \quad (22)$$

which dictates that the total probability of registering an event in the entire spatial-temporal-attentional complex is unity. Enforcing the normalization condition of Eq. (22) will cause an event

perceptible in the spatial-attentional domain to perturb the probing of the event in the spatial-temporal domain. Should there be a change to the total probability of registering an event in one spatial location due to any perturbation of any cause, that change must be compensated by a change of the probability of registering the event in some other spatial locations. In the case when the probability is associated with registering the interaction between two event functions as shown in Eq. (6), the normalization condition of registering the correlated event becomes

$$\int_{-\infty}^{\infty} |\Psi_{12}(\vec{r}, t, @)|^2 d\vec{r} = 1 \quad (23)$$

Figure 7 is used to illustrate how the probability of registering an event (as a result of intra-action of one event function or interaction of two event functions) in the spatial-temporal domain may be modulated by the spatial-attentional aspect of the events via the psi-scale ξ . The thick horizontal green line atop the figure corresponds to A^2 which is the total probability of corroborating the event at a specific spatial location. A^2 corresponds specifically to the MCE of registering a purely objective event in the spatial-temporal domain in the absence of any spatial-attentional influence. If the spatial-attentional aspect of the event kicks in and intensifies, it will cause an increased deviation (i.e. reduction) of the probability of registering the event in the spatial-temporal domain from MCE, as is determined by the composition of the first and the second terms in Eq. (21). Assume that the spatial-temporal-attentional event incurs at a temporal-attentional phase difference to hold the second term in Eq. (21) at zero, the magnitude of the first term will deviate from its baseline (i.e. A^2) as the psi scale increases, shown by the thick curved red line just below the green line. For any measurement, there is always a threshold for registering an event occurrence with respect to MCE. Only when the deviation of the event occurrence from MCE is greater than the threshold, can an event be registered as abnormal or psi. The horizontal dashed red line in Fig. 7 that run parallel to the thick green line is analogous to a threshold of

registering an anomaly. Only when the deviation of the event occurrence from A^2 makes the probability of probing the event in the spatial-temporal domain drop below the line of threshold, can a psi occurrence be registered. When the anomalous change of probing the event in the spatial-temporal domain at a specific spatial location is not compensated completely by a change of equal magnitude and opposite polarity in the spatial-attentional domain at the same spatial location, the anomalous change has to ripple to other spatial locations to maintain the unity of the total event probability over the entire spatial-dimension.

5. Effects of an agent function on the spatial-temporal presentation of a target function

With the construction of an event function in the spatial-temporal-attentional complex, it becomes feasible to project the outcome of the coupling between an agent event that has expression in the spatial-attentional domain and a target event that is probed in the spatial-temporal domain. The target event can be a purely-objective event that is expressed exclusively in the spatial-temporal domain, or an event that also is expressed in the spatial-attentional domain. The agent event by default to have complete presence in the spatial-temporal-attentional complex. The following sections first assess the effect of one or multiple agent functions effecting another event function that is also expressed in the spatial-temporal-attentional domain. Then the analysis is applied to the case of one or multiple agent functions effecting a target event function that is expressed only in the spatial-temporal domain. In the following, a function with complete expression in the spatial-temporal-attentional complex may be called a vivo-dynamic function.

5.1 Agent-target interaction for a target event function expressed in the spatial-temporal-attentional domain

5.1.A Effects of one vivo-dynamic event function on target event function expressed in the vivo-dynamic complex

Probing the outcomes of the interactions of two vivo-dynamic event functions in the spatial-temporal domain would require the same spatial-temporal phase be associated with both event functions. Consider that the agent function differs an amount of $\Delta\psi_{@}$ in the spatial-attentional phase with respect to the target function. The target and agent functions can be represented respectively as (by referring to Eq. (20) assuming the appropriate boundary condition):

$$\Psi_0(\vec{r}, t, @) = A_0(1 - \xi_0) \cdot \exp[j(\vec{k} \cdot \vec{r} - \omega t)]\hat{t}\hat{t} + B_0\xi_0 \cdot \exp[j(\vec{k} \cdot \vec{r} - \omega_{@}@)]\widehat{@@} \quad (24)$$

$$\Psi_1(\vec{r}, t, @) = A_1(1 - \xi_1) \cdot \exp[j(\vec{k} \cdot \vec{r} - \omega t)]\hat{t}\hat{t} + B_1\xi_1 \cdot \exp[j(\vec{k} \cdot \vec{r} - \omega_{@}@ + \Delta\psi_{@})]\widehat{@@} \quad (25)$$

The interaction of these two event functions results in the following

$$|\Psi_{01}(\vec{r}, t, @)|^2 = \Psi_0(\vec{r}, t, @)\Psi_1^*(\vec{r}, t, @) = (A_0A_1)(1 - \xi_0)(1 - \xi_1)\hat{t}\hat{t} + (B_0B_1)\xi_0\xi_1\widehat{@@} + \left\{ \begin{aligned} &(A_0B_1)(1 - \xi_0)\xi_1 \exp[-j(\omega t - \omega_{@}@ + \Delta\psi_{@})] \\ &+ (A_1B_0)\xi_0(1 - \xi_1) \exp[-j(\omega t - \omega_{@}@)] \end{aligned} \right\} \widehat{t@} \quad (26)$$

The term of Eq. (26) that is associated with $\hat{t}\hat{t}$ is the result of intra-domain coupling of the spatial-temporal aspects of the two event functions. The term that is associated with $\widehat{@@}$ is the outcome of intra-domain coupling of the spatial-attentional aspects of the two event functions. The term that is associated with $\widehat{t@}$ manifests the combined effect of the inter-domain coupling between the spatial-attentional aspect of one event function with the spatial-temporal aspect of the other event function. Simplicity is obtained by having $A_0B_1 = A_1B_0$, $\xi_0 = \xi_1 = \xi$, and $\Delta\psi_{@}=0$, to lead to

$$|\Psi_{01}(\vec{r}, t, @)|^2 = (A_0A_1)(1 - \xi)^2\hat{t}\hat{t} + 2(A_0B_1)\xi(1 - \xi) \exp[-j(\omega t - \omega_{@}@)]\widehat{t@} + (B_0B_1)\xi^2\widehat{@@} \quad (27)$$

The first term identified with $\hat{t}\hat{t}$ is the pure objective term that can be probed directly in the spatial-temporal domain. The second term identified with $\hat{t}\hat{@}$ signifies domain-coupling that modulate the event registration in the spatial-temporal domain. The third term identified with $\hat{@}\hat{@}$ is the “intuitive” term that is to be perceived in the spatial-attentional domain.

5.1.B Collective effects of multiple vivo-dynamic event functions on a target event function expressed in the vivo-dynamic complex

Consider a vivo-dynamic event function defined in Eq. (24) as a target that is affected by multiple agent functions in the vivo-dynamic domain. To have all agent function act upon the same target function, it is imperative to assign the spatial-temporal aspect of all agent functions to be the same as that of the target function. The m -th agent function, $m = [1, M]$, is represented as

$$\begin{aligned}\Psi_m(\vec{r}, t, @) = & A_m(1 - \xi_m) \cdot \exp[j(\vec{k} \cdot \vec{r} - \omega t)]\hat{t}\hat{t} \\ & + \xi_m \cdot \exp[j(\vec{k} \cdot \vec{r} - \omega_{@@} + \Delta\psi_{@m})]\hat{@}\hat{@}\end{aligned}\quad (28)$$

where $\Delta\psi_{@m}$ is the difference of the spatial-attentional phase of the event function of $m \geq 2$ with respect to a baseline function of $m = 1$ (i.e. $\Delta\psi_{@1} = 0$). Assume that the agent functions interact with the target function in a linear manner, the composite agent function then becomes:

$$\begin{aligned}\vec{\Psi}(\vec{r}, t, @) = & \sum_{m=1}^M \Psi_m(\vec{r}, t, @) = \\ & \sum_{m=1}^M \{A_m(1 - \xi_m) \cdot \exp[j(\vec{k} \cdot \vec{r} - \omega t)]\hat{t}\hat{t} + B_m\xi_m \cdot \exp[j(\vec{k} \cdot \vec{r} - \omega_{@@} + \Delta\psi_{@m})]\hat{@}\hat{@}\}\end{aligned}\quad (29)$$

The interaction between the composite agent function of Eq. (29) with the target function of Eq. (24) results in

$$\begin{aligned}|\vec{\Psi}_{0(M)}(\vec{r}, t, @)|^2 = & \Psi_0(\vec{r}, t, @)\vec{\Psi}^*(\vec{r}, t, @) = \Psi_0(\vec{r}, t) \sum_{m=1}^M \Psi_m^*(x, t, @) \\ = & A_0(1 - \xi_0) \sum_{m=1}^M A_m(1 - \xi_m)\hat{t}\hat{t} + B_0\xi_0 \sum_{m=1}^M B_m\xi_m\hat{@}\hat{@}\end{aligned}$$

$$+\sum_{m=1}^M \left\{ (A_0 B_m)(1 - \xi_0) \xi_m \exp[-j(\omega t - \omega_{@@} + \Delta\psi_{@m})] + (A_m B_0) \xi_0 (1 - \xi_m) \exp[-j(\omega t - \omega_{@@})] \right\} \widehat{t@} \quad (30)$$

The term of Eq. (31) that is associated with $\widehat{t\hat{t}}$ is the composite result of intra-domain coupling of the spatial-temporal aspect of each agent function with the spatial-temporal aspect of the one target event function. The term of Eq. (31) that is associated with $\widehat{@@}$ is the outcome of intra-domain coupling of the spatial-attentional aspect of each agent function with the spatial-attentional aspect of the one target event function. The term of Eq. (31) that is associated with $\widehat{t@}$ manifests the combined effect of the inter-domain coupling between the spatial-attentional aspect of the only target function with the spatial-temporal aspect of each agent function. Simplicity is gained by setting $A_0 B_m = A_m B_0$, $\xi_0 = \xi_m = \xi$ and $\Delta\psi_{@m}=0$, then we have

$$\begin{aligned} |\vec{\Psi}_{0(M)}(\vec{r}, t, @)|^2 &= A_0(1 - \xi)^2 \sum_{m=1}^M A_m \widehat{t\hat{t}} + B_0 \xi^2 \sum_{m=1}^M B_m \widehat{@@} \\ &\quad + 2A_0 \xi (1 - \xi) \sum_{m=1}^M B_m \exp[-j(\omega t - \omega_{@@})] \widehat{t@} \end{aligned} \quad (31)$$

Alternatively, if we have $A_0 B_m = A_m B_0$, $\xi_0 = \xi_m = \xi$ but $\Delta\psi_{@}=\pi$, we have

$$|\vec{\Psi}_{0(M)}(\vec{r}, t, @)|^2 = A_0(1 - \xi)^2 \sum_{m=1}^M A_m \widehat{t\hat{t}} + B_0 \xi^2 \sum_{m=1}^M B_m \widehat{@@} \quad (32)$$

5.2 Agent-target interaction for a target event function that is exclusively spatial-temporal

5.2.A Effects of one vivo-dynamic agent-event function on an objective-event target function

Now consider a target function as one that does not contain the attentional aspect as the following

$$\Psi_0(\vec{r}, t) = A_0 \cdot \exp[j(\vec{k} \cdot \vec{r} - \omega t)] \widehat{t\hat{t}} \quad (33)$$

An agent function must be expressed in the spatial-attentional aspect for it to be able to influence an objective-event target function. Because only when the agent function is acted upon the target function with the same “coherent” presence in the spatial-temporal domain can any effect of the

agent on the target be measured, it is imperative to assign the same spatial-temporal phase to both the target function and the agent function. The vivo-dynamic agent function then becomes the same as Eq. (25). The interaction of the vivo-dynamic agent function of Eq. (25) with the objective-event target function of Eq. (33) results in

$$\begin{aligned} |\Psi_{01}(\vec{r}, t, @)|^2 &= \Psi_0(\vec{r}, t) \Psi_1^*(\vec{r}, t, @) \\ &= (A_0 A_1) (1 - \xi_1) \widehat{t} \widehat{t} + (A_0 B_1) \xi_1 \exp[-j(\omega t - \omega_{@} @)] \widehat{t} @ \end{aligned} \quad (34)$$

The term of Eq. (34) that is associated with $\widehat{t} \widehat{t}$ is the result of intra-domain coupling of the spatial-temporal domain of the agent event with the spatial-temporal target event function. Equation (34) does not have a term associated with $@ @$ to express an outcome in the spatial-attentional domain. The term of Eq. (34) that is associated with $\widehat{t} @$ manifests the combined effect of the inter-domain coupling between the spatial-attentional aspect of the agent event function with the spatial-temporal target event function.

5.2.B Effects of multiple vivo-dynamic event functions on the objective target-event function

Consider an objective-event target function defined in Eq. (33) that is affected by multiple agent functions expressed in the full complex vivo-dynamic domain. To have all agent functions act upon the same target function, the spatial-temporal phase of all agent functions should be identical to that of the target function. The m -th agent function, $m = [1, M]$, and their composite agent function are referred to Eqs. (28) and (29). The interaction of the composite agent function of Eq. (29) with the objective-event target function of Eq. (33) results in

$$\begin{aligned} |\vec{\Psi}_{0(M)}(\vec{r}, t, @)|^2 &= \Psi_0(\vec{r}, t) \vec{\Psi}^*(\vec{r}, t, @) = \Psi_0(\vec{r}, t) \sum_{m=1}^M \Psi_m^*(x, t, @) \\ &= A_0 \sum_{m=1}^M \{A_m (1 - \xi_m) \widehat{t} \widehat{t} + B_m \xi_m \exp[-j(\omega t - \omega_{@} @ + \Delta\psi_{@m})] \widehat{t} @\} \end{aligned} \quad (35)$$

The term of Eq. (36) that is associated with $\hat{t}\hat{t}$ is the result of intra-domain coupling of the spatial-temporal domain of all agent events with the spatial-temporal target event function. Equation (36) does not have a term associated with $\widehat{@@}$ to express an outcome in the spatial-attentional domain. The term of Eq. (36) that is associated with $\widehat{t@}$ manifests the composite effect of the inter-domain coupling between each of the spatial-attentional aspect of all agents with the spatial-temporal target event function. Simplicity is obtained by having $\xi_m = \xi$.

6. Discussion

An event expressed in the spatial-temporal-attentional complex must be constrained by the normalization condition of Eq. (22), because the total probability of registering an event in the entire complex that it exists is unity. Enforcing this normalization condition will cause an event that is perceptible in the spatial-attentional domain to perturb the probability of probing the event in the spatial-temporal domain. The following section assesses four special cases of an intra-acting event:

(1). $\xi=0$. This condition corresponds to a zero-psi state that shall not intra-produce any influence on the objectivity of the event probed in the spatial-temporal domain from the spatial-attentional domain. Accordingly, this condition in Eq. (21) will simply reduce $|\Psi(\vec{r}, t, @)|^2$ to $A^2\hat{t}\hat{t}$, which is exactly the probability of finding the event at a specific location in the spatial dimension when associated exclusively with the temporal dimension.

(2). $\xi \neq 0$, i.e. $\xi = (0,1)$, but $\omega t - \omega_{@@}=2n\pi, n = 0, 1, 2, 3 \dots$ to make $\cos(\omega t - \omega_{@@})=1$. This condition symbolizes the case when the spatial-attentional aspect of the event is “coupled” into the spatial-temporal domain, but the spatial-attentional domain is perfectly in-phase with the spatial-temporal domain. In this case, the spatial-attentional domain would be indifferent from the

spatial-temporal domain in terms of assessing the evolution of the event along the time-axis. This condition will thus effectively equate $\hat{t}\hat{t}$ and $\widehat{@@}$, and since $(1 - \xi)^2 + 2\xi(1 - \xi) + \xi^2 = 1$, the magnitude of $|\Psi(\vec{r}, t, @)|^2$ is kept at A^2 , i.e. the same total probability of finding the event at a specific location in the spatial dimension as in the case (1). However, the maximum probability of assessing the event in the spatial-attentional domain will become $A^2[(1 - \xi)^2 + 2\xi(1 - \xi)] = (1 - \xi^2) A^2$ which is $< A^2$. The outcome is then a deviation of the event registration in the spatial-temporal domain from its baseline, purely objective probability---- A^2 . The net difference of $\xi^2 A^2$ in the probability for probing the event in the spatial-temporal domain with respect to MCE is registered exactly in the spatial-attentional domain at the same spatial location. Because the total probability of registering the event at the specific $\vec{r}$ is not changed, there is no change to the event probability at other spatial locations.

(3) $\xi \neq 0$, i.e. $\xi = (0,1)$, but $\omega t - \omega_{@@} = (2n + 1)\pi, n = 0, 1, 2, 3 \dots$ to make $\cos(\omega t - \omega_{@@}) = -1$. This condition specifies the case when the spatial-attentional aspect of the event function is coupled into the spatial-temporal domain due to intra-action, but the spatial-attentional domain is perfectly anti-phase with the spatial-temporal domain. In this case, the spatial-attentional domain would counteract the spatial-temporal domain in terms of assessing the evolution of the event along the time-axis. Now the total probability of registering the event at $\vec{r}$ becomes $A^2[(1 - \xi)^2 - 2\xi(1 - \xi) + \xi^2] = A^2(1 - 2\xi)^2 < A^2$. The outcome is a deviation of the event registration in the spatial-temporal domain from its baseline, purely objective probability---- A^2 . Since the magnitude of $|\Psi(\vec{r}, t, @)|^2$ is now less than A^2 , satisfying the normalization condition Eq. (22) over the entire spatial dimension would require increasing the probability of registering the event in a different $\vec{r}$.

(4). $\xi \neq 0$, i.e. $\xi = (0,1)$, but $\omega t - \omega_{@@} = (n + 1/2)\pi, n = 0, 1, 2, 3 \dots$ to make $\cos(\omega t - \omega_{@@}) = 0$. This condition symbolizes the case when the spatial-attentional aspect of the event is “coupled” into the spatial-temporal domain due to intra-action, but the spatial-attentional domain is orthogonal with respect to the spatial-temporal domain to annihilate the domain coupling term. Now the total probability of registering the event at $\vec{r}$ becomes $A^2[(1 - \xi)^2 + \xi^2] = A^2(1 - 2\xi + 2\xi^2) < A^2$. Since the magnitude of $|\Psi(\vec{r}, t, @)|^2$ is less than A^2 , the normalization condition would require increasing the probability of registering the event in a different $\vec{r}$.

According to the extensibility principle, the probabilities of registering an inter-action between two events in the spatial-temporal domain shall converge to the probabilities of registering an intra-action in the spatial-temporal domain when the two functions become identical. The probabilities of registering an inter-action between an agent and a vivo-dynamic target in the spatial-temporal domain shall resort to the probabilities of registering an inter-action between an agent and a purely objective target in the spatial-temporal domain as the attentional aspect of the target vanishes. A trivial projection is that the probabilities of registering an inter-action between an agent and a purely objective target in the spatial-temporal domain must become the probabilities of registering an inter-action between two purely objective events in the spatial-temporal domain as the attentional aspect of the agent vanishes.

In the following, four cases of agent-target interaction are assessed for two circumstances: (1) the target being vivo-dynamic and (2) the target being purely objective. These analyses are necessary as they inform the difference that lies in between the intra-action cases analyzed above and the interaction cases. The patterns associated interaction cases can be considered as akin sheep or goat effects.

6.1 Phase-modulated agent-target interaction in association with a target event expressed in the spatial-temporal-attentional complex

A target event expressed in the spatial-temporal-attentional domain when interrogated by an agent event function shall satisfy the hard condition of normalization of Eq. (23) because the total probability of registering the agent-target interaction in the entire spatial-temporal-attentional complex is one. The normalization condition of Eq. (23) will cause an agent event to perturb the probability of probing a target event in the spatial-temporal domain. Should there be a change to the total probability of registering an event in one spatial location due to any perturbation from any domain, that change must be compensated by a change of the probability of registering the event in other spatial locations extending to all domains. The agent-target interaction is assessed for the following four special conditions, based on Eq. (27):

(1). $\xi=0$. This condition corresponds to a zero-psi state that shall not manifest any influence on the spatial-temporal aspect of the target event by the agent event. Accordingly, this condition will simply reduce $|\Psi(\vec{r}, t, @)|^2$ to $A_0 A_1 \hat{t}t$, which is exactly the probability of only the temporal aspect of the agent function interacting with only the temporal aspect of the target function at a specific location in the spatial dimension.

(2). $\xi \neq 0$, i.e. $\xi = (0,1)$, but $\exp[-j(\omega t - \omega_{@@})] = 0$. This condition symbolizes the case when the spatial-attentional aspect of the agent function is “coupled” into the spatial-temporal domain of the target event. However, the difference of the spatial-attentional aspects between the agent and target functions is orthogonal to the difference of the spatial-temporal aspects between the agent and target functions to annihilate the domain coupling term. Now the probability of probing the temporal aspect of the event at $\vec{r}$ becomes $A_0 A_1 (1 - \xi)^2 < A_0 A_1$. The total probability of registering the event at $\vec{r}$ becomes $A_0 A_1 (1 - \xi)^2 + B_0 B_1 \xi^2 < A_0 A_1$ because $B_0 B_1$

must be substantially smaller than A_0A_1 . Since the magnitude of $|\Psi(\vec{r}, t, @)|^2$ is now less than A_0A_1 , the normalization condition Eq. (23) over the entire spatial dimension would require increasing the probability of registering the event in a different $\vec{r}$.

(3). $\xi \neq 0$, i.e. $\xi = (0,1)$, and $\exp[-j(\omega t - \omega_{@@})] = 1$. This condition symbolizes the case when the spatial-attentional aspect of the event is “coupled” into the spatial-temporal domain, but the spatial-attentional domain is perfectly in-phase with the spatial-temporal domain. In this case, the spatial-attentional domain would be indifferent from the spatial-temporal domain in terms of assessing the evolution of the event along the time-axis. This condition will thus effectively equate $\hat{t}\hat{t}$ and $\widehat{@@}$ to make $|\Psi_{01}(\vec{r}, t, @)|^2$ to have a magnitude of $(A_0A_1)(1 - \xi)^2 + 2(A_0B_1)\xi(1 - \xi) + (B_0B_1)\xi^2 < A_0A_1$. The event probability that can be assessed in the spatial-temporal domain is $(A_0A_1)(1 - \xi)^2 + 2(A_0B_1)\xi(1 - \xi) < A_0A_1$. The outcome is a further deviation, in comparing to the case (2), of the event registration in the spatial-temporal domain from its baseline, purely objective probability of A_0A_1 .

(4) $\xi \neq 0$, i.e. $\xi = (0,1)$, to make $\exp[-j(\omega t - \omega_{@@})] = -1$. This condition specifies the case when the spatial-attentional aspect of the event is coupled into the spatial-temporal domain, but the spatial-attentional domain is perfectly anti-phase with the spatial-temporal domain. In this case, the spatial-attentional domain would counteract the spatial-temporal domain in terms of assessing the evolution of the event along the time-axis. Now the probability of registering the event at $\vec{r}$ becomes $(A_0A_1)(1 - \xi)^2 - 2(A_0B_1)\xi(1 - \xi) + (B_0B_1)\xi^2 < A_0A_1$. The event probability that can be assessed in the spatial-temporal domain is $(A_0A_1)(1 - \xi)^2 - 2(A_0B_1)\xi(1 - \xi) < A_0A_1$. The outcome is further deviation, in comparison to the case (3), of the event registration in the spatial-temporal domain from its baseline, purely objective probability of A_0A_1 .

Figure 8 may be used as the analogy of sheep-goat effect with the in-phase or out-of-phase condition of the attentional-temporal phase between an agent and a target of vivo-dynamic expression. The schematic illustrates the domain-coupling effect between two event functions both of which are expressed in the spatial-attentional domain. The upper panel corresponds to the two event functions that are in-phase in the spatial-attentional domain with each other. The outcome is analogous to a sheep effect that will register an event further away from MCE. The lower panel corresponds to the two event functions that are anti-phase with each other in the spatial-attentional domain. The outcome is analogous to a goat effect that will register an event less away from MCE.

6.2 Phase-modulated agent-target interaction in association with a target event expressed in only the spatial-temporal domain

An event function expressed only in the spatial-temporal domain when interrogated by an agent event function shall also satisfy the hard condition of normalization of Eq. (23) dictating that the total probability of registering the objective spatial-temporal aspect of the event in the entire spatial-temporal-attentional complex must be one. Enforcing the normalization condition of Eq. (23) will cause a target event that is expressed in only the spatial-temporal domain to be perturbed by the spatial-attentional aspect of an agent event. Should there be a change to the total probability of registering the agent-target interaction in one spatial location, that change must be compensated by a change of the probability of registering agent-target interaction in other spatial locations. The following assesses the probability of registering the objective aspect of the agent-target interaction under four special conditions (the composite-agent), based on Eq. (34):

(1). $\xi=0$. This condition corresponds to a zero-psi state in the agent-target interaction that shall not manifest any influence on the exclusively spatial-temporal aspect of the target event by the

agent. Accordingly, $|\Psi(\vec{r}, t, @)|^2$ is reduced to $A_0 A_1 \hat{t} \hat{t}$, which is exactly the probability of only the temporal aspect of the agent function interacting with the exclusively temporal aspect of the target function at a specific location in the spatial dimension.

(2). $\xi \neq 0$, i.e. $\xi = (0,1)$, but $\exp[-j(\omega t - \omega_{@@})] = 0$. This condition symbolizes the case when the spatial-attentional aspect of the agent event is “coupled” into the exclusively spatial-temporal domain of the target event, but the spatial-attentional domain is in orthogonal phase with respect to the spatial-temporal domain to annihilate the domain coupling term. Now the total probability of registering the event at $\vec{r}$ becomes $A_0 A_1 (1 - \xi_1) < A_0 A_1$. Since the magnitude of $|\Psi(\vec{r}, t, @)|^2$ is now less than $A_0 A_1$, satisfying the normalization condition Eq. (23) over the entire spatial dimension would require increasing the probability of registering the event in a different $\vec{r}$.

(3). $\xi \neq 0$, i.e. $\xi = (0,1)$, and $\exp[-j(\omega t - \omega_{@@})] = 1$. This condition symbolizes the case when the spatial-attentional aspect of the agent event is “coupled” into the spatial-temporal domain to affect the exclusively spatial-temporal target, but the spatial-attentional domain is perfectly in-phase with the spatial-temporal domain. In this case, the spatial-attentional domain would be indifferent from the spatial-temporal domain in terms of assessing the evolution of the event along the time-axis. This condition will thus effectively equate $\hat{t} \hat{t}$ and $\widehat{@@}$, now the total probability of registering the event at $\vec{r}$ becomes $A_0 A_1 (1 - \xi_1) + A_0 B_1 \xi_1 = A_0 A_1 \left[(1 - \xi_1) + \frac{B_1}{A_1} \xi_1 \right] < A_0 A_1$, where $\frac{B_1}{A_1}$ is supposed to be very small. Since the magnitude of $|\Psi(\vec{r}, t, @)|^2$ is now less than $A_0 A_1$, satisfying the normalization condition Eq. (23) over the entire spatial dimension would require increasing the probability of registering the event in a different $\vec{r}$.

(4) $\xi \neq 0$, i.e. $\xi = (0,1)$, and $\exp[-j(\omega t - \omega_{@@})] = 1$. This condition specifies the case when psi “acts” to leak the spatial-attentional aspect of the agent event into the spatial-temporal domain to affect the exclusively spatial-temporal target event-function, but the spatial-attentional

domain is perfectly anti-phase with the spatial-temporal domain. Now the total probability of registering the event at $\vec{r}$ becomes $A_0A_1(1 - \xi_1) - A_0B_1\xi_1 = A_0A_1 \left[(1 - \xi_1) - \frac{B_1}{A_1}\xi_1 \right] < A_0A_1$, where $\frac{B_1}{A_1}$ is very small. The outcome is further deviation, in comparison to the case (2), of registering the event in the spatial-temporal domain from its baseline, purely objective probability of A_0A_1 .

Figure 9 may be used for sense of the sheep-goat effect in terms of the in-phase or out-of-phase condition of the attentional-temporal phase between an agent and a target that is expressed in only the spatial-temporal domain. The schematic depicts the domain-coupling effect between two event functions with the agent function expressed in the spatial-attentional domain and the target function presenting only in the spatial-temporal domain. The upper panel corresponds to a sheep agent effecting an objective target. The effect will be overlapped on a residual influenced by the spatial-attentional aspect of the sheep agent, so the event is to be registered further away from MCE with respect to the residual deviation due to the attentional aspect of the sheep agent. The lower panel corresponds to a goat agent effecting an objective target to register an event less away from MCE with respect to the residual deviation due to the attentional aspect of the goat agent. In other words, a goat may make the event deviating less from MCE, however, the goat may not completely inhibit the deviation of event probability from MCE.

The sheep-goat effect concerns the deviation of a matter event from physical randomness due to human agent intention (Atmanspacher 1999). These afore-detailed descriptions regarding the deviation of the probability of registering an event in the spatial-temporal domain from its baseline, purely objective probability reveals patterns that are analogous to the sheep-goat effect. All measurements have a threshold of response. For a matter event of physical randomness, only when the event deviates from the MCE more than causing the threshold response of the

measurement, can the event be registered as to manifest psi. The consensus of “*the anomalous effect is very small but statistically significant over many replications*” (Nelson 2018) recognizes that psi results are inherently difficult to interpret, confirm, and to replicate. The analytical interpretation entertained in this work may be particularly insightful for assessing the condition of the psi on-demand and understanding why it may be difficult to replicate psi of specific property.

Figure 10 illustrates the probability of registering a vivo-dynamic event in the spatial-temporal domain as a function time, at a fixed psi scale ξ at three values of the difference of the spatial-attentional phase between the agent and the target. The thick horizontal green line at the top of the figure corresponds to 1 that represents the total probability of corroborating the target event at a specific spatial location at the absence of any attentional influence, i.e. MCE. The spatial-attentional aspect of the agent event will cause a net deviation of the probability of registering the target event in the spatial-temporal domain from MCE. In referring to Equations including Eq. (27) for the probability of event interaction, assuming that the spatial-temporal-attentional agent event incurs at a constant temporal-attentional phase difference of $(\omega t - \omega_{@@}) = 0, \frac{\pi}{2}, \text{ or } \pi$, the magnitude of the first term will undulate with respect to the deviation by the first term that is to be controlled by the psi scale. For any measurement, there is always a threshold for registering an event occurrence with respect to its expected occurrence. Therefore only when the deviation of the event occurrence from the expected value is greater than the threshold, can a psi occurrence be registered. The undulation will cause a random registration of the event away from MCE, if the sampling of the event with respect to the attentional-temporal phase difference is random, therefore it will be difficult to replicate a psi of a specific pattern. Should the randomness of sampling with respect to the attentional-temporal phase difference be true, psi-event may be more easily

identifiable by perhaps monitoring the abnormal neurological conditions with the use of technologies such as EEG (Gimeno 2017).

6. Conclusions

In conclusion, this work proposed a framework of operating mind-matter interaction in a hypothetical spatial-temporal-attentional domain for the interpretation of sheep-goat effect. The attention is quantitated as a non-uniformly interspaced discrete index that depends solely on the number of live neurons that function in a coherent state for a purpose of the mind. A spatial-attentional “information” domain assumed to be operable by hinging it with the spatial-temporal “energy” domain along the spatial dimension, to form a vivo-dynamic complex. Operations of an event function with respect to attention is assigned to assimilate those with respect to time. Domain operators are defined to specify the domain of temporal or attentional attribution used for assessing an event and identify the outcome of domain-coupling on the registration of an event. Time-dependent Schrodinger’s equation is then treated as a lower-dimensional case of a higher-dimensional mind-matter-event equation elaborated in the spatial-temporal-attentional complex. The resulted mind-matter-event function defined in the vivo-dynamic complex degrades to an objective-event function in the spatial-temporal domain at zeroing of the attention or the first-order derivative of the function with respect to attention. The mind-matter-event equation leads to simple traveling-wave-type solutions that combine temporal presentation and attentional perception. The interaction of mind-matter event functions creates “information-energy” coupling terms presumed to be amenable to instrument probing in the spatial-temporal domain as is the objective-event term. The domain-coupling when modulated by the phase difference between the temporal and attentional dimensions, can enhance or inhibit the deviation of the event registration in the spatial-

temporal domain from its baseline probability. The outcome is akin the sheep-goat effect. The phase-dependency of the event-coupling may also elucidate the difficulty of replicating psi. Such theoretical attempts could be extended in future works for explaining other anomalous effects that are definitively associated with the state of mind.

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Figure captions:

Figure 1 The non-contact two-body interactions that are possible when involving life-less objects and live subjects. Physical-physical interaction as marked by the bottom horizontal plain arrow happens between two lifeless objects. Attentional-attentional interaction as represented by the top horizontal colored arrow is the hall-mark between two live subjects. Attentional-physical or physical-attentional interaction as depicted by one of the two oblique colored arrows is associated with one lifeless object and one live subject.

Figure 2. The attentional dimension is hypothesized to connect with the temporal dimension via the common spatial dimension.

Figure 3. Discrete change of $\#neuron_{cohe}$ over a finite range of $[0, \#NEURON_{total}]$ at a uniform interval of 1 leads to a discrete change of $(\#neuron_{cohe})/(\#NEURON_{total} - \#neuron_{cohe})$ over a semi-infinite range of $[0, \infty)$ at a non-uniform and monotonically increasing non-integer interval. The plot assumes $\#NEURON_{total} = 500$ and $\#neuron_{cohe} = [0, 450]$ only to illustrate the salient pattern of the ratio, $(\#neuron_{cohe})/(\#NEURON_{total} - \#neuron_{cohe})$.

Figure 4. A function Ψ is assumed to be assessible in two domains, each has two dimensions. The function is represented by the combination of the presence of the function in the two domains with each identified by a domain operator.

Figure 5. Principles of domain operation.

Figure 6. A vivodynamic function Ψ is assumed to present in the spatial-temporal “energy” domain and the spatial-attentional “information” domain.

Figure 7. The registration of a psi event depends upon the significance of the deviation of the event occurrence from the expected chance of occurrence. The solid green horizontal line at the top denotes the expected occurrence. The dashed red horizontal line demarks a threshold of registering an event that deviates from expectation. The abscissa represents the psi-scale that is assumed to vary over $[0,1)$. The ordinate is not plotted according to scale and shall be interpreted as for illustration only.

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