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Impact of sensory processing capacity building activities on motivation and academic achievement of elementary schools students

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Abstract:

Sensory processing is the ability to take in, organize, and make sense of the sensory information received by the brain from the sensory systems and respond appropriately. It is the foundation for skill development. The research was carried out in Haripur city, KPK Pakistan at the elementary level to investigate the impact of sensory processing capacity building on motivation and academic achievement of elementary schools. For the study Qusai experimental research design was used. Hundred students having age between 6 to 10 years old from 4th and 5th grades were selected from elementary school of Haripur. Purposive sampling technique through High Sensitive Person (HSP-12) was used to select experimental and control group. Pretest was taken from both groups. Activities with different treatment was given to experiment group and then post-test was taken from both groups.Standard Motivational Scale was used to assess the motivational level of learners. Academic achievement was assessed using class room teacher test. The major results showed that sensory processing activities have negative effect on motivation as well as on academic achievement. The results revealed that three types of sensory processing activities including olfactory, auditory and visual lower the academic achievement of students. The teachers may use different project to explore and then decrease the impact of sensitivity on learners.

Key Terms: Motivation**,** academic achievement,Sensory processing, highly sensitive person scale (HSP), Olfactory, auditory, visual

Introduction

The major manner by which an individual sees and reacts to their current circumstance is through senses. Individuals have various thresholds for seeing, reacting to, and becoming overpowered by sensations, which are reflected in people's ways of life, feelings and dispositions. It was quite a long while back that the writers were first struck by the perceptions to

be accounted for here. A few exceptionally small kids had strange aware nesses showing themselves in a few, while perhaps not taking all things together, tangible modalities (visual, hear-able, material, and so forth) Colors, splendid lights, clamors, uncommon sounds, characteristics of material, encounters of harmony, of taste, of smell, of temperature, appeared to have a remarkably intensive effect upon these kids at an early age. They were "delicate" in the two implications of the word: effortlessly hurt, and effectively stimulated to happiness. Varieties in tangible impression that made no distinction to the normal kid had a lot of effect on these kids. However, they were additionally portrayed by a specific giftedness, this was unevenly circulated among the different elements of their character.

Research Questions

- Is there any significant difference between control and experimental groups for perceived motivation of elementary school students before treatment?
- Is there any significant difference between control and experimental groups for perceived motivation of elementary school students after treatment?
- Is there any significant difference between control and experimental groups for academic achievement of elementary school students before treatment?
- Is there any significant difference between control and experimental groups for academic achievement of elementary school students after treatment?

Review of Related Literature:

Moran (2022) and Lee and Okhee (2020) described that in the long run, science becomes more relatable and memorable for instructors and students when sustainable and equitable learning approaches are used, according to research There has been a considerable drive in the past two decades to include science in the elementary classroom more, particularly through the use of cross-cutting topics and inquiry-based education.

Maryanti et al. (2021) and Mokiwa and Msila (2013) described that a unit in science education uses a variety of components to gather data and effect change in a way that is directly tied to the environment in which people live. A body of knowledge known as science, or natural science, is composed of a collection of observations and studies that explain what, why, and how a phenomenon occurs.

Blanche &Bodison (2021) enlightened about the material framework enlists and separates between torment, temperature, weighty/light touch, vibration, and pressing factor. On the off chance that somewhat of these are not working as expected, tasks with sensory inflection and praxis can happen. Sensory processing alludes to an individual's capacity to get and arrange tactile data for use in daily existence.

Wan et al.(2020) explained one fundamental process of intelligence which include manipulation, recognition, and learning related to sensory memory. These activities can generally be divided into three categories: actions for perception, actions for perception, and reactions. These tasks always involve interactions between them and call for the integration of several sensory modalities and investigated particular objects, such as an egg, a keyboard, or a piano, by looking, hearing, feeling, gripping, and tapping actions associated to tactile perception. Activities impact motivation (Ayaz et al, 2022; Khan et al 2022).

Smith (2019) explained about theory of sensory processing was first depicted by Dr. A. Jean Ayres in 1972 to distinguish those youngsters who seemed to have difficulties coordinating different tactile boosts from visual, hear-able, material, taste, vestibular, and proprioceptive

input. Theory was created to clarify the connection between shortfalls in deciphering tactile improvements from the sensation body and the climate what's more troubles with scholarly or locomotive learning.

Kilroy et al. (2019) stated that kids with ASD have a motivation scarcity and defined motivation as the aspiration or readiness to react to a stimulus that has been detected or to ignore it. She notably noticed that people with ASD might not be as interested in engaging in meaningful or positive activities. Ayres claims that although kids with ASD have the motor skills, they could lack the motivation to really do some things.

Tillmann et al. (2018) assumed that students with higher levels of sensitivity find it harder to focus in a classroom constructed on the particular traits that go along with advanced stages of environmental sensitivity and maintained, for instance, by results by Maher and van Hippel (2005) in open-plan offices in an occupational environment. Students may easily feel overwhelmed due to the constant noise, sporadic commotions and lack of prospects for evacuation. This can then result in persistent overstimulation, which over time may diminish wellbeing and impair performance.

Pluess et al. (2018) defined Environmental Sensitivity is one of the most fundamental human traits and is apparent in most animals. It is described as the capacity to recognize and interpret external stimuli. An organism wouldn't be able to do anything without this skill, whether these are of a carnal or psychosocial origin, and whether they are favorable or unfavorable (i.e., whether they endanger or encourage the growth, existence, and procreative achievement of the individual), perceive, assess, and react to varied environmental conditions.

Ershova et al. (2018) described Highly Sensitive Child (HSC) scale, created by Pluess, is a condensed (12-item) and child-adapted version of the Highly Sensitive Person (HSP scale) that be able to use to examine individual differences in Environmental Sensitivity in children and adolescents and associates. The HSC scale imitates the same three dimensions as the HSP scale and can be used with kids as young as 8 years old.

Fast and McGann (2017), Dias and Ressler (2014) and Li (2014) argued about emotional learning dramatically alters the way humans and animal models receive sensory information in the olfactory system and where noradrenergic signalling has been demonstrated to affect odour perception, olfactory memory, newborn olfactory preference and other olfactory functions.

Anderson (2016; Roley et al., 2009) investigated about sensory processing showed and commonness of sensory problem all alone or related to different issues may be advanced than naturally suspect. To statement sensory processing concerns word related advisors might utilize tangible based engine exercises that incorporate vestibular, proprioceptive or material info that are alarming and quieting to influence the youngster's consideration, social reaction and preparation to learn.

James et al. (2011) showed that kids with troubles in handling facts from their senses may show up in excess of responsive or potentially further down-receptive to specific sorts of sensory input. Increased responsive implies which they immediately observe and receive information from their senses or are profoundly mindful. A little may appear to be a ton to kid that is increased response. Decreased response implies that they don't sign and proceeding information accepted from the senses also. They frequently look for further tangible information or they may require provision from others to enlist sensory processing

Research Methodology:

The study was quantitative in nature and experiment was preformed to collect the data focusing on variables of the study. The population of study constituted elementary government girls school of Haripur having more than 250 students. It was Government Girls Primary Model School (JICA) Sector No.2 KTS of Haripur. 100 students of grades 4th and 5th with the age of 6 to 10 years participated. One standard HSP-12 scale was used to select experimental and control groups and then treatment was given in the form of different activities that students participated. The activities included dressing a wound, preparing organic fertilizer, lit the candle, earthquake/flood drill, fire drill, flute the balloon with glitter/ tiny pieces of papers, heat the solid wax, rusting of nails in beakers with water and oil, removal of eggshell with vinegar, chemical change and weight loss with vinegar and baking soda, shaking of cattle neck's bell, put ear on iron's fence while shaking, making fossils through plaster of paris, making of fossils with cement, transportation of water in soft plants, observe the shadows, plucking of flower petals with tweezers, visit of noisy environment, observe ecosystem, preparing and observing bio-degradable and non-bio degradable things etc. Two questionnaires were used to collect data, one was self-made questionnaire for academic achievement and other was standard form of motivational scale.

The collected data through academic achievement tests (pre-test and post-test) and motivational scale was tabulated, analyzed and interpreted in the light of the objectives of research study. The collected data was scrutinized by mean score frequencies and t-test analysis by using computer software MS-Excel and SPSS. On the basis of the findings, conclusions were drawn and recommendations were made.

Results and Discussion

The experimental and control groups are formed through the utilization of (HSP Scale 12). The collected data were analyzed and table showed the comparison of mean scores between both groups' students in motivation level.

Table No 1

Comparison of experimental group and control group of students before treatment

Group	N	M	SD	SE Mean	T	P
Experimental	50	1.45	.26	.038	1.645	.991
Control	50	1.36	.26	.037		

Not significant

Table 1 shows the comparison between the two groups of the students over the pre-test of motivational scale. The calculated means scores of the both experimental (N=50), (M=1.45), (SD=.26), (SE=.038) and control (N=50), (M=1.36), (SD=.267), (SE=.03789) groups with value of t=1.645 and p=.991. This shows that there is no significant difference between scores of motivation scale between experimental and control group as (p>0.05), (0.991>0.05).

Table No 2

Comparison of experimental group and control group of students after treatment

Group	N	M	SD	SE Mean	t	P
Experimental	50	1.596	.208	.029	-12.214	.000
Control	50	4.120	1.446	.204		

Significant

Table 2 shows the comparison between the two groups of the students over the post-test of motivational scale. The calculated means scores of the both experimental (N=50), (M=1.596), (SD=.208), (SE=.0292) and control (N=50), (M=4.120), (SD=1.446), (SE=.204) groups with value of t=-12.214 and p=.000. This shows that there is significant difference between scores of motivation scale between experimental and control group as ($p<0.05$), ($0.00<0.05$).

Table No 3

Comparison of Pre-test of experimental group and control group students for sensory activities

Group	N	M	SD	SE Mean	t	P
Experimental	50	22.660	3.261	.461	-1.629	.654
Control	50	23.780	3.604	.509		

Not significant

Table 3 shows the comparison between the two groups of the students over the pre-test of academic achievement test. The calculated means scores of the both experimental (N=50), (M=22.660), (SD=3.261), (SE=.461) and control (N=50), (M=23.780), (SD=3.604), (SE=.509) groups with value of t=-1.629 and p=.654. This shows that there is no significant difference between scores of academic achievement test between experimental and control group as ($p>0.05$), ($0.654>0.05$).

Table No 4

Comparison of Post-test of experimental group and control group students through sensory processing activities

Group	N	M	SD	SE Mean	t	p
Experimental	50	36.260	3.993	.564	-9.710	.000
Control	50	42.280	1.807	.255		

Significant

Table 4 shows the comparison between the two groups of the students over the post-test of academic achievement test. The calculated means scores of the both experimental (N=50), (M=36.260), (SD=3.993), (SE=.564) and control (N=50), (M=42.280), (SD=1.807), (SE=.25) groups with value of t=-9.710 and p=.000. This shows that there is significant difference between scores of academic achievement test between experimental and control group as ($p<0.05$), ($0.00<0.05$).

Findings & Discussion:

- There is no significant difference found between perceived motivations of elementary school students before treatment. Pre-test for motivational scale of experimental group and control group is almost equal and also the value of $p>0.05$.Kim (2020) results showed that that the motivation have significance influence on sensory processing. Those children which have high motivation usually have low sensory difficulties while Clifford and Bundy (1989) results explained that normal pre and sensory processing school boys did not differ with regard to play predilection.
- Experiment proved that there is substantial difference found between two groups (experimental and control). In the post-test for motivation scale of control group is better than experimental group through sensory processing activities and the value of $p<0.05$.Kim (2020) finding explore that sensory processing is affected by observations of activities. Then children avoid such activities because they want success and do not want to mentally disturb. Samsen et al. (2022) showed in their results that sensory processing sensitivity have positively affected intrinsic as well as extrinsic motivation but teacher relatedness and competence were used as independent variable.
- Before experiment there is no significant difference found between control and experimental groups for academic achievement of elementary school students as the mean score of control and experimental groups are almost same and the value of $p>0.05$.Anderson (2016) concluded that use of sensory-based movement activities influence academic as students with sensory issues may struggle daily with academic performance while normal students do not while Nesayan et al. (2018) explained that comprehension tangible sources of info is important for activities ,like development, learning, profound turn of events, and idea arrangement. Kids who can't get and deal with tangible data show maladaptive ways of behaving as by Cabral et al. (2016).
- It was found from the above study that there is a significant difference between motivations of students taught with sensory processing activities at elementary level. There are three types of sensory processing activities used as treatment including olfactory, auditory and visual but it is found that when experiment done through these types of activities then significant difference found. The control group perform well than the experimental group after the commencement of experiment. The mean score of control group goes up in posttest than experimental for academic achievement through sensory processing activities and these results are in line with Ismael et al. (2018), Bakker &and Moulding (2012) and Ashburner et al. (2008).

Conclusions

The study concluded that sensory processing activities do not enhance motivation. Treatment lower the motivation and the experimental group do not performed well than the control group. Results of posttest of the academic achievement do not increase academic achievement sensory processing activities lower the academic achievement. It was found that Sensory processing activities (olfactory, auditory as well as visual) have negative effect on motivation and academic achievement of elementary school students.

Recommendations:

- Change in learning environment provide diversity and sensory issues may be assess. Impact of sensory processing activities, which may be reduced by performing activities in daily life.
- There is necessity to develop classroom environment in which self-esteem of students may be developed, this may increase motivational level of students.

- Teachers may be use sensory break ideas for students which enhance the motivational level for students.
- Teachers may provide friendly environment in schools as well as in homes to explore about students sensitivity.
- Teachers may ask students to create the projects about those which create high sensitivity in them.
- Teachers as well as parents may be minimize sensitivity processing sensitivity through sympathy and empathy to students and bring students in natural environment to know about the olfactory sensitivity of students.
- Teachers may contact of all types of aroma such as plants, flowers, mud, grass, hand creams, fresh herbs, scented dough, wood, meal, paints, organic fertilizers etc to assess olfactory sensitivity of students that which smell create sensitivity as well as ask to sensitive students to sit beside window or near door.
- Teachers may give group work, projects as well as discussion to diagnose about auditory sensitivity of students as well as give high verbal interaction projects for high auditory sensitivity.
- Teachers may provide less noisy environment during the recess to control high auditory sensitivity as well as teachers as well as parents may observe students in natural environment such as in zoos, gardens to investigate about the things which create visual sensitivity in children.

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