

## The Effects of a Psychological Intervention on Motor Performance in Children

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This study focused on whether instructional interventions arouse interest and enhance the competence perception of motor performance. In addition, to see whether performance is affected by individual volitional abilities of self-regulation, self-control, volitional development, self-access and life stress. Based on the Personality Systems Interaction (PSI) theory of Julius Kuhl (2001) a quasi-experimental study was used to compare the motor performance (to built a tower of ten beverage boxes and climb it up) of students from Berlin due to volitional abilities and different interventions. Seventy-six primary school students, between 9 to 11 years old, participated in this study. Volitional Component Inventory version 3 (VCI-3; Kuhl & Fuhrmann, 2004) was used to measure volitional abilities. Two different interventions (Autonomy Support vs. External Control) were used. The results of these studies suggest that intervention conditions contribute to motor performance. The results show that Autonomy Support greatly influences the performance of students with low volitional ability. It must be pointed out that the students with different volitional competences profit from different interventions in performance.

**Keywords:** PSI theory, autonomy support, external control, volitional abilities, motor performance

Anyone who regularly does sports knows what it feels like to be completely immersed in the activity, to bask in the moment, and to let intrinsic enjoyment guide your actions. But it is not only the physical activity itself that creates the above-mentioned conditions. Researchers

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have already recognized and demonstrated the importance of psychological skills for motor performance in children (Crocker, & Graham, 1995; Gould, Dieffenbach, & Moffett, 2002). It is necessary to broaden today's knowledge about those psychological components that influence the ability to perform motor tasks. The focus is on making use of psychological abilities in the performance of a difficult motor task in children. Giving short self-regulatory interventions should enable students to mobilize enough motivation to overcome inner obstacles to perform a difficult task. Studies show that benefits for self-regulation and problem-solving can be derived and maintained from relatively short interventions (Schunk & Sheeran, 2005).

#### *Volitional ability*

Modern theories of volition claim that individuals must rely on specific psychological mechanisms to ensure that their wishes and goals are translated into concrete actions (Gollwitzer, 2006; Kuhl, 2000a). It seems plausible that volitional functioning is supported by a set of powerful affect regulation mechanisms (Kuhl, 2000a). Although Kuhl acknowledges that such representations may have a causal impact on behavior, PSI theory aims to extend and elaborate on such accounts by describing the conscious and non-conscious mechanisms that compose the functional processes that address how, operationally, behavior occurs. PSI theory outlines processes concerned with two tasks of volition: (a) goal maintenance that is achieved by mechanisms of self-control and (b) self-maintenance that is achieved by mechanisms of self-regulation. Self-control supports the realization of conscious intentions and goals in an explicit memory structure and essentially refers to conscious processes (e.g., planning) that inhibit other cognitive and emotional processes to protect an ongoing intention from competing alternatives. Self-regulation maintains a person's actions in line with the self. When operating in self-regulation mode, self-generated goals are protected by means of largely

unconscious processes that integrate cognitive and emotional subsystems to support a chosen action (Kuhl & Fuhrmann, 1998).

Volition or will is the cognitive process by which an individual decides on and commits to a particular course of action. According to Kuhl and Fuhrmann (1998), the term volition describes a central coordination of cognitive, motivational, emotional, and temperamental processes.

### *Interventions*

The aim of intervention is to help individuals cope better with their own emotional states and to have a clear idea of how best to deal with different situations (Brodaty, Green, & Koschera, 2003). There are three kinds of intervention strategies: *Instructional intervention* is typically an activator or antecedent event used to move the behavior from the automatic stage to the self-directed stage, or to improve the behavior already in the self-directed stage. *Supportive intervention*, including behavior-based recognition, reward, and feedback, helps people develop fluency, which in turn can lead to a state of unconscious competence. *Motivational interventions* are utilized to improve the behavior of people who are in a state of conscious incompetence. When an individual knows what to do but does not do it, motivational intervention becomes necessary (Geller, 1998). Two motivational interventions were used in this study, Autonomy Support (AS) versus External Control (EC). In AS participants were encouraged to pursue self-determined agendas and then support students' initiatives and intrinsic motivation. The goal is to strengthen students' autonomous self-regulation. In EC participants were followed a certain agenda. The goal is to control students' goals and behaviors toward a prescribed end (Deci & Ryan, 2002).

Kuhl (2000b) emphasizes that PSI theory can help teachers identify individual differences and select suitable intervention techniques that can optimize their teaching. Providing adequate interventions, independent of students' self-regulation abilities, should help them perform well and complete a difficult task successfully, followed by the feeling of being

efficacious in their performance, which in turn leads to further engagement, effort, motivation, and persistence.

Based on the theoretical background in the present study it is assumed that children who are supported in an appropriate way that suits their volitional styles will perform better in a challenging motor task than children who are either not supported or supported in a way that does not suit their individual volitional styles.

## **Method**

### *Subjects*

Seventy-six students (39 boys and 37 girls) with a range from 9 to 11 years old ( $M = 10.04$ ,  $SD = .49$ ) from different primary school of Berlin participated in the study. The participants were divided randomly into 2 experimental and one control groups.

### *Instruments*

To measure students' volitional abilities the Volitional Component Inventory 3 (VCI3) (Kuhl & Fuhrmann, 2004, German version) was applied. The inventory consists of five macro scales (Self-regulation, Self-control, Volitional development, Self-access and General life stress) and 13 subscales. Each subscale consists of 4 items (the total number of items is 52). The questionnaire has been shown to be a reliable and valid one (Kuhl & Kazén, 2004). The Cronbach's alpha coefficients from  $\alpha = .76$  to  $.90$  were reported, Table 1 shows the correlations between macro scales and the cronbach's alphas in this study. The degree of agreement between the items is indicated using a four-point Likert scale (0= "completely disagree" to 3= "completely agree"). In some subscales the scale is reversed.

**Table 1**  
**Internal Consistency Values: Cronbach's Alphas (Diagonal) and**  
**Pearson Correlation Coefficients (above Diagonal) for Volitional**  
**Component Macro Scales**

Macroscales	1	2	3	4	5
1-Self-regulation	.66	.01	.01	-.14	.16
2-Self-control		.51	.11	.01	.01
3-Volitional development			.76	.55**	-.29**
4-Self-access				.78	-.29**
5-Life stress					.84

N=76, \*\*p<.01.

The main task for the participants was to build and climb up a tower of maximum of ten beverage boxes as fast as possible. The number of boxes and the whole time for this performance were recorded. To determine the participants' motor efficiency, which is necessary for the climbing task, the T-rail test, one of the items of KATS-K (Karlsruher Test System für Kinder, Bös, 2001) and to measure the balance and sideways movements, as a measurement of coordination, one of the items of KTK (Kiphard & Schilling, 1974) were used.

A psychologist gave, in a one-to-one interaction, two different verbal interventions to each student separately before performing the climbing task. The content of the interventions is based on the PSI theory. The aim of the interventions is to either induce a) External Control, or b) Autonomy Support. Depending on the individual volitional abilities of the students one of the two specific interventions, given in advance, was presumed to lead to an increased performance in the climbing task.

#### *Procedure and statistical methods*

The method chosen to measure volitional abilities was that of the self-completed questionnaires which the participants completed in their classrooms. The motor tests and the Body Mass Index (BMI) were measured in a cliff climbing gym (Magic Mountain) in Berlin.

To determine the effect of interventions and level of volitional abilities on the performance a MANOVA was performed. Statistical significance was set at  $p < .05$ .

### Results

A two-way MANOVA was conducted to evaluate the effects of the volitional components on the performance of the motor task. The independent variables were volitional abilities and External Control/Autonomous Support. The dependent variables were the number of boxes and the meantime for building and climbing up each box.

Results<sup>1</sup> indicate that there was a main effect of self-regulation on the dependent variables, Wilkes' Lambda = .597;  $F(2, 71) = 23.98$ ,  $p < .05$  and the significant interaction between self-regulation and interventions, Wilkes' Lambda = .836;  $F(6, 142) = 2.22$ ,  $p < .05$ , supporting the research hypothesis. To explore these results, the univariate analyses were considered. Univariate tests for the main effect of self-regulation were significant for the number of boxes  $F(1, 72) = 24.92$ ,  $p < .05$ ;  $\eta^2 = .02$ , mean time  $F(1, 72) = 39.94$ ,  $p < .05$ ;  $\eta^2 = .02$  and also the main effect of interventions was significant for the number of boxes  $F(3, 72) = 4.31$ ,  $p < .01$ ;  $\eta^2 = .06$ . The interaction effect was significant for the number of boxes ( $p < .01$ ;  $\eta^2 = .06$ ). The results of the overall pair wise differences are exhibited in Table 2.

There was a main effect of self-control on the dependent variables, Wilkes' Lambda = .621;  $F(2, 71) = 21.69$ ,  $p < .05$  and also a significant interaction effect Wilkes' Lambda = .755;  $F(6, 142) = 3.57$ ,  $p < .01$ . Univariate tests for the main effect of self-control were significant for the number of boxes  $F(1, 72) = 29.42$ ,  $p < .05$ ;  $\eta^2 = .01$ , mean time  $F(1, 72) = 30.34$ ,  $p < .05$ ;  $\eta^2 = .01$  and also the main effect of interventions for number of boxes  $F(3, 72) = 35.96$ ,  $p < .05$ ;  $\eta^2 = .02$ . The interaction effect was significant for the number of boxes ( $p < .05$ ;  $\eta^2 = .02$ ) (see table 2).

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<sup>1</sup> .In this paper only the significant results were reported and shown in Tables.

There was a significant interaction effect, Wilkes' Lambda=.784;  $F(6,142) = 3.06, p < .01$  between life stress and the dependent variables. The interaction effect was significant for the number of boxes  $F(3, 72) = 5.70, p < .01; \eta^2 = .07$  (see Table 2).

There were no significant effects for the self-access and volitional development concerning dependent variables.

**Table 2**  
**The Pair Wise Comparisons**

Dependent Variables	Group	M	SD	Sig.
Number of boxes <sup>a</sup>	AS	1.40*	.650	.034
	EC	2.06*	.905	.026
	CG	-.652	.844	.442
Number of boxes <sup>b</sup>	CG	2.013*	.635	.002
	EC			
	AS	2.56*	.640	.000
	EC	-.548	.675	.419
Number of boxes <sup>c</sup>	CG	1.52*	.635	.019
	EC			
	AS	2.28*	.653	.001
	EC	-.762	.655	.249
	CG	EC		

Note. a. is the self-regulation variable. b. is the self- control variable. c. is the general life stress variable. \*.  $p < .05$ .

### Discussion

The aim of the present study was to assess (1) the effect of volitional components and (2) the impact of different psychological interventions on the motor performance of primary school students. As postulated by PSI theory, a lack of self-motivation ability has negative consequences on goal pursuit. The present data show that participants under AS condition slightly perform better than the participants in the EC and control groups. The results indicate that, indeed, it is important to assess whether

participants who are selected for a special intervention program are able to imagine the given verbal intervention. Once participants understand how to make use of their senses during an intervention, teachers and coaches can help them to understand how to benefit from these skills in a variety of requirements.

There are meaningful correlations between the performance of climbing and the other motor tests. The relationship between balance and coordination tests with climbing shows that although the participants received and understood the interventions, without balance and coordination abilities, they will not be able to perform the task well. High BMI is another important aspect. The study showed that participants with a high BMI did not succeed in the performance. The study of Graf et al. (2004a; 2004b) had demonstrated that overweight and obese children showed the poorest improvement in motor ability over time, and no significant differences between interventions for these subsets of children and control children were found.

In general, the most significant effects were found in three main macro scales of VCI 3, which are self-regulation, self-control and general life stress. With attention to the concept of interventions, access to self is too important for operationalism, and both studies showed there was no effect of self-access on the performance. One reason for these results could be the age of the test subjects.

Children become more efficient at regulating their cognition and behavior, and possibly their motivation, as they get older (Eccles et al., 1998). Older children may know how to regulate these areas, but oftentimes do not regulate them. With respect to motivation, a person's level of efficacy, degree of interest in the activity, and goals for it all relate to children's self-regulation (Pintrich & Zusho, 2002). When children are efficacious, interested in the activity they are doing, and have learning goals; they are more likely to regulate their behavior to accomplish a certain activity (Wolters, 2003).

### *Limitations and Future Research*

The findings of this study support the notion that the effect of psychological intervention is related to people's differences in volitional competences. Several limitations of the present research will be described below. As mentioned above, I can only speculate on the mechanisms linking volitional competences to short-term verbal interventions; long-term interventions need to be examined in the light of future studies. It is better that the participants take the VCI 3 before preparing the interventions. Under this condition, the evaluation of the intervention can be carried out in a straightforward manner. Practitioners can examine changes in the person's functions that did not work well before the intervention, in addition to behavioral changes and improvements in psychological and physical well-being.

PSI theory distinguishes a complex set of self-regulation processes that can be measured separately. In various applied fields, there is often a tendency to resort to simple formulas that promise quick and easy results. However, gaining adequate knowledge about a complex system such as human volitional competence requires a sophisticated set of measurement tools. It could be helpful to use a follow-up test to evaluate the personality and cognitive-emotional styles. Thorough assessment of these many personality functions permits the teachers to quickly zoom in on those critical aspects or functions of the individual student that need change (Kuhl, Kazén, & Koole, 2006).

It is important to consider the generalizability of the study's findings. The sample consisted of fourth-grade students; however, the results may not be generalized and thus not applicable to other age groups. There are further reasons which can affect the performance. There is a high correlation between climbing up, balance and coordination. Also, the BMI plays a crucial role in the performance of the main task, because 7% of the students in the study were overweight, the effects of interventions on the performance may be underestimated due to their physical ability. Children with greater standardized BMI were less physically active, more sedentary,

and had poorer motor proficiency compared with children with a lower standardized BMI (Wrotniak et al., 2006).

A participant sample limited in size (n = 76) cannot be considered representative, as different interventions in participants with low volitional abilities are generally more profitable than participants with high volitional abilities.

The findings of the present study are important in several ways. In schools, teachers should consider the student's personality. Each student has individual abilities and teachers can help students to learn more if they use different educational methods which should be based on students' abilities. This could be a perfect opportunity to learn mental skills at an early age, which can ultimately give students greater control over their own destiny.

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