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Teaching students with autism spectrum disorder and moderate intellectual disabilities to use counting-on strategies to enhance independent purchasing skills

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ABSTRACT

The demands of basic math skills often limit the ability of students with autism spectrum disorders to master purchasing skills. This study examined the use of counting-on math skills in conjunction with the next-dollar strategy to enhance independent purchasing skills. Four students with autism and intellectual disabilities successfully acquired and generalized counting-on and next-dollar skills to community settings. Students maintained both skills at a 100% level for up to 6 weeks. Intensifying instruction on functional skills that builds on basic academic skills represents one means of accessing the general education curriculum.

With an increase in advocacy for improved post-school outcomes, the importance of preparing students to live independently and interact within their community has gained attention (Lehmann, Bassett, Sands, Spencer, & Gliner, 1999). Being able to earn an income, budget, and spend money is an integral part of independent community functioning. The ability to function independently within community settings increases when students acquire purchasing skills. Generalized purchasing skills allow students to pay independently for purchases or activities they require across a variety of natural environments.

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Browder and Grasso (1999) reported that the one-more-than technique or the next-dollar strategy was one of the most successfully taught skills to assist students to determine the amount of money to pay for their purchases. When using the next-dollar strategy, students are taught to make purchases using one more dollar than asked for by the salesperson (Test, Howell, Burkhart, & Beroth, 1993). The next-dollar strategy has been used successfully to teach students with mild intellectual disabilities (e.g., Colyer & Collins, 1996), moderate intellectual disabilities (e.g., Denny & Test, 1995), and serve intellectual disabilities (Test et al.). An adaptation to the next-dollar strategy is called the cents pile modification. This modification requires students to put aside a one-dollar bill for the cents, count out the requested dollar amount, and then combine the two piles to compensate the price.

However, a meta-analysis of effective purchasing skills instruction for individuals with developmental disabilities concluded that the demands of basic math skills (e.g., counting, adding) often limits the ability of students with disabilities to master purchasing skills (Xin, Grasso, Dipipi-Hoy, & Jitendra, 2005). Xin et al. noted that research is needed that improves the necessary prerequisite math skills (e.g., counting, adding) to effectively respond to purchasing instruction. From a practical perspective, relatively little is known about what common components (e.g., prerequisite skills, skill objectives) characterize effective instructional methods of purchasing and money skills for children with autism spectrum disorders and moderate intellectual disabilities.

Addition is the simplest operation in arithmetic and serves as the basis for other mathematical operations. Knowledge of addition is useful both within the classroom and in everyday life. Kirk and Gallagher (1983) noted that elementary knowledge of the four arithmetic operations is necessary for such basic living skills as making purchases, keeping a budget, and knowing how to save money. Many purchasing challenges that confront individuals with disabilities can be dealt with independently and effectively if they have a clear understanding of addition or have acquired advanced counting skills. Knowledge of addition or counting strategies would broaden and enhance an individual's purchasing skill.

Initially, children use a counting-all strategy to find solutions to addition problems (Carpenter & Moser, 1984). At the most basic stage, physical objects or fingers are used to represent each addend, and beginning at one, the union of the two sets is counted. In an example such as 2 + 3, two concrete objects are counted out, then three objects are counted out, and finally the sets are joined and each objects is counted "one, two, three, four, five." The last number counted represents the solution to the problem.

As a student continues to use counting-all methods, development of more efficient strategies emerge, such as counting-on (e.g., Carpenter & Moser, 1984). The count-on method may appear in two forms: (a) counting-on from the first addend and (b) counting-on from the larger addend. Counting-on from the first addend begins with the first number and counts forward from there. For example, the problem 2 + 3 would be solved by identifying 2, and then counting 3, 4, 5. In comparison, if the student was counting-on from the larger addend, they would identify 3 and then count 4, 5.

The final level of development in addition problem solving is the number fact strategy. In this case, the student is able to retrieve solutions to certain number pair combinations from long-term memory. However, without an understanding of the addition process, number facts must be learned in isolation or through rote learning. With over-reliance on rote learning, the one's memory load becomes unmanageable.

Hanrahan, Rapagna, and Poth (1993) suggested that students with intellectual disabilities follow a similar pattern of development as students without disabilities. However, many students with intellectual disabilities relied on the counting-all strategy to add for longer periods. Similarly, Kirk and Gallagher (1983) concluded that for students with intellectual disabilities more advanced addition strategies take much longer to develop and are not as certain. Although the spontaneous acquisition of addition skills observed in students without disabilities is not readily apparent in students with moderate intellectual disabilities, it has been shown that these skills can be systematically taught and maintained when using concrete materials (Irwin, 1991). Baroody (1996) noted that students with moderate intellectual disabilities can develop more sophisticated counting and addition strategies. Baroody assessed 13 students with moderate intellectual disabilities, addition skills using manipulatives, and modeling counting-all procedures to solve single-digit addition problems. Over 6 months, the students were given regular opportunities to practice computing sums. Some students