NATIONAL RESEARCH UNIVERSITY
HIGHER SCHOOL OF ECONOMICS

Vadim A. Petrovsky

RISK-TAKING AS DESIGNED BY LEFEBVRE

BASIC RESEARCH PROGRAM

WORKING PAPERS

SERIES: PSYCHOLOGY
WP BRP 132/PSY/2022

Vadim A. Petrovsky[1]

RISK-TAKING AS DESIGNED BY LEFEBVRE

This paper interprets the hard-to-explain discrepancies between the results of empirical research into achievement motivation (with free choice of the levels of task challenge, as in Hoppe's experiments) and the predictions of the risk-taking model by Atkinson that is based on a combination of three variables: motives for achieving success, avoiding failure, and the probability of success. This model predicts that when the motive of success dominates the motive of failure, subjects choose tasks of an average level of difficulty, but this (and some other consequences of the model) is not confirmed by empirical data. Unlike most works that introducing additional variables into the classical Atkinson model to account for these, this paper proposes a different solution, based on the development of a model of readiness for a bipolar choice by Lefebvre. Lefebvre's original model contains the perceived "pressure of the environment" (*a1*) which impels the choice of a positive pole; the image of the pressure of the environment (*a2*); subjective intentions (*a3*); and the objective readiness to make a choice (*A*). The variables are interconnected by an operator of material implication, $A = ((a_3 \rightarrow a_2) \rightarrow a_1$ and its continuous counterparts. Just like the classical risk-taking model by Atkinson, the model of readiness for a bipolar choice (defined here as the "reflexive model of risk-taking") includes the three variables of the subjective probability of success, the motive of success, and the motive of avoiding failure. As a combination they are considered as a predictor of preferences for tasks of various difficulty levels. It is possible to adjust Atkinson's model to account for experimental data without increasing the number of variables.

JEL Classification: Z

Keywords: achievement motivation, model of risk-taking, model of reflexive choice, intentional choice, congruence, choice strategies

[1] *HSE University, petrowskiy@mail.ru*

1. Introduction

Atkinson's classic risk-taking model (Atkinson, 1957; Atkinson, 1964; Atkinson & Cartwright, 1964) predicts the levels of difficulty of tasks chosen by an individual in experimental research on the levels of aspirations (according to Hoppe, 1930). According to Atkinson, subjects whose motive for achieving success dominates the motive for avoiding failure should prefer tasks of average levels of difficulty as their first choice; otherwise, that is, with the predominant motive for avoiding failure, they choose either very easy or very difficult tasks. The real stumbling block is that subjects who are motivated more by success rather than by failure preferred not an average task difficulty level of 0.5, (as predicted by Atkinson's model), but tasks of increased levels of difficulty whose probability of being solved was in the range between 0.3 and 0.4 (correspondingly, the difficulty of the chosen tasks is in the range between 0.6 and 0.7).

The purpose of this paper is to propose a non-conventional way of interpreting the available data (based on the model of readiness for bipolar choice by Lefebvre (Lefebvre, 1992; Lefebvre, 1996)) which corrects certain predictions arising from the classical model by Atkinson, but without expanding the number of the variables involved. Taking into account the terminology of Lefebvre's reflexive theory, we henceforth call our proposed model the *reflexive model of risk-taking*.

Method: interpretating Lefebvre's model of bipolar choice in terms of achievement motivation, we reinterpret the empirical data in the literature describing the behavior of subjects in a situation of achievement.

2. The model of risk-taking by Atkinson

We proceed from the "need for achievement" construct (McClelland, 1987). In general, we understand need as a desire to achieve one or another final state, and the need for achievement is seen as a desire to act focusing on a generally recognized standard We speak of the motive of success as the dispositional drive of an individual to surpass the standard, and the motive of the avoidance of failure is considered to be the individual's drive to reach the standard without falling below it. Accordingly, we distinguish between the tendency to succeed and the tendency to avoid failure (in the latter case, we sometimes use the term "the avoidance tendency"). Both tendencies are patterns of activity generated on the basis of motives for success or of the avoidance of failure and depend on the probabilities of success or failure in achieving a goal. We understand achievement motivation as a combination of the two tendencies, that is, a combination of the tendencies towards success and away from failure.

The tendencies have differences, but their commonality remains possible. In Atkinson's risk-taking model, they have a universal structure:

$$Te = Me \times Ae \times We;$$
$$Tm = Mm \times Am \times Wm;$$

where *Te* and *Tm* are the tendencies to succeed and to avoid failure respectively; *Ae* and *Am* are the attractiveness of achieving success and avoiding failure; *We* and *Wm* are the subjective probabilities of success and failure. The commonality between the tendencies is also in the fact that an inverse linear relationship is postulated between the attractiveness of success/the avoidance of failure and the subjective probability of success:

$$Ae = 1 - We;\ Am = 1 - We, \qquad (1)$$

that is, the more accessible a chosen goal, the less attractive it is for individuals who strive for success, and the more attractive it is for those avoiding failure.

Atkinson assumes that $Wm = 1 - We$ (that is, the subjective probability of failure is complementary to the subjective probability of success), and finds this to result in an elegant model that includes only three variables: the strength of the motive of success, the strength of the motive to avoid failure, and the subjective success rate:

$$Tr = (Me - Mm) \times (We - We^2).$$

The *achievement motivation* (*Tr*) always has positive values for $Me \geq Mm$ and reaches a maximum at $We = Wm = 0.5$ (that is, precisely at the average level of difficulty of a chosen task). The situation when $Me = Mm$, as follows from the model, should deprive the subjects of the incentive to search for a solution ($Tr = 0$), and if $Me < Mm$, the individual is supposed to avoid solving any task (which may be prevented by the presence of an extensive motivation, for example, a desire to make a favorable impression on the experimenter).

Various researchers have proposed corrections in order to explain the facts of the deviation of the choices from the calculated average value of the preferred difficulty of a task. Heckhausen notes that attempts have been made either to fit the model of risk choice to a symmetric function of preference or to axiomatically introduce it (Hamilton, 1974; Heckhausen, 1968; Nygard, 1975; Wendt, 1967). For example, "researchers have introduced a 'personal standard' as a specific dimension of personality" (Kuhl, 1978b) and, according to Heckhausen (2018), presupposed the existence of an experience-driven tendency of inertia (Atkinson & Cartwright, 1964) or future-oriented tendencies (Raynor, 1969). The predictive power of Atkinson's model was sometimes extended to choices motivated by the avoidance of failure: both the choice of tasks of the minimum levels of difficulty and the choice of extremely difficult tasks were predicted; however, in this case, the test results were ambiguous (McClellad, 1987; Heckhausen, 2003). Thus, Atkinson's harmonious model was not clearly confirmed by empirical results.

As part of the discussion of the implications of Atkinson's model in the context of the opportunities potentially provided by Lefebvre's model, we note that our proposed reflexive model of risk-taking includes the same variables as Atkinson's model of risk-taking. However, the variables in the reflexive model of risk-taking are presented in a significantly different form as compared to Atkinson's model; achievement motivation is not considered as the total of the opposite tendencies but is their combination based on the competition (prevalence) or alternation of these tendencies depending on the type of the situational progress towards success. It is assumed that the reflexive model of risk-taking, in contrast to Atkinson's model, does not require an expansion of the number of variables in order to be consistent with the empirical data available in the literature.

3. Lefebvre's model of bipolar choice

The basic formula of Lefebvre's reflexive theory describes the readiness of a subject to make a choice between alternatives, one of which represents the positive pole, the other negative:

$$A = (a_3 \rightarrow a_2) \rightarrow a_1, \qquad (2)$$

Here *A* is the subject's readiness to choose the positive pole; the variable a_1 correlates with the "perceptual sphere of the subject" and describes the intensity of the pressure with which the world inclines the subject to choose the positive pole; accordingly, the value $1 - a_1$ is the pressure perceived by the subject towards the negative pole; a_2 reflects the subject's idea of the pressure of the world towards the positive pole (the higher the value of a_2, the stronger the subjective pressure the world puts on them, inclining them to choose the positive pole); respectively, the value $1 - a_2$ is the subjective pressure of the world towards the negative pole; finally, a_3 is intention. In the base model, the variable a_i takes a value of 0 or 1.

The meaning of the "→" operator in Lefebvre's reflexive theory is significantly different than in mathematical logic: there is no connection between the material implication and the logical connective "*if ... then*" in the conditional sentence of natural language (and it is important to emphasize this in order to avoid confusion). According to Lefebvre, this is a "relation of dominance" (we shall note that other ways of understanding the implication have been proposed, for example, "a relation of mediation", "relations of feasibility", etc., see Petrovsky, 2008). But the table of values of implication as a function of two variables *a* and *b* is formally the same as in the logic that connects the values of true (1) and false (0) with the following relations:

$$0 \to 0 = 1$$
$$0 \to 1 = 1$$
$$1 \to 0 = 0$$
$$1 \to 1 = 1$$

A generalization of the material implication can be its continuous analogue: from the expression $a \to b$ we proceed to the expression $1 - x + xy$ (here, instead of the clear values of *a* and *b*, numbers are used on the segment [0, 1]); variables A, a_1, a_2, a_3 in expression (2) are replaced by variables X, x_1, x_2, x_3, and it corresponds to the formula

$$X = x_1 + (1 - x_1)(1 - x_2)\, x_3, \qquad (3)$$

where $X, x_1, x_2, x_3 \in [0, 1]$.

Formula (3) can be represented as implicative by analogy with (2), while maintaining the logical (and visual) structure of the relationship between the variables:

$$X = (x_3 \to x_2) \to x_1. \qquad (4)$$

When switching to a continuous model, it seems appropriate to use the terms *continuum implication* (Volgin, 1996) or *meta-implication* (Petrovsky, 2002; Petrovsky & Taran, 2002). The continuum implication deals with all values of variables in the segment [0, 1], while meta-implication refers only to rational values of variables (which somewhat narrows the range of its use). Meta-implication, defined based on the apparatus of algebraic lattices, is logically successive in relation to the material implication that deals with clear values of variables. The general term implication is used here for all its varieties, together with the traditional arrow → that symbolizes it.

After all necessary transformations, we obtain:

$$X = x_1 + (1 - x_1)(1 - x_2)\, x_3 = 1 - 2x + 3x^2 - x^3. \qquad (5)$$

The main role in Lefebvre's theory is given to the construct "intentional choice", which means the equality between the subjective intention (a_3) and the readiness to choose X ($x_3 = X$). The essence of this equality is that the agent's subjective intentions are transformed into a readiness to choose that is appropriate for them:

$$X = (x_3 \to x_2) \to x_1 = x_3. \qquad (6)$$

The term "intentional choice" in the psychology of motivation can be understood as "internal agreement", "justification" or "congruence". Further we give preference to the term "congruence" which implies the possibility of a quantitative assessment of the measure of intentionality. An example of such an assessment is the calculation of the congruence of a subject's desire to solve the task x_3 and their motivational readiness to choose this task:

$$Q = 1 - |x_3 - X| = 1 - |\Delta|,$$

where Q is the congruence of readiness to choose, $\Delta = x_3 - X$ (the closer to zero the difference between the desire x_3 and the readiness to choose this task, X, the closer Q is to 1).

4. The situation of achievement in terms of the reflexive model

The situation of achievement when interpreted based on the model of reflexive choice is as follows:
– "success", the goal of achievement, is interpreted as an approach to the positive pole; "failure" is considered as an approach to the negative pole. The polar manifestations of success and failure correspond to the subject's maximum/minimum satisfaction in trying to solve the task;
– the real attainability of the task is the objective probability of its solution. In Lefebvre's model, this is the variable x_1, the pressure of the environment; it is interpreted in the opposite way, depending on whether the subject is trying to avoid failure or is striving for success. In the first case it is interpreted as pressure towards the positive pole and towards the negative pole in the second;
– the attainability of the task in the subject's eyes, that is, the subjective probability of its solution. In the reflexive model of risk-taking, this is the variable x_2, that is, the image of the pressure of the environment that makes the subject choose the positive/negative pole (similarly to x_1);
– the attractiveness of the task, which is the desire to solve it. In Lefebvre's model, attractiveness corresponds to the variable x_3, the subjective intention. Presumably, this is the probability of the actualization of internal resources that make the subject choose, when "I can solve it" is experienced by them as "I want to solve it" (Petrovsky, 2008);
– motivational readiness to choose a task. In Lefebvre's model, it corresponds to X, denoting the subject's objective (actual) readiness to make a choice. We consider X as a unity of "I want to" and "I can" and a manifestation of choice motivation. This is only a part of achievement motivation. A more complete description requires going beyond the three-stage implication that describes the subject's readiness to choose; to do so, it is necessary to add to the three steps of the implicative construction a fourth step that describes the subjective feasibility of a choice, and thus determine its expected effectiveness:

$$X_+ = ((x_3 \rightarrow x_2) \rightarrow x_1) \rightarrow x^{\wedge}, \qquad (7)$$

where X_+ is the expected effectiveness of the choice (expected achievement, success); $x^{\wedge}$ is the subjective probability of success at a given level of motivational readiness of the subject to choose X;
– adaptability/non-adaptability is the criterion of congruence. Achievement motivation, although not usually described in these terms, is replete with examples of irrational adaptability and the paradoxical non-adaptability of people's behavior in various circumstances (Petrovsky, 1992). The concepts of Lefebvre's "intentional choice" and, accordingly, "congruence" enable an assessment of the degree of the adaptability or non-adaptability of the subject in achieving, starting with the acceptance of a task.

The general hypothesis is that subjects in a situation of achievement adhere to the strategy of the adaptability of choice, namely, maximizing the congruence between the attractiveness of the chosen tasks (subjective "I want to") and indicators of a real progress towards a solution (that is, the set to solve and forecasts regarding the solvability of a task, "I will solve it").

Next, we shall consider two hypothetical variants of the strategy of adaptability: authenticity ("I want to, and I am ready") and pragmatism ("I want to, and I have").

However, does this hypothesis correspond to reality, bearing in mind the behavior of people in the experimental conditions of studies of achievement motivation? The answer to this question is important for a comparative assessment of Atkinson's risk-taking model and the reflexive model of risk-taking when explaining and predicting the activity of subjects in situations that encourage achievement.

5. Strategies of adaptability: authenticity of choice

The first of these goal-setting strategies is to ensure the authenticity of choice. Here, and in all cases below, we are faced with the important question of the relationship between the subjective and objective probability of solving a task. This question has been discussed in many ways in the books of Heckhausen (Heckhausen, 1980; 2018). We proceed from the following generalization: "it is reasonable to conclude that the more objective and subjective the probabilities of success and the more consistent with each other, the sooner the subject, after the initial period of learning, reaches the upper plateau of achievement and considers it as such" (Heckhausen, 1980, p. 10).

We assume that some subjects already have experience of success and failure in solving tasks which gives them adequate knowledge of the difficulty of a task, and, thus, at the moment of choice, the equality is correct:

$$x_2 = x_1, \qquad (8)$$

that is, the subjective and objective probabilities are equal. We regard choices based on real knowledge of probabilities as conscious ones. In what follows, we deal only with such choices.

We make one more assumption. We believe that in experiments that encourage a choice of tasks of varying difficulty, the field of possibilities is limited from below. We assume that "ultra-easy tasks" are too simple to be considered by the subjects as "tasks" to be solved (as there is nothing to solve). This requires an element of some the unattainability of the tasks to be solved; the attainability of these tasks must be strictly less than one:

$$x_2 < 1. \qquad (9)$$

5.1. Subjects motivated by success. Such individuals are characterized by an inverse linear relationship between the attractiveness of a task x_3 and its attainability x_2:

$$x_2 = 1 - x_3.$$

As noted, here and below, the subjective probability is equal to the objective one, $x_2 = x_1$, we can assume (by replacing x_3 with x) that $x_2 = x_1 = 1 - x$. In view of this, we have:

$$X = (x \to (1 - x)) \to (1 - x) = 1 - x + x^2, \qquad (10)$$

where $x = 1 - x_3$. The formula (10) then takes the form:

$$X = ((x \to (1 - x) \to (1 - x). \qquad (11)$$

We now consider the authentic strategy of choosing tasks. By substituting the admissible numerical values of variables in the segment [0, 1] into formula (3), we summarize the results of the comparison of variables in Table 1, the first row is highlighted showing how attractiveness ($x = 1$) turns into readiness to choose ($X = 1$); in the last line, the pattern is opposite: the readiness to choose is drastically different from the attractiveness of the task embodied in its choice ($x = 0$); in the ninth line, as well as in the first line, there is an approximate correspondence between the variables, "attractiveness" and "readiness" ($x = X = 0.618$).

	1	**2**	**3**	**4**
	Attractiveness (“I want”, “I wish”)	Attainability of the task (the subjective probability of a solution)	Motivational readiness to solve	Authenticity of choice
	x *(=* x_3*)*	*1* **-** ***x***	***X*** = *(**x**→(1-**x**))→1-**x**)* = 1 – ***x*** + $\boldsymbol{x}^2$	*Q* = **1 -** |Δ|
1	**1.00**	**0.0**	**1.000**	**1.000**
2	0.95	0.05	0.907	0.957
3	0.90	0.10	0.829	0.929
4	0.85	0.15	0.764	0.914
5	0.80	0.20	0.712	0.912
6	0.75	0.25	0.672	0.922
7	0.70	0.30	0.643	0.943
8	0.65	0.35	0.625	0.975
9	**0.618**	**0.382**	**0.618**	**1.000**
10	0.60	0.40	0.616	0.984
11	0.55	0.45	0.616	0.934
12	0.50	0.50	0.625	0.875
13	0.45	0.55	0.641	0.809
14	0.40	0.60	0.664	0.736
15	0.35	0.65	0.693	0.657
16	0.30	0.70	0.727	0.573
17	0.25	0.75	0.766	0.484
18	0.20	0.80	0.808	0.392
19	0.15	0.85	0.853	0.297
20	0.10	0.90	0.901	0.199
21	0.05	0.95	0.950	0.100
22	0. 00	1.00	1.000	0.000

Table 1. The first column: the attractiveness of the tasks for the subjects motivated to succeed (“I want to”); the second column: the subjective probability of solving the task (attainability); the third column: motivational readiness to make a choice as a function of the attractiveness and of the level of attainability of the task; the fourth column: the authenticity of the choice, that is, the congruence of the desire to solve a task and the set towards solving it (the actual inclination to solving it).

In the pecified cases there is a match/mismatch between *x* and *X*, but the description partially applies to their adjacent lines, for example lines 2 and 3, (the accuracy of the match depends on the chosen measurement accuracy and the accepted deviation tolerances). Keeping in mind line 1 and lines 2 and 3, we discuss the choice of difficult tasks, and those of the tasks which have the probability of successful completion, *x*, marked in lines 21 and 22, which are considered super-easy.

A graph of the functional relationship between motivation for success and the attainability of chosen tasks is shown in Figure 1.

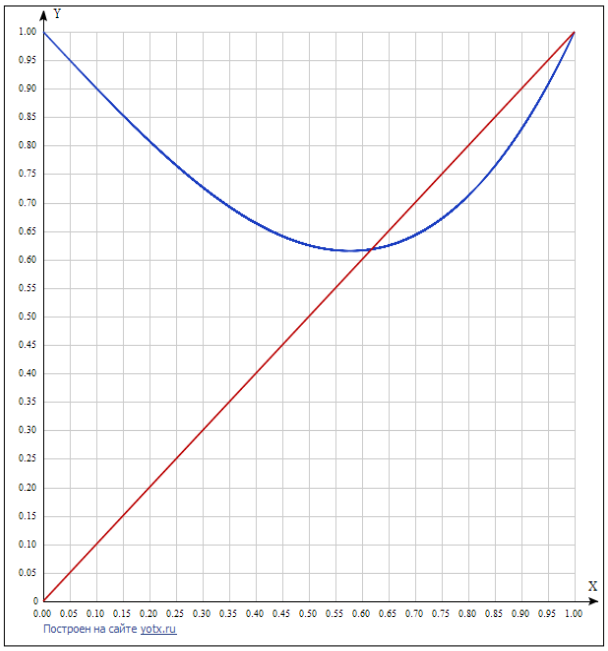

Fig. 1a. Motivation of SUCCESS: striving for success (motivational readiness to solve a task) depending on the measure of its attractiveness x: $X_E = 1\text{-}x + x^3$. The abscissa axis is for the attractiveness of the task. The ordinate axis is for the motivational readiness to solve a task of a certain level of difficulty.

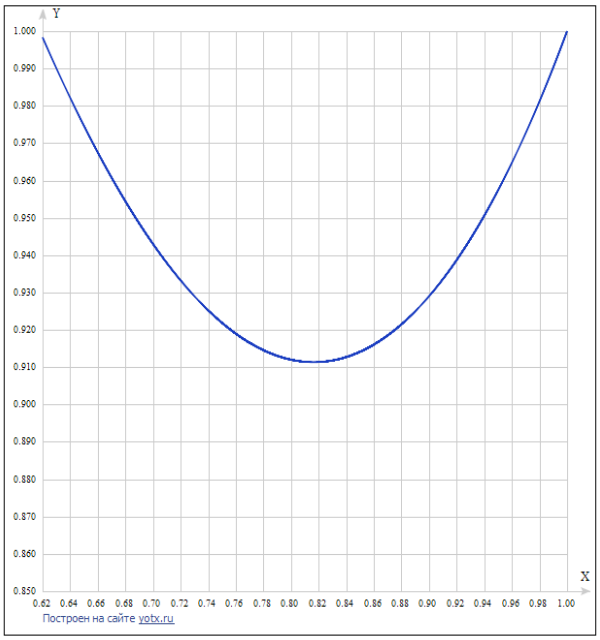

Fig. 1b. Authenticity of the motivational readiness to solve a task (or to refuse solving it) under the prevailing motivation of SUCCESS: $Q_E = 1\text{-}|2x\text{-}x^3\text{-}1|$. The abscissa axis is for the attractiveness of the task. The ordinate axis is for the authenticity of the choice of a task of a certain level of difficulty.

Referring to Table 1 and Figures 1, we find two solutions to the equation

$$X_E = ((x \to (1 - x)) \to (1 - x) = x \qquad (12)$$

Solution 1: $x^{(1)} = 0.62$; respectively, $x_2{}^{(1)} = x_1{}^{(1)} = 0.38$; the numbers 0.62 and 0.38 (= 0. 62^2) form the golden ratio: 0.62 + 0. 62^2 = 1. We have:

$$((0.62 \to 0.38) \to 0.38 = 0.62$$

Here we have rational choices; we use the term “rationalist” for those who prefer such choices. The term “rationalist” in psychology is used as a characteristic of individuals who “reflect on their decisions, are able to keep their affairs in order, and demonstrate perseverance relevant to these properties, as well as a focus on higher standards of achievement” (Kornilova, 2003, p. 239).

As we can see, the attainability of the tasks chosen in this case lies on the interval between 0.3 and 0.4, which corresponds to the empirical data but does not coincide with the predictions arising from Atkinson’s model (p = 0.5).

Solution 2: $x_E{}^{(2)} = 1$. In this case

$$X_E{}^{(2)} = (1 \to 0) \to 0 = 1.$$

This is the choice of “the romantic hero” in the reflexive theory of Lefebvre. The romantic hero is prepared to act in defiance of evil and overcome its pressure. In this case, “evil” is the real

challenge of solving a task, which is acknowledged by the hero and experienced by them as a challenge.

Such choices are rare in experimental studies (). We consider the possible reasons for this by analyzing the strategy of pragmatically oriented choices.

The choices made by rationalists and romantic heroes are not in keeping with the classical model of risk-taking, which prompted many researchers to introduce additional variables. Our interpretation includes the same variables as in Atkinson's model, and yet it does not require an expansion of their number in order match the empirical findings.

5.2. Subjects motivated by failure. We noted earlier that these subjects have a direct linear relationship between the attractiveness of tasks and the subjective probability of solving them. In the accepted nomenclature,

$$x\ (=x_3) = x_2.$$

Based on the condition of congruence,

$$X_M = (x \to x) \to x = 2x - 2x^2 + x^3 = x. \qquad (13)$$

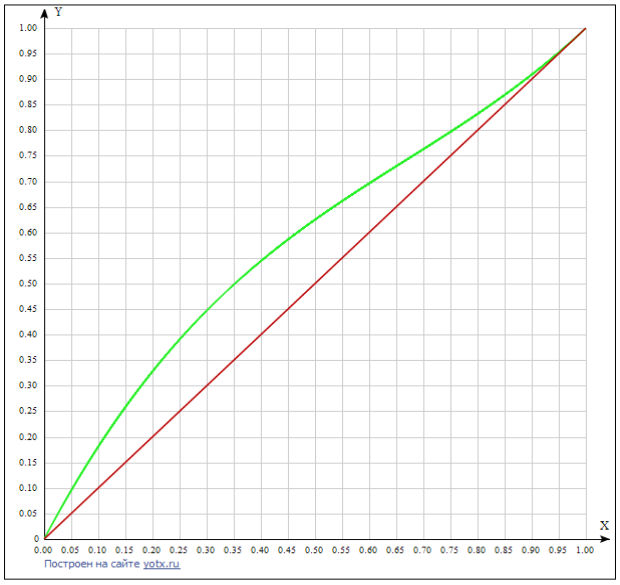

Fig. 2a. Motivation for FAILURE (readiness to solve a task or refuse to solve a task depending on the attractiveness of the task): $X_M = 2x - 2x^2 + x^3$
The abscissa axis is for the attractiveness of the task. The ordinate axis is for the motivational readiness to solve a task.

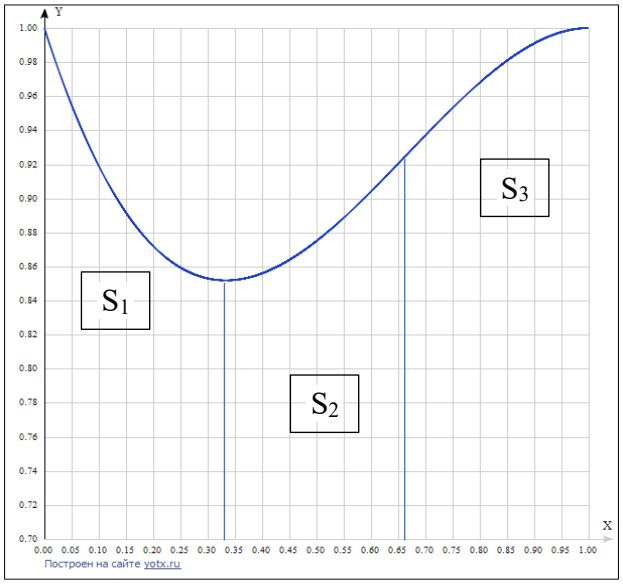

Fig. 2b. Authenticity of the motivational readiness to solve a task with the predominant motivation of FAILURE: $Q_M = 1 - |\, x\,(x^2 - 1)\,|$. The abscissa axis is for the attractiveness of the task. The ordinate axis is for the authenticity of the choice of a task.

We obtain two options for solving equation (13). In Figure 2a, these solutions are present at the intersection points of the graphs of two functions, $X_M(x)$ and $x(x) = x$.

Solution 1: $x = 1$. The authentic choice of a task in this case is described by:

$$X_M^{(1)} = (1 \to 1) \to 1 = 1$$

There is no task here as such (see (9)). The subject imitates their readiness to solve the task. They opt for an opportunity to do "at least something". We will use the term "imitator" in this case.

Solution 2: $x = 0$. The authentic choice corresponds to:

$$X_M^{(2)} = (0 \rightarrow 0) \rightarrow 0 = 0.$$

Here the task is rejected as too difficult. The subject is focused on their being not ready to deal with this task and they refuse to choose to solve any other tasks. We will call such subjects "inactive" (the term was proposed by Borodenko (personal communication)).

In theoretical terms, both solutions could be considered as confirming Atkinson's model and ours, no less, if they were systematically noted in practical experimentation; however, such facts are rare (Heckhausen, 1980; 2018). In contrast, we find in Heckhausen's monograph a general statement that, according to experimental data, subjects who avoid failure prefer to choose relatively easy tasks ($p > 0.5$).

Does the proposed reflexive model of risk-taking agree with these data?

Figure 2b (authenticity of the motivational readiness to solve the task as related to its subjective attractiveness) gives a clear answer to this question confirmed by integrating the function $Qm\ (x) = 1 - |\ x\ (x^2 - 1)\ |$. Calculations show that the minimum frequency of cases of congruence (the area under curve S_2) falls on the average interval of task attainability (that is, subjects less often choose tasks of average attainability); subjects more often choose tasks of low attainability ($p << 0.5$), which corresponds to the area under curve S_2; the maximum frequency of such choices refers to tasks of high attainability ($p \geq 0.666 >> 0.5$) (the area under S_3), which confirms Heckhausen's cumulative conclusion regarding the preferences of subjects wishing to avoid failure.

Cases when subjects avoid solving tasks are very rare in artificial experimental conditions, but often occur in clinical practice: these are the phenomena of "doing nothing" (Schiff A. & Schiff J., 1971), "symbiosis" (Mellor & Schiff, 1975), and "supra-situational passivity" (Vasilyuk (1986), who proposed a witty shift of our term, "supra-situational activity" (Petrovsky, 1976)).

We conclude that the reflexive model of risk-taking pertaining to subjects who avoid failure does not confirm Atkinson's classical model of risk-taking but corresponds to the results of existing observations.

5.3. Subjects equally motivated by success and failure. How to reconcile the two tendencies?

In Atkinson's original model, all tasks with balanced motives for success and failure are equally indifferent: the resulting tendency to solve any of them is zero. But does this match reality? It is noted that "the assumption of a purely negative (more precisely, "subtractive") role of avoiding failure in the composition of the resulting tendency has not yet been directly confirmed. On the contrary, it is quite likely, as evidenced by the results of some studies of the level of aspirations (Heckhausen, 1963), that the tendency to avoid failure has a positive effect on behavior" (Heckhausen, 1986, p. 7).

Under these circumstances, the level of attainability of a chosen task simultaneously corresponds to the motivation for success ($x_2 = 1 - x$) and the motivation for failure ($x_2 = x$), which implies $x_{2(s)} = ½$. But what is the attractiveness of a task that has an average difficulty level of ½? One of the seemingly obvious answers is to assume that the choice of such a task is due to averaging the tendencies to succeed and to avoid failure, i.e. $\mathcal{X}_S = (X_E + X_M)/2$.

The figure 3 shows an attempt of such a solution, but it is inconsistent, since the attractiveness of tasks that form an adequate level of readiness for choice ($x_S = X_S = 0.7$) contradicts the rule of congruence:

$$\mathcal{X}_S = (0.7 \rightarrow 0.5) \rightarrow 0.5 \neq 0.7.$$

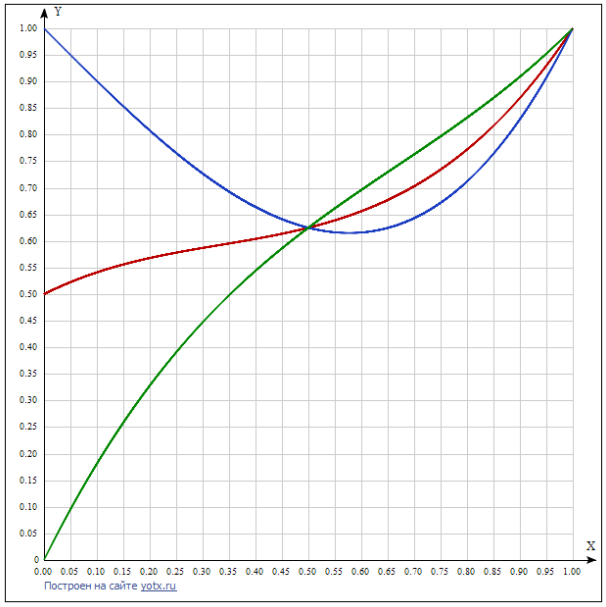

Fig. 3. Motivational readiness to solve a task under the combined effect of the equally strong motives of success and of avoidance of failure.
$\mathcal{X}_S = (X_E + X_M)/2 = (1 + x\text{-}2x^2 + 2x^3)/2$.
An experience of a trial attempt to reconcile X_E and X_M. The abscissa axis is the average power of the effect of two motivations. The ordinate axis is for the motivational readiness to solve the task. A compromise is impossible.

Another solution takes into account the rule of congruence and indicates the point of attractiveness corresponding to the average level of the task attractiveness: $x_S = X_S = 0.666$,
$Xs = (0.666 \rightarrow 0.5) \rightarrow 0.5 = 0.666$ (the prudent choice).

Another version of a possible combination of the equally powerful tendencies to succeed and to fail implies switching the operating modes so that either the motive of success or the motive of failure alternately come to the fore. The change of the motives in this case is similar to the "struggle of fields of vision" or the alternation of the "figure/background" in perception.

For all its hypothetical nature, this version, if confirmed, could explain the phenomenon of paradoxical choices in the dynamics of the level of aspirations, when, after success in solving a more difficult task, the subject chooses a task with a lower level of difficulty (as if to secure success), and after a failure the subject chooses a more difficult ask (as overcompensation of the failure).

6. Strategies of adaptability: the pragmatism of choice

It was noted earlier that the congruence between the attractiveness of a task and the motivational readiness for action may constitute a necessary, but insufficient, condition for the optimal choice. The desired completeness involves the introduction of another criterion of congruence—a correspondence between the attractiveness of a task and the expected outcome of solving it.

When starting to solve a task, the subject predicts the possible effect of the solution, while reflecting on the probable consequences of implementing their readiness for action. We shall assume that, looking ahead, the subject deals with the subjective probability of solving $x_{\wedge}$ which corresponds to the initial x_2 and x_1. Thus, we accept that the expected effect of the fulfilled solution

$$X_+ = ((x_3 \rightarrow x_2) \rightarrow x_2) \rightarrow x_2.$$

Accordingly, the second criterion of the adaptability of the choice of a task can be defined as the correspondence between the attractiveness of the chosen task, x_3, and the expected effect of its solution, the pragmatism of a choice, Ξ.

$$\Xi = 1 - |x_3 - X_+|$$

This can be paraphrases as “I may or may not achieve what I want, but the closer what I strive for is to what I actually expect, the more pragmatism is expressed”.

The optimal goal-setting strategy is determined by a combination of two conditions: the desire to solve a task matching the motivational readiness to solve it (authenticity), and the motivational readiness (desire) matching the expected result of solving (pragmatism). It remains to check in which case the motivational readiness is adequate for the desire to choose a task and the expected efficiency of the solution corresponds to the motivational readiness.

Previously, five cases of choosing tasks that meet the first criterion, $Q = 1$ (choice authenticity), were described:

For the motive of success ($Me > Mm$):

$X' = (1 \rightarrow 0) \rightarrow 0 = 1$ (“the choice of the romantic hero”)
$X'' = (0.618 \rightarrow 0.382) \rightarrow 0.382 = 0.618$ (“the choice of the rationalist”).

For the motive of avoiding failure ($Me < Mm$):

$X' = (1 \rightarrow 1) \rightarrow 1 = 1$ (“the choice of the imitator”)
$X'' = (0 \rightarrow 0) \rightarrow 0 = 0$ (“the choice of the inactive subject”).

For a combination of the equally powerful motives of success and of avoiding failure ($Me = Mm$):

$Xs = (0.666 \rightarrow 0.5) \rightarrow 0.5 = 0.666$ (“the prudent choice”)

Of the five options, it remains to determine the cases which also comply with second criterion of optimality, $\Xi = 1$ (congruence of the expected effect, a pragmatic choice).

By extending the condition of adaptability to *W*, we find three choice options that meet the criteria of congruence-authenticity and pragmatism of choice:

$We^{\wedge} = (0.618 \rightarrow 0.382) \rightarrow 0.382 \rightarrow 0.618 = 0.618$
$Wm^{\wedge =} ((1 \rightarrow 1) \rightarrow 1) \rightarrow 1 = 1$
$Ws = (0.666 \rightarrow 0.5) \rightarrow 0.5) \rightarrow 0.5 = 0.666.$

These choices set the most likely guidance for preferences in situations where the tendency to achieve is on a par with the tendency to avoid failure: $Me \geq Mm$. Thus, the reflexive model of risk-taking predicts and explains the empirical results of studies that diverge from those predicted by Atkinson’s model of risk-taking: subjects motivated primarily by success choose tasks of increased difficulty ($0.3 < x_2 = 0.382 < 0.4$); subjects avoiding failure or/and equally motivated by success choose tasks of average attainability ($x_2 > 0.5$). Based on assumption (9), we believe that the choice of the position $((1 \rightarrow 1) \rightarrow 1) \rightarrow 1 = 1$ is the least likely, as in this case the chosen “task” does not require a solution and, therefore, is not a task.

7. Adaptation to the environment and adaptation to oneself

The reflexive model of risk-taking provides us with one more option, and we suggest it for possible future research. We adhere to the already accepted concept of the commonality of the relationship between the attractiveness of tasks and their attainability in relation to both tendencies, *Te* and *Tm*, that is, in both cases, as we take $x_3 = 1 - x_2$ (the less attainable the solution of a task, the more attractive the task). Earlier this condition only referred to the motive of success, and the tendency to avoid failure was determined by the equality $x_3 = x_2$ (the more attainable, the more attractive).

We assume, as before, that subjects motivated for success strive to achieve the equality $X = x_3$ (the setting to "solve" implements the subjective "I want to"); the choice, in terms of Lefebvre, is intentional. But in the new version, the choices made by subjects who avoid failure are focused on the attainability of a solution; that is, the motivational readiness to choose a task under perfect circumstances is equal to attainability, $X = x_2$ (which may be practically impossible). Such choices are not intentional; they are cautious choices. The subject's tendency to adapt to the environment is manifested in cautious choices, while intentional choices reveal the tendency to adapt to oneself (one's own desires).

Adaptation to the environment under experimental conditions pushes subjects to choose tasks with a probability of solving which is significantly higher than the average, $p >> 0.5$, while individuals adapting to themselves set themselves either super-difficult tasks (which apparently more often occurs in life than in experiment), or tasks whose attractiveness (and the aspiration to solve them) correspond to the golden section: $x_3 = 0.62$, $x_2 = 0.38$.

As a special case of implementing the cautious strategy, we note paradoxical choices that are rarely encountered in experiments. Some of the subjects following this strategy are ready to choose the most unattractive, but super attainable "tasks" because they are "doomed to succeed" in completing these tasks: $(0 \rightarrow 1) \rightarrow 1 = 1$.

Without dwelling further on the discussion of the new model, we do not conceal from the reader a certain limitation that this model introduces into the interpretation of choice motivation. In contrast to the previously accepted form of the reflexive model, with the balance and the combined effect of the tendencies *Te* and *Tm* considered acceptable, such a relation is impossible in this case. The subject has to choose between a proclivity toward attractiveness and a proclivity toward attainability, between the "adaptation to oneself" and the "adaptation to the environment". Such a dichotomy, while limiting the possibility of a "compromise" between the subject's alternative proclivities at the time of choice, nevertheless intuitively seems appropriate. We also do not rule out the possibility of an alternation of two hypothetical adaptations in the process of choosing tasks to be achieved by subjects.

The new version suggests that the model of reflexive choice permits the interpretation of experimental data with no less accuracy than the previously described model and enables reconceptualizing the processes of personality adaptation to enrich their spectrum.

8. Active non-adaptivity

We return to choosing super-difficult tasks:

$$(1 \rightarrow 0) \rightarrow 0 = 1.$$

This choice satisfies authenticity as a criterion of adaptability, but not the pragmatism of choice:

$$((1 \rightarrow 0) \rightarrow 0) \rightarrow 0 = 0 \ (\neq 1).$$

Such choices are pragmatically non-adaptive and fraught with frustration. This seems to us to be the reason why Lefebvre's "choice of a hero" is the precise term for describing the situation. However, in order to agree with this, it is essential to take one step further than the two-step implication and rely on its third step which the subject never knows beforehand, while the hero is given the opportunity to be reasonable. This reveals a class of phenomena of *active non-adaptivity* "beyond the horizon" of the subject's readiness to make a choice, characterized by the choice results predicted by the subject (Petrovsky, 1976; 1992; 2010).

One of these phenomena was first experimentally explored by the author using the example of "disinterested risk" (Petrovsky, 1972). This is the tendency to prefer tasks that, when solved, bear no promise of a reward in the event of success, but imply a punishment in the case of a failure.

In these experimental conditions, the subjects observe the movement of an object entering a tunnel from the outside and they have to stop it in the hidden part of the movement; the site of the stopping is chosen by the subjects themselves, taking into account the risk of making a mistake near a small section of the tunnel (they are exposed to a stressful sound in their headphones). The subject is told that only the accuracy of their guess is being studied, regardless of where the object is stopped in the tunnel; the subject knows that "all targets are equal and equivalent", and the stressor only prevents distractions during the process (in fact, the participants in the experiment are never punished). We note that this situation would be easy to transform into a test of ordinary "pragmatic" risk, by simply scoring points or receiving money for precise reactions in the danger zone (the closer to the edge, the higher the reward) and penalizing the misses; however, in this case risk-taking is not in any way stimulated from the outside: neither by scores, money, praise nor the experimenter's encouraging gestures and facial expressions.

It turned out that from 20% to 30% of the participants make a risky choice at least once; the intensity of the stressor is increased (before the test, the participants are informed of a possible punishment for a mistake. The sound intensity varied among 90, 100, 110 and 120 dB in different groups of subjects, and an increase in the intensity did not cause a decrease in the number of subjects taking risks, but paradoxically increased the percentage of risk-takers (Petrovsky, 1977). It was shown on different material in the same study that the tendency to take "disinterested risk" is combined with the tendency to take "ordinary risk", and this comprises the necessary, although not sufficient, condition for taking risky decisions that have a pragmatic purpose. It can be assumed that the availability of such an appetite for risk, as an additional motivation for action, can explain the flutter phenomenon, a pilot's readiness to accept the challenge of a situation that requires that they are fearless, as when Chuck Yeager crossed the sound barrier accompanied by unprecedented turbulence during the flight (Shmelev, 2017; Petrovsky, Shmelev, 2019).

The phenomenology of active non-adaptive behavior has been analyzed using examples of transgression (Kozielecki, 1987), creative talent (Gryazeva & Petrovsky, 1996), the "trend towards rapprochement with difficulty" (Bityutskaya, 2018), etc. In all these cases the subjective attainability of success may be close to zero, but the implementation of such readiness enables success (Petrovsky, 2010; 2011).

The evolutionary prerequisites for active non-adaptive behavior have been thoroughly studied in works devoted to "pre-adaptation" (Asmolov et al., 2017).

Conclusion

We have proposed a motivational interpretation of Lefebvre's model of readiness for bipolar choice and analyzed the discrepancy between empirical data and behavioral parameters predicted by the classical risk-taking model of Atkinson. As shown by many years of research, the model of risk choice generally predicts the characteristics of subject behaviors in a situation of achievement, but it cannot explain certain deviations from the predictions. The question most frequently discussed in the literature is why subjects are motivated more by success than by avoidance jf failure, preferred in their experience-based choices not the average levels of task difficulty (the subjective probability of solving which $p = 0.5$, as predicted by Atkinson's model), but increased levels of difficulty, the probability of solving which is in the range between 0.3–0.4.

The reflexive model of risk-taking helps explain the shift towards more difficult tasks. Two theoretically possible solutions are discovered here, $p' = 0$ (the choice of "the romantic hero") or $p'' = 0.382$ (the choice of "the rationalist"). The first of the two options can be discarded as "failed" strength tests according to the criterion of expected efficiency (it occurs extremely rarely in experiments). The other option is typical for experimental situations in the study of the level of aspirations.

In contrast to the choices predicted by Atkinson's model of the easiest and most difficult tasks by subjects motivated by failure (which is rarely empirically confirmed), the reflexive model

of risk-taking their typical choices of easy tasks rather than difficult ones ($x_2 > 0.5$), which is confirmed by the results of numerous empirical studies.

The pattern of choice by subjects motivated equally by success and failure has been clarified. The reflexive model of risk-taking predicts that in this event subjects will prefer tasks of average difficulty ($x_2 = 0.5$) as they can sense their increased attractiveness ($x_3 = 0.666$).

The number of variables making it possible to interpret experimental data does not exceed the number of variables in the classical model ("motive of success", "motive of avoiding failure" and the "subjective probability of success"). In this respect, the reflexive model of risk-taking differs from other models where researchers have introduced additional variables that adjust the forecast.

As a development of this model, alternative options for adaptive goal setting are distinguished: "adaptation to the environment" (a cautious strategy, the subjects strive to avoid failure) and "adaptation to oneself" (a risky strategy, determined by the subject's desire to succeed).

Distinguishing two criteria for the congruence of choices, authenticity and pragmatism, we can single out a class of phenomena of non-adaptability, a typical example of which is the "hero's choice" (in Lefebvre's terms); such choices can be authentic, but pragmatically unjustified, including, in particular, the non-adaptive (disinterested) risk that does not fit into Atkinson's risk-taking model, but is interpreted and formalized within Lefebvre's model of reflexive choice.

The "risk-taking" in the title of this paper emphasizes the continuity of the reflexive model of risk-taking in relation to Atkinson's classical model, and the experience of interpreting the latter in Lefebvre's design is the first attempt to implement the concepts of the reflexive theory in the psychology of motivation.

The substantiation and development of the reflexive model of risk-taking implies the use of traditional research methods (Heckhausen, 1968; Schmalt, 1975), as well as methods that have appeared in recent years (Kornilova, 1994; Petrovsky, 2008; Leontiev et al., 2018; Gershkovich et al., 2019).

Acknowledgements

The author would like to express generous gratitude to W. Joseph MacInnes, PhD, FPsyS, Associate Professor, for his valuable comments and suggestions.

References

Asmolov, A. G., Shekhter, E. D., Chernorizov, A. M. (2017). Preadaptatsiya k neopredelennosti kak strategiya navigatsii razvivayushchikhsya sistem: marshruty evolyutsii [Preadaptation to uncertainty as a strategy for navigating in developing systems: evolutionary paths]//Voprosy psikhologii, 4, 3 – 27.

Bityutskaya, E. V., Korneev, A. A. (2020). Diagnostika faktorov kopinga: aprobatsiya oprosnika "Tipy oriyentatsiĭ v trudnykh situatsiyakh" [Diagnostics of coping prerequisites: approbation of the questionnaire "Types of Orientations in Difficult Situations"]//Psikhologicheskiĭ zhurnal, Vol. 41, # 1, p. 97 – 111.

Vasilyuk, F. E. (1984). Psychology of experience. M.: Publishing House of Moscow State University.

Volgin, L. I. (1996). AM-algebra i ee primeneniya. Avtomatika i vychislitel'naya tekhnika [AM-algebra and its applications. Automation and computer technology]. 1, 19 – 23.

Gershkovich, V. A., Moroshkina, N. V., Kulieva, A. K., Nasledov, A. D. (2019). Adaptaciya oprosnika E.T. Higginsa po diagnostike fokusa regulyacii na russkoyazychnoj vyborke [Adaptation of the E. T. Higgins questionnaire for the diagnosis of the focus of regulation on a Russian-speaking sample]//Psychology. Journal of the Higher School of Economics. Vol. 16. # 2. P. 318 – 340.

Gryazeva, V. G., Petrovsky, V. A. (1996). Odarennye deti i ekologiya tvorchestva [Gifted children i ekologiya tvorchestva]. Chelyabinsk: IPI RAO, CHGIIK].

Kozielecki J. (1987). Koncepcia transgresyjna czlowieka. Warsaw.
Kornilova, T. V. (1994). Diagnostika "lichnostnyh faktorov" prinyatiya reshenij [Diagnostics of “personal factors” in decision making]//Voprosy psihologii. # 6

Kornilova, T. V. (2003). Psihologiya riska i prnyatiya resheniya [Psychology of risk and decision making]. M.: Aspekt-Press.

Leontiev, D. A., Kifak, L. S., Mitina, O. V., Petrovsky, V. A., & Tikhobrazova, J. S. (2018). Sostoyatel'nost' kak psikhologicheskiy konstrukt: opyt psikhometricheskoy validizatsii [Subjectness as a psychological construct: an experience of psychometric validation]. Psychology. Journal of the Higher School of Economics, 14(3), 433 – 452.

Petrovsky, V. A. (1971). Eksperimental'noye issledovaniye riska kak tendentsii lichnosti [An experimental study of risk as a tendency of personality]//Proceedings of the 15th Congress of the All-Union Society of Psychologists. Tbilisi: Metsniereba. Pp. 429 – 30.

Petrovsky, V. (1976). Aktivnost' kak nadsituativnaya deyatel'nost' [Activity as a ‘supra-situational activity’]. Proceedings of scientific reports of Soviet psychologists to the XXI International Psychological Congress. M.

Petrovsky, V. A. (1992). Psihologiya neadaptivnoj aktivnosti [Psychology of non-adaptive activity]. M.: Gorbunok.

Petrovsky, V. A. (2002). Metaimplikativnaya model' ekzestentsial'nogo vybora [A metaimplicative model of existential choice]//Izvestiya Samarskogo nauchnogo tsentra Rossiĭskoĭ akademii nauk. Special Issue on Urgent problems of psychology. Samara region. Samara. 95 – 103.

Petrovsky, V. A. (2008). Sostoyatel'nost' i refleksiya. Model' chetyrekh resursov [Subjectness and reflection. A model of four resources]. Psychology. Journal of the Higher School of Economics, Vol. 5, # 1, pp. 77 – 100.

Petrovsky, V. A. (2010). Chelovek nad situatsiyey [The person over the situation]. Moscow, Smysl.

Petrovsky, V. A., Shmelev, I. M. (2019). Personology of difficult life situations: at the intersection of three cultures//Psychology. The Journal of the Higher School of Economics, vol. 16., # 3.

Shmelev, I. M. (2015). Emotsional'nyy ‘flatter’ i ovladevayushcheye povedeniye: mezhprostranstvennyy perekhod [The emotional ‘flutter’ and coping behavior: an interdimensional transition]. The World of Psychology. Scientific and Methodical Journal, 84, 4, 111 – 123.

Atkinson, J. (1957). Motivation determinants of risk-taking behavior. Psychological Review, 64(6), 359-372.

Atkinson, J. W. (1964). An introduction to Motivation. Princeton, N.J.

Atkinson, J. W., Cartwright, D. (1964). Some neglected variables in contemporary concepts of decision and performance. Psychological Reports, 14(2), 575 – 590.

Hamilton J.O. (1974). Motivation and risk-taking behavior, Journal of Personality and Social Psychology, 29.

Heckhausen, H. (1960). Die Probliematik des Projektionsbegrieffs und die Grundlagen und Grundannanhemen des Thematischen Auffassungstests. - Psychologische Beitrage, 5.

Heckhausen, H. (1968). Achievement motive research: towards a general theory of motivation. – In W. J. Arnold (ed.) Nebraska Sympozium on Motivation, 1968, Lincoln, Nebraska.

Heckhausen, H. (1980). Motivation and Handeln. 2. New York. [Heckhausen, H. (2003). Motivaciya i deyatel'nost' [Motivation and activity]. Vol. 2. St. Petersburg: M.: Meaning. (Masters of Psychology Series).

Heckhausen, H. (1986). Motivaciya i deyatel'nost' [Motivation and activity]. Moscow. Pedagogika. Vol. 2.

Hekkhauzen, H. (1986). Motivaciya i deyatel'nost'. [Motivation and activity]. Moscow. Pedagogika Vol. 2.

Hoppe, F (1930). Untersuchungen zur Handlungs- und Affertpsycologie. 1X. Erfolg und Mißerfolg. - Psychologische Forschung, 1930, 14.

Kuhl, J. (1978). Standard setting and risk preference: An elaboration of the theory of achievement motivation and an empirical test – Psychological Review, 85.

Lefebvre, V. A. (1992). A Psychological Theory of Bipolarity and Reflexivity. Lewinston: The Edwin Mellen Press.

Lefebvre, V. A. (1996). Kosmicheskiĭ sub"yekt [The cosmic subject]. M.: In-kvarto, 1996.

Lefebvre, V. A. (2004). Refleksiya [Reflection]. M.: Kogito Tsentr, 2003.

McClelland, D. C. (1987). Human Motivation. Cambridge. New York, New Rochelle, Melbourne, Sydney.

Mellor K., Schiff E. “Redefining”, Transactional Analysis Journal, 5:3, July 1975, p. 303.

Mellor, K., and Sigmund, E. (1975). ‘Discounting’, 1, 1, 1971. 71-8.

Nygard, R. (1975). A reconsideration of the achievement motive theory – European Journal of Social Psychology, 5.

Raynor, J. O. (1969). Future orientation and motivation of immediate activity: An elaboration of the theory of achievement motivation. – Psychological Review, 76.

Schiff A. and Schiff J. (1971). "Passivity", Transactional Analysis Journal, 1, January 1971, p. 71.

Schmalt, H. D. (1975). Selbständingkeitsierzichung und verschiedene Aspekte des Leistungsmotivs. – Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie. 7.

Wendt, H. W. (1967). Verhaltensmodelie des Nichtwissenschaftlers: Einige biographische und Antriebskorrelate der wahrgenommenen Beziehung zwischen Erfolgswahrsscheinlichkeiten und Zielanreiz – Psychologische Forschung, 30.

Acknowledgements

My gratitude to W. Joseph MacInnes, PhD, FPsyS, Associate Professor for his valuable comments and suggestions.

Any opinions or claims contained in this Working Paper do not necessarily reflect the views of HSE.