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CASE REPORT

Case series: gaming vs. eating—comorbidity of ARFID and IGD

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Abstract
This case series includes innovative information regarding the relationship between Avoidant/Restrictive Food Intake Disorder and the recently formulated diagnosis of Internet Gaming Disorder. The series illustrates two clinical cases in which both disorders were simultaneously recognized during diagnosis and treatment. Both disorders were utilized by patients as maladaptive coping strategies in efforts to avoid emotional distress and are potential risk factors that interfere with physical and mental health functioning. This case series highlights the unique relationship between these disorders and the compounding contribution of these two risk factors to poor physical and mental health outcomes, which is a unique contribution to the eating disorder literature.
Level IV Evidence obtained from multiple time series with or without the intervention, such as case studies.

Keywords Avoidant/restrictive food intake disorder · Gaming disorder · Eating disorders

Case report

Case 1

A 17-year-old, Latino male was referred to the Adolescent Medicine clinic for malnutrition and poor weight gain. According to the referral, the patient had been seen three times at the referring clinic to address weight issues and was described as "almost cachectic" in appearance. The patient initially presented to the referring clinic due to vomiting which he believed was due to a "lump" in his throat. During visits to the referring clinic, the patient acknowledged lack of food intake through insufficient meals, skipping meals, and vomiting which reportedly had been occurring for 2–3 months. The patient denied weight concerns, eating problems, and body image disturbance, despite being 167 cm and 43.3 kg (73.2% mean estimated body max index (MEBMI)). Patient history included restricted intake, emetophobia (anxiety related to vomiting), defined food preferences, disinterest in eating, and responsibility for food preparation and consumption. A diet history from the previous 24 h was obtained which indicated a tendency to eat preferred, calorie-dense items in limited quantities. Additionally, the patient reportedly spent four or more hours a day gaming; he reported that he would "forget to eat" while gaming. After the initial office visit, he was hospitalized in the Disordered Eating Program for refeeding in the face of severe malnutrition. During admission, the patient's lab tests were within normal parameters, with the exception of a vitamin $D = 13.6$ ng/mL and phosphorus = 2.3 mg/dL. Dexa scans revealed a total body (less head) z-score of -1.5 and AP spine z-score of -2.4. The patient initially admitted to feeling anxious; however, he continued to deny anxiety thereafter despite signs of paranoia, trouble sleeping, difficulty concentrating, and preoccupation with time to discharge. He was prescribed medication to relieve anxiety symptoms. Relevant family history includes colon cancer and type two diabetes.

Case 2

A 15-year-old, Latino male presented to the Adolescent Medicine Clinic for weight loss, malnutrition, concerns

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regarding school performance, and excessive video gaming. The referral indicated that the patient had a long-standing problem with eating difficulties and was seeing a nutritionist at the referring clinic. He admitted to skipping meals frequently. On presentation, he was 180.4 cm, 48.2 kg (74.4% MEBMI) and denied body image concerns, though he acknowledged his thin physique. A 24-h diet history indicated a preference for certain items that were generally calorie dense. His eating behaviors included post-meal vomiting, restricted food interests, emetophobia, and 1 h or more daily exercise. The patient reportedly spent "most of every day" gaming with family reports of continuous gaming interfering with eating. Paperwork from the referring clinic indicated that the patient was spending a minimum of 4 h per day gaming. The patient acknowledged playing games instead of eating with a stated preference for the excitement of gaming over eating. Additionally, this patient noted use of gaming as a coping strategy to avoid emotional distress. Despite acknowledgement of the benefits the patient received from gaming, he reported feeling too thin and had noticed a decrease in his overall energy. The patient was admitted to the inpatient Disordered Eating Program due to orthostasis and bradycardia secondary to moderate malnutrition. During admission, lab tests were within normal parameters, with a low alanine transaminase = 10 u/L Dexa scan revealed a total body (less head) z-score = 0.04 and AP Spine z-score = 0.4. He endorsed feelings of anxiety and depression related to interpersonal interactions 1 month into treatment. During hospitalization, he regularly asked to play video games. Relevant family history includes obesity, type two diabetes, and high cholesterol.

Hospital course and follow-up

Both patients were hospitalized in the Disordered Eating Program for malnutrition. Following the initial admission, both patients received diagnoses of Avoidant/Restrictive Food Intake Disorder (ARFID) and anxiety. In both cases, ARFID was diagnosed from information provided by the referring clinic, obtained during the initial visit to the Adolescent Medicine Clinic, and gathered during hospitalization regarding the long-standing presence of eating behaviors leading to malnutrition without the presence of body image disturbance. Both patients reported engaging in gaming behaviors to the point of functional impairment meeting criteria for what is now defined as Internet Gaming Disorder (IGD) by the World Health Organization. Importantly, at the time of hospitalization for both patients, the diagnosis of Internet Gaming Disorder was being considered as a possible diagnosis by the medical community but was not officially recognized as a diagnosable condition. It has since been concluded that both patients met criteria for IGD prior to hospitalization. Within the first full week of admission, each patient consumed 100% of meals; however, as food portions increased to accommodate nutritional needs, both patients struggled to complete meals, sometimes requiring oral, liquid supplementation. Other observations included frequent inquiry about the availability of gaming systems and limited desire to interact with peers.

During hospitalization, both patients were placed on the malnutrition protocol which included structured programming, refeeding plan, supervision, psychoeducation, nutrition counseling, individual and family therapy, behavioral interventions, physical therapy, and social services. Interventions were aimed at changing both eating and gaming behaviors through structured programming designed to disrupt constant gaming and restrictive eating practices by limiting opportunities to engage in either behavior and reinforcing engagement in adaptive behaviors contributing to improved medical and psychological health outcomes. Both patients participated in individual therapy using a cognitive behavioral paradigm to address behavioral and communication problems and to develop adaptive coping strategies to manage emotional distress. Families participated in family therapy to improve communication and interpersonal dynamics with parents, as well as promote education and support for family members. Additionally, family work focused on structuring families to limit patient opportunities to engage in restrictive eating and gaming by adjusting expectations regarding patient behavior, providing increased supervision, and reinforcing desired behaviors. Both patients achieved the minimum medical ($\geq$ 85% MEBMI) and psychological goals (e.g., ability to eat three unobserved meals, maintain progress, refrain from maladaptive coping techniques) and were discharged to follow-up in outpatient clinic. Post hospitalization, each patient followed-up with their team of providers assigned during hospitalization including a physician, individual therapist, family therapist, and dietitian. Both patients maintained medical progress with consistent clinic follow through. Of important note, both patients returned to gaming behaviors once discharged from the hospital with one family requesting additional in-home behavioral support in an effort to curb gaming behavior.

Discussion

Avoidant/Restrictive Food Intake Disorder (ARFID) is an eating/feeding disorder that can be associated with significant weight loss, restrictive eating patterns, malnutrition, the need for nutritional supplementation, and/or psychosocial dysfunction [1, 2]. Individuals diagnosed with ARFID deny body image disturbance or fear of weight gain. Restriction is motivated by a disinterest in specific food(s), a loss of appetite, and/or a fear of physical discomfort (e.g., choking,

vomiting, and sensory discomfort) [2, 3]. The prevalence of ARFID is estimated at 5% − 22.5% of children and youth presenting in pediatric clinics for disordered eating [3]. Patients with ARFID in the United States are often younger than individuals diagnosed with anorexia nervosa (AN) and bulimia nervosa (BN), tend to be male, and, despite similar weight to those with AN and BN, have a longer average duration of illness [4]. Resulting malnutrition can have detrimental and sometimes irreversible consequences to an individual's immediate and long-term physical health and psychosocial functioning including low bone density, depression, anxiety, and gastrointestinal dysfunction [5, 6].

Internet Gaming Disorder (IGD) was originally proposed in section three of the Diagnostic Statistical Manual 5th Edition (DSM-5), under "Conditions to Further Study", and is now a diagnosis in the 11th Revision of International Classification for Diseases (ICD-11) [7]. IGD is described as a preoccupation with online gaming characterized by impaired control over gaming behaviors which take precedence over other interests despite recognized consequences to the individual's psychosocial functioning for a period of at least 12 months [7, 8]. Video gaming behavior may also result in significant consequences, including relational conflict, decreased attention, and loss of educational and career opportunities [7, 8]. It is estimated that IGD affects up to 15% of teenagers in Asian countries and 10% in Western countries, and the disorder occurs more frequently in adolescent males and young adults [7–9]. Although IGD was recently included in the ICD-11 and was recently proposed as a DSM-5 diagnosis in 2013, there is no research about the long-term effects [9].

This case series illustrates the observed comorbid relationship of two adolescent risk behaviors, restrictive eating and excessive gaming, both of which can result in negative medical and mental health outcomes. Risk behaviors serve a functional purpose including the avoidance of acknowledging and facing emotional distress. Risk behaviors have also been known to co-occur during adolescence [10]. For example, an adolescent who engages in one risk behavior such as underage drinking, may be more likely to engage in multiple risk behaviors simultaneously, including unprotected sex or other substance use [10]. Engaging in risk behaviors may compromise an individual's overall health and well-being and may have compounding negative functional outcomes [10].

Both patients in this case series engaged in restrictive eating behaviors and excessive gaming resulting in a diagnosis of ARFID and retrospectively IGD. For both patients, these behaviors created significant functional impairment leading to medical and psychosocial compromise as well as prolonged hospital stays that potentially further interfered with their developmental trajectories. While the "clustering of risk behaviors" theory helps explain the development of the concurrent behaviors, less is known about the interaction of these behaviors and the effect of the interaction on the progress related to each disorder. The relationship between these two disorders is unique due to development of malnutrition during reduced energy expenditure. In both cases, interventions specifically aimed at improving nutritional intake and reducing gaming time during hospitalization and follow-up resulted in improved functional outcomes. Additionally, while medical progress was maintained during follow-up, both patients returned to gaming activity, though not to the degree of interfering with basic functions like that prior to hospitalization. Hospitalization and a standardized eating disorder inpatient protocol aided in behavior change and weight restoration; evidence regarding effective treatment strategies to address excessive gaming are not as well understood. In both cases, interventions specifically aimed at improving nutritional intake and reducing gaming time during hospitalization and follow-up resulted in improved functional outcomes. More research is needed to better understand the immediate and long-term effects of ARFID and IGD, as well as the relationship between the two.

Conclusion

ARFID and IGD are relatively new diagnoses defined within the past 5 years and accordingly are not fully characterized. Limited literature about ARFID and IGD is available. This is the first case series we found exploring the potential association between ARFID and gaming behavior. While hospitalization and a standardized disordered eating protocol provide structure, limiting the ability to engage in restrictive eating behaviors and excessive gaming, there is much work that remains in understanding the interaction between diagnoses and mechanisms leading to lasting behavior change. More research is needed to better understand the nature of each disorder alone and the interaction between ARFID and IGD, including how to effectively intervene with each disorder when they occur comorbidly.

Author contributions ANH contributed to conception and design, acquisition, analysis, and interpretation, drafted and critically revised the manuscript, gave final approval of the manuscript, and agrees to be accountable for aspects of the work ensuring integrity and accuracy. ABM and PDP contributed to the conception and design, analysis and interpretation, critically revised the manuscript, gave final approval of the manuscript, and agree to be accountable for the aspects of the work ensuring integrity and accuracy.

Compliance with ethical standards

Conflict of interest No author has any conflicts of interests to disclose. No monies, including honorariums, grants, or other forms of payment, were received in connection with writing this manuscript.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent is not required in the United States or by authors' institution in case series including less than three patients.

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