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Optimal solution of fractional differential equations in solving the relief of college students' mental obstacles

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Abstract

The thesis applies solutions to boundary value problems of a class of fractional differential equation coupled systems with a p-Laplacian operator. This article applies this part of the content to alleviate the psychological barriers of college students. This article transforms the tendency of individual consciousness in college students' psychological counselling into a problem of solving boundary value problems of fractional differential equations. Studies have shown that using fractional differential equations to analyse the causes of college students' psychological barriers has an essential role in eliminating college students' psychological barriers.

Keywords: Fractional differential equations, psychological obstacles, college students, optimal solutions, alternative terms; consciousness; transfer Intensity.

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1 Introduction

Psychological counselling is the process of changing the individual's conscious tendency, which is a generally accepted view in clinical and counselling psychology. Freud's psychoanalytic therapy, Rogers's person-centred therapy, Bandura's behavioural therapy identified by Observation and Learning, Ellis's rational emotion therapy, the reality therapy created by Glasser, and Pars's Gestalt Therapy, Yang Guangxue's narrative-hermeneutics theory, and empirical behaviour research are all based on theoretical assumptions about understanding human nature. Scholars' research theories are derived from the techniques and methods of consultants' philosophical attitudes. After they explored human psychology, they obtained a complete knowledge

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system [1]. This knowledge system develops their consultation and treatment techniques and applies them to practical consultation and treatment operations. Although various consultation theories and technologies have different understandings and operations of human nature, psychological consultation is still based on the interpersonal communication between the counsellor and the client. Of course, interpersonal communication is exceptional in the sense that it is different from ordinary communication.

From the consultant's perspective, the consultant uses his or her professional background, theory, and knowledge system to develop the ability to explore psychological activities. The consultant and the client jointly face the problems faced by the client's psychological world. It helps the person's personality to improve, grow, and mature. From the perspective of the client, what the client has experienced is a process of changing consciousness. In this change process, the parties have to go through the process of their thinking activities [2]. Thought is the result of thinking activity. Thoughts and thoughts hide behind the language. Language can be used as a tool to observe the mental or thought activities caused by the person's thinking activity.

This research follows the construction of consulting technology to process the consulting records from the clinic in a statistical sense. This article uses fractional differential equations to establish a model for alleviating the mental disorders of college students. At the same time, we use mathematical models to analyse the problem and make quantitative inferences about the possible flow of language terms in changing the consciousness of the parties in psychological counselling [3]. We examine the possible degree of change in the linguistic terms of the party's conscious tendency through analysis.

2 Model background analysis

2.1 Consultation theory hypothesis

2.1.1 Consultation background assumptions

(1) The language process is the material carrier of the thinking process, it expresses the tendency of consciousness. The consultant can convert the spoken language of the client into a written language. (2) The terms and concepts in the language expressions of the parties have the same relationship. (3) Consciousness orientation can be expressed in the form of definition. Defined in language expressions is a combination of terms that state the nature of a sentence and propositional expressions. (4) The consultant abandons the expression of specific incidents and emotional vents of the parties concerned. The consultant only pays attention to transforming the spoken language about the conscious tendency into a written language. (5) The consultant uses lexical questions to intervene in changing the parties' consciousness. (6) The counsellor regards the psychological process of the client as the objective object of the consultation process. The consultant can ignore factors such as the person's gender, age and region.

2.1.2 Consultation assumptions for participating problem factors

(1) The number of conversions is got when the person's spoken language is converted into written language. (2) The number of vocabulary items is the sum of the number of language expression vocabularies. This includes the number of subject terms, predicate terms and object terms. (3) The term being attacked means that the party accepts the question of the term from the consultant. A particular term is selected as the transfer point of the party's consciousness.

2.2 Mathematical model assumptions

2.2.1 Factors involved in model assumptions

(1) Consultation target standards: When the consultation contract is terminated, if the party's expression of consciousness tendencies and the expression of the consultation contract at the time of the establishment of the consultation contract change in content and cognitive perspective, it is deemed that the consultation goal has

been achieved.

(2) The function of consultation: After the vocabulary is attacked, the party is at the point of shifting consciousness [4]. The vocabulary has been attacked many times to strengthen the direction of the shift of consciousness.

(3) The work performance of the consultant: The consultant has been professionally trained and has the quality of consulting to preside over and complete the consulting activities.

(4) Considering the strength of the client's conscious tendency, the intensity of the client's consciousness transfer from receiving counselling is three times the intensity of the consciousness transfer from the self.

(5) The calculation of the model is based on the Means mean and standard deviation from the statistical processing data of clinical consultation records.

2.2.2 Symbol definition

V_i The number of alternatives for the i lexical item to be attacked. P_i is the intensity of the person's consciousness transfer after the i term is attacked. p_{ni} is the intensity of the person's consciousness transfer before the i term is attacked. V_x is the number of alternative terms obtained in a particular conversion [5]. The intensity of consciousness transfer before m . M is the intensity of consciousness transfer after the parties' consultation contract is terminated. F is the cumulative number of alternative terms brought about by the number of conversions that may occur in fact, if the party did not accept consultation, and F_n is the cumulative number of alternative terms for which the n term is attacked. L is the cumulative number of alternative terms resulting from the possible conversions. E is the degree of expected achievement of consulting goals. r is the degree of unrealisation of the expectation of the consulting target. P_s is the intensity of the transfer of consciousness received by the client from the consultation. P_x is the intensity of the person's self-consciousness transfer. W is the alternative flow of terms.

3 Model establishment

We use differential equations to establish mathematical models. Under the premise of achieving a certain consulting target expectation degree E , find out the possible word item-total alternative W value.

The $\alpha > 0$ order *Riemann – Liouville* fractional integral of a function $y : (0, \infty) \rightarrow$ is defined as

$$J_0^\alpha + y(t) = \frac{1}{\Gamma(\alpha)} \int_0^t (t-s)^{\alpha-1} y(s) ds \quad (1)$$

The right end of the equation is defined in $(0, \infty)$.

The $\alpha > 0$ order *Riemann – Liouville* fractional derivative of the continuous function $y : (0, \infty) \rightarrow$ is defined as

$$D_0^\alpha + y(t) = \frac{1}{\Gamma(n-\alpha)} \left(\frac{d}{dt}\right)^n \int_0^t \frac{y(s)}{(t-s)^{\alpha-n+1}} ds \quad (2)$$

Among them: $n = [a] + 1$, $[a]$ represents the integer part of the actual number α . The right end of the equation is defined in $(0, \infty)$. The *Green* function of the eigenvalue problem corresponding to the differential equation is given below [6]. Figure 1 shows the *Green* functional diagram of the differential equation.

Given $h \in C[0, 1]$ and $3 < a \leq 4$ then

$$\begin{aligned} D_{0+}^\alpha u(t) &= h(t), 0 < t < 1 \\ u(0) &= u(1) = u'(0) = u'(1) \end{aligned} \quad (3)$$

The only solution of the above formula is $u(t) = \int_0^1 G(t, s) h(s) ds$, where

$$G(t, s) = \begin{cases} \frac{(t-s)^{a-1} + (1-s)^{a-2} t^{a-2} [(s-t) + (a-2)(1-t)s]}{\Gamma(a)} & 0 \leq s \leq t \leq 1 \\ \frac{(1-s)^{a-2} t^{a-2} [(s-t) + (a-2)(1-t)s]}{\Gamma(a)} & 0 \leq t \leq s \leq 1 \end{cases} \quad (4)$$

Fig. 1 Green function diagram of a differential equation

Then we call it the *Green* function of the boundary value problem (1).

The *Green* function defined above satisfies the following relationship:

- 1) For any $t, s \in [0, 1]$, $G(t, s) = G(1 - s, 1 - t)$;
- 2) For any $t, s \in (0, 1)$, $(a - 2)q(t)k(s) \leq \Gamma(a)G(t, s) \leq M_0k(s)$;
- 3) For any $t, s \in (0, 1)$, $G(t, s) > 0$;
- 4) For any $t, s \in (0, 1)$, $(a - 2)q(t)k(s) \leq \Gamma(a)G(t, s) \leq M_0q(t)$. Where $M_0 = \max\{a - 1, (a - 2)^2\}$; $q(t) = t^{a-2}(1 - t)^2$; $k(s) = s^2(1 - s)^{a-2}$.

We assume that X is a real normed linear space. $\Omega_1, \Omega_2 \subset K$ is a non-empty open set, and $0 \in \Omega_1 \subset \overline{\Omega}_1 \subset \overline{\Omega}_2$.

We assume that $F : \Omega_2 \rightarrow K$ is a fully continuous operator and satisfies one of the following two conditions:

- 1) $\forall x \in \partial\Omega_1, \|F(x)\| \leq \|x\|$; $\forall x \in \partial\Omega_2, \|F(x)\| \geq \|x\|$;
- 2) $\forall x \in \partial\Omega_1, \|F(x)\| \geq \|x\|$; $\forall x \in \partial\Omega_2, \|F(x)\| \leq \|x\|$. Then F has a fixed point on $\overline{\Omega}_2 \setminus \Omega_1$.

3.1 The first term is attacked

We assume that the intensity of consciousness transfer before the client has not received the consultation is m , and the intensity of consciousness transfer after the consultation is M . Then the intensity of the consciousness transfer of the party concerned after the first attack on the term is:

$$P_1 = [(M - m)/V_1] \times P_0 (P_0 = 1) \quad (5)$$

3.2 The second term was hit

The intensity after the previous alternative is attacked obtained for the same reason as the above formula:

$$P_2 = [(M - m)/(V_2 + V_1)] \times P_1 \quad (6)$$

At this time, there is a functional relationship $k(v_x), k(v_x)$ between the intensity of the party's consciousness transfer after the previous term was attacked and the intensity of the party's consciousness transfer when the term was attacked again [7]. It is a function that increases as the consultation process runs:

$$P_s = K(V_x) \times P_x \quad (7)$$

We assume that P_x is the intensity of the party's consciousness transfer that the consultation needs to achieve after the number of optional terms of the parties reaches a certain cumulative level. P_s is derived from the intensity of consciousness transfer obtained by the person receiving the consultation. The intensity P_x of the party's self-consciousness transfer will increase due to the injection of P_s from the consultation [8]. It is assumed that the change of the party's conscious orientation is a flow process of development and operation. The intensity of the party's self-consciousness transfer is directly proportional to the enhancement rate dP_x/dV_x of the vocabulary attack. At the same time, it is proportional to the difference between the intensity of the person's source of self-consciousness and the intensity difference $P_x - 0$ before the attack on the term that has not been consulted, a , namely

$$\begin{aligned}\frac{dP_x}{dV_x} &= a(P_x - 0) \\ \ln P_x &= aV_x + c \\ P_x &= e^{aV_x + c}\end{aligned}\quad (8)$$

We use boundary conditions to determine the parameter c . We substitute the boundary condition $V_x = 0, P_x = P_2$ into

$$\begin{aligned}P_2 &= e^c \\ c &= \ln P_2\end{aligned}\quad (9)$$

$$P_s = k(v_x) \times e^{av_x + \ln P_2}\quad (10)$$

After P_s integrates the lexical item alternative quantity V_x to obtain the party's self-consciousness transfer intensity function P_s , we can solve the agent's consciousness transfer intensity function $F(v_x)$ that is attacked by the lexical item alternative.

$$F(v_x) = \int_0^{v_x} P_s dv_x\quad (11)$$

Here we need to determine parameter $k(v_x)$ and parameter a . $k(v_x)$ is a proportional function of the intensity of the consciousness transfer of the party after receiving the consultation term in the progressive process. $k(v_x)$ is a small amount before the unaccepted term is hit. When the progressive $k(v_x)$ increases with the acceptance of the vocabulary, the intensity of the consciousness transfer of the party is equal to the intensity of the consciousness transfer before the consultation. When $v_x = 0$, $k(v_x)$ is relatively most miniature [9]. We take $[k(v_x)]_{\min} = 2$. We will take $[k(v_x)]_{\max} = 5$ after the consultation. In the model's hypothesis, we take into account the fixation of the parties' conscious tendencies. Figure 2 shows the relationship between the optional amount of psychological counselling terms and the intensity of self-consciousness transfer. The intensity of the consciousness transfer of the client from receiving counselling is three times the intensity of consciousness transfer from the self. We can establish functional relationships:

$$k(v_x) = 3 + e^{-v_x} + 2\quad (12)$$

When $v_x \rightarrow \infty, [k(v_x)]_{\min} = 2$; When $v_x = 0, [k(v_x)]_{\min} = 5$ and the function is incremented. The parameter a can be calculated from the number of optional terms accumulated for any N times and the intensity of the person's consciousness transfer from the consultation. We take the average value [10]. The analytical formula of $F(v_x)$ after parameter $[k(v_x), a]$ is determined is

$$F(v_x) = \int_0^{v_x} (3e^{-v_x} + 2)^{e^{av_x + \ln P_2}} dv_x\quad (13)$$

It can be seen that the change function of the intensity of consciousness transfer after the party accepts the word item is attacked is

$$g(v_x) = \frac{r - p_1 v_1 - F(v_x)}{v_2 + M - m}\quad (14)$$

We can get the cumulative total of term alternatives (term flow)

$$W = v_1 + v_2 + v_x\quad (15)$$

Fig. 2 The relationship between the optional quantity of psychological counselling terms and the intensity of self-consciousness transfer

4 Discussion

This research aims to use mathematical language to describe the possible process of changes in the parties' consciousness. Language is the material carrier of thinking and mental activity. Its estimation of the flow of terms that make up the language can be used as a perspective to observe the psychological activities of people hidden behind the language. From the derivation process of the differential equation model, we can see the change process of the intensity of consciousness transfer after the party accepts the attack of the progressive term. Moreover, the party's self-consciousness transfer intensity will increase after receiving the attack and intervention of the terms derived from the consultation [11]. The proportional function $k(v_x)$ of the intensity of consciousness transfer after the client accepts progressive terms is increased to the same extent before the intensity of consciousness transfer before the consultation, indicating the self-improvement, growth, and maturity of the client's personality under the intervention of consciousness the consultation process. This can critically deny the notion that made him a party before. When the client's conscious tendency shifts to the negative side of the previous client's concept, the psychological experience will also change with the client's self-improvement. From the perspective of the work performance of the counsellor, the counsellor uses his professional and technical conditions to build an environmental background that can improve the mental activity of the client. This enables the parties to receive intervention from professional consultations in the intensity of consciousness transfer in this unique environment. The acquisition of the alternative quantity of lexical items leaves enough space for the parties to realise the intensity of the transfer of self-consciousness.

In this research, it is assumed that in any consulting operation under consulting theory, the consultant can obtain the number of alternative terms that can provide the term attacked by the number of conversions from spoken language to written language. The simulation of the mathematical model of the consultation process in this study can also show that the acquisition of the lexical item alternative is also the consultant finding a way to enter the client's psychological state [12]. The flow of alternative terms indicates the sportiness of the person's mental activity. With this, the consultant can observe the point-and-face performance, depth source, and possible trend of the party's conscious tendencies. This can also observe and find an opportunity to change the conscious tendency of the parties.

This research model's progressive term attacked alternative flow calculation scheme applies to every consultation operation under the consultation background hypothesised in this research. By calculating the optional quantity of terms, the workability of the consultant can be distinguished from the ability of the client's personality to self-improvement. The establishment of the model can help the counsellor better observe the changes in the client's psychological activities during the consultation. When appropriate, this can support the client,

which may be conducive to the improvement, growth, and maturity of the client's personality. The significance of establishing this model is to describe how the change of the subject's alternative flow of terms during the consultation process may cause a change in consciousness. Therefore, the measurement results of the specific quantitative values of the model do not become an argument to prove the superiority of the model. However, the calculation of the intensity of the transfer of the party's self-consciousness relative to the enhancement rate of the attacked terms derived from the consultation is the key to the model's effectiveness. The dP_x/dV_x rate relates to the impact of the attack's impact on the intensity of the party's self-consciousness transfer. In the consulting operation, it is shown as the degree of external force driving the improvement of the client's personality by the practical consulting process under the consultant's control.

5 Conclusion

The article quantifies the index data through consulting on-site records to make statistics and sorting out the data. We give a consistent estimate of the exogenous parameters in the model to accurately measure the scale. We need to further optimise the model by accurately quantifying the ratio between the intensity of the impact of the term being attacked and the intensity of the person's self-conscious transfer.

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