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Comparative Effectiveness of General Lifestyle Education and Dialectical Behavior Therapy on Dysfunctional Attitudes and Health-Promoting Lifestyle Among Patients with Human Papillomavirus Infection

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ABSTRACT

This study aimed to compare the effectiveness of general lifestyle education and dialectical behavior therapy (DBT) in reducing dysfunctional attitudes and improving health-promoting lifestyle among patients with human papillomavirus (HPV) infection. This quasi-experimental study employed a three-group pretest–posttest–follow-up design. The statistical population consisted of adults with HPV infection attending Lolagar Center in Tehran, Iran, during 2024–2025. Forty-five eligible participants were selected through convenience sampling and allocated to general lifestyle education (n = 15), DBT skills training (n = 15), or a wait-list control group (n = 15). The lifestyle education group received six sessions, whereas the DBT group received twelve sessions focused on mindfulness, distress tolerance, emotion regulation, acceptance, and problem-solving skills. Dysfunctional attitudes and health-promoting lifestyle were assessed at pretest, posttest, and follow-up using standardized questionnaires. Data were analyzed using repeated-measures analysis of variance and Bonferroni-adjusted pairwise comparisons in SPSS. Repeated-measures analysis demonstrated a significant group-by-time interaction for dysfunctional attitudes, $F(4, 84) = 18.64$, $p = .001$, partial $\eta^2 = .47$, and for health-promoting lifestyle, $F(4, 84) = 22.38$, $p = .001$, partial $\eta^2 = .52$. Bonferroni comparisons indicated significant pretest-to-posttest and pretest-to-follow-up improvements in both intervention groups for both outcomes (all $p = .001$), whereas corresponding changes in the control group were not significant. DBT was significantly more effective than lifestyle education in reducing dysfunctional attitudes at posttest ($p = .002$) and follow-up ($p = .001$) and in improving health-promoting lifestyle at posttest ($p = .030$) and follow-up ($p = .020$). Posttest-to-follow-up differences were nonsignificant, indicating maintenance of intervention effects. Both general lifestyle education and DBT were effective in improving cognitive and health-related lifestyle outcomes among adults with HPV infection; however, DBT produced significantly greater and sustained effects, suggesting that emotion-regulation and mindfulness-based skills may provide additional benefits beyond general lifestyle education.

Keywords: Human Papillomavirus; Dialectical Behavior Therapy; Lifestyle Education; Dysfunctional Attitudes; Health-Promoting Lifestyle

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Introduction

Human papillomavirus (HPV) is one of the most common sexually transmitted viral infections and represents an important public health concern because persistent infection with high-risk HPV types may contribute to the development of precancerous lesions and several malignancies. Although many HPV infections are transient and resolve without severe clinical consequences, the diagnosis itself can have substantial psychological and behavioral implications for affected individuals. Clinical management generally emphasizes vaccination, appropriate screening, monitoring, and treatment of HPV-related lesions; however, the experience of receiving an HPV diagnosis often extends beyond purely biological considerations. Concerns regarding transmission, recurrence, intimate relationships, disclosure, stigma, and uncertainty about future health may influence patients' emotional well-being and their engagement in health-related behaviors (1). Consequently, contemporary approaches to HPV management increasingly require attention not only to biomedical follow-up but also to the cognitive, emotional, interpersonal, and lifestyle-related dimensions of living with the infection.

The psychosocial burden of HPV has been demonstrated in qualitative investigations examining how individuals understand and respond to a positive diagnosis. Women testing positive for high-risk HPV have reported fear, shame, uncertainty, difficulties related to disclosure, and concerns regarding sexual relationships and partner reactions (2). These responses may be particularly intense when individuals interpret HPV infection as a threat to their identity, intimate relationships, or social acceptance. Such experiences can influence self-perception and may contribute to avoidance of conversations, medical follow-up, or adaptive self-care. In women with co-occurring mental health difficulties, the psychological consequences of HPV can be even more pronounced, including withdrawal, emotional shutdown, heightened distress, and difficulty integrating the diagnosis into everyday life (3). These findings suggest that the psychological adjustment of patients with HPV may depend not merely on the medical characteristics of the infection but also on their cognitive appraisals, emotion-regulation abilities, perceived stigma, and behavioral coping strategies.

A biopsychosocial framework provides an appropriate conceptual basis for understanding these interrelated dimensions. From this perspective, health and illness are shaped by the interaction of biological processes, psychological functioning, behavioral patterns, and social conditions rather than by isolated physiological mechanisms. Contemporary applications of the biopsychosocial model emphasize the need to integrate psychological support, health education, lifestyle modification, and patient-centered communication with conventional medical treatment (4). This approach is particularly relevant to HPV because the medical course of infection may be accompanied by uncertainty, repeated screening, fear of adverse outcomes, and concerns about interpersonal disclosure. Therefore, interventions that improve coping, modify maladaptive beliefs, and strengthen health-promoting behaviors may complement routine medical care and contribute to more comprehensive patient management.

One cognitive factor that may be particularly important in adaptation to stressful health conditions is dysfunctional attitudes. Dysfunctional attitudes are rigid, maladaptive, and often conditional beliefs concerning self-worth, approval, success, failure, vulnerability, and personal adequacy. Within Beck's cognitive model, these attitudes function as underlying cognitive structures that can shape the interpretation of stressful experiences and increase vulnerability to emotional distress when activated by challenging events

(5). A diagnosis such as HPV may activate assumptions related to rejection, contamination, blame, perfectionism, social judgment, or loss of control. For example, individuals who strongly believe that personal worth depends on social approval may experience intense distress when contemplating disclosure of an HPV diagnosis, whereas those with perfectionistic assumptions may interpret infection as evidence of personal failure. Such rigid appraisals can amplify emotional reactions and interfere with adaptive decision-making.

The assessment of dysfunctional attitudes has therefore become an important component of cognitive and clinical research. The Dysfunctional Attitude Scale was developed to evaluate maladaptive cognitive beliefs associated with psychological vulnerability, and later psychometric work contributed to more concise and culturally adaptable forms of this construct. In Iran, development and validation of a 26-item version identified dimensions including perfectionism, need for approval, need to please others, and vulnerability or performance evaluation (6). These domains are theoretically relevant to the psychosocial experience of HPV because concerns regarding sexual health, privacy, intimate relationships, and stigma may interact with preexisting beliefs about approval and self-worth. Thus, reducing dysfunctional attitudes may represent a meaningful psychological target in interventions designed for individuals coping with HPV infection.

Alongside cognitive adaptation, health-promoting lifestyle behaviors constitute another important component of patient adjustment. Health-promoting lifestyle refers to a pattern of behaviors oriented toward maintaining or improving health, including health responsibility, physical activity, nutrition, stress management, interpersonal relationships, and personal or spiritual development. In the context of HPV, such behaviors may affect not only general well-being but also patients' willingness to engage with medical follow-up, communicate with health professionals, adhere to recommended screening, and maintain healthier routines during periods of uncertainty. Educational interventions can facilitate these behaviors by improving knowledge, correcting misconceptions, strengthening self-efficacy, and translating general health recommendations into specific daily practices.

Evidence from HPV-specific educational research supports the potential value of structured health education. A randomized trial among HPV-positive women demonstrated that education based on the Health Belief Model could enhance sexual self-care by addressing perceptions of susceptibility, severity, benefits, barriers, and self-efficacy (7). Such findings indicate that carefully structured educational programs may strengthen health-related decision-making and self-management among individuals living with HPV. Nevertheless, education alone may not fully address the emotional processes that interfere with adaptive behavior. Patients may understand what they should do while still experiencing fear, shame, intrusive thoughts, distress, or interpersonal avoidance that prevents them from acting consistently with that knowledge. This limitation highlights the potential value of psychological approaches that directly target emotional and behavioral regulation.

Dialectical behavior therapy (DBT) is one such approach. Originally developed as a comprehensive behavioral treatment, DBT integrates strategies of acceptance and change and emphasizes the development of mindfulness, distress tolerance, emotion regulation, and interpersonal effectiveness skills (8). Rather than attempting only to eliminate distressing thoughts or emotions, DBT teaches individuals to observe internal experiences without immediate judgment, tolerate difficult affective states, and choose effective actions even in the presence of emotional discomfort. These principles may be especially applicable to patients with HPV

who face uncertainty, shame, fear of judgment, concerns about disclosure, or difficulties maintaining health behaviors while distressed.

Emotion regulation is central to DBT and constitutes one of its primary mechanisms of change. Comparative theoretical work examining DBT and schema therapy has emphasized that maladaptive emotional responses may be maintained by difficulties in recognizing, tolerating, modulating, and responding effectively to emotional states (9). DBT attempts to modify these processes through explicit skills training, including emotional awareness, nonjudgmental observation, acceptance, behavioral activation, opposite action, and problem solving. In patients coping with a chronic or potentially stigmatizing health concern, these strategies could reduce the tendency to respond to fear or shame through avoidance, withdrawal, rumination, or disengagement from self-care.

The effectiveness of DBT-related approaches has been supported across several psychological populations, although most evidence has emerged outside the context of HPV. A systematic review and meta-analysis examining DBT for adolescents with self-harm and suicidal ideation demonstrated beneficial effects on clinically relevant emotional and behavioral outcomes (10). Longitudinal research has also shown that DBT may contribute to improvements across multiple domains of functioning over extended treatment periods, suggesting that its effects are not necessarily limited to acute symptom reduction (11). These findings are important because they indicate that skills related to emotional regulation, behavioral control, and adaptive coping may influence broader functioning.

More recent investigations have further clarified the role of emotion dysregulation and interpersonal dysfunction in DBT outcomes. In individuals with borderline personality disorder, changes in emotional and interpersonal processes have been examined as important mechanisms associated with reductions in maladaptive behaviors during DBT (12). Similarly, research on adolescents with borderline personality features has emphasized the importance of emotion dysregulation in understanding treatment outcomes and the potential of DBT to address complex patterns of emotional reactivity (13). Although these populations differ substantially from adults with HPV infection, the underlying therapeutic principles may remain relevant when patients experience intense affective responses, difficulty tolerating uncertainty, or ineffective coping following a medical diagnosis.

DBT has also been evaluated in more focused and adapted forms. An adapted school-based DBT skills program for adolescents was found to be acceptable and useful from participants' perspectives, illustrating the feasibility of delivering core DBT skills outside highly specialized psychiatric settings (14). This is relevant to health psychology because it demonstrates that DBT-informed interventions can be adapted to structured, skills-focused formats rather than delivered exclusively as intensive treatment packages. Similarly, DBT has shown potential for strengthening positive psychological characteristics in clinical groups. An intervention among individuals with borderline personality disorder demonstrated improvements in self-compassion and integrative self-knowledge, suggesting that DBT may contribute not only to symptom reduction but also to healthier self-understanding and psychological integration (15). Such effects may be particularly meaningful for individuals whose medical diagnosis challenges self-image or activates self-critical beliefs.

Further evidence has suggested that DBT can influence shame-related and self-concealment processes. Research among female adolescents with suicidal ideation reported that DBT was effective in reducing fear

of compassion and self-concealment while enhancing emotion efficacy (16). Although these findings cannot be directly generalized to HPV-positive adults, self-concealment is conceptually relevant to HPV because patients may avoid disclosing their diagnosis due to fear of negative evaluation, stigma, or relationship consequences. Skills that improve emotional efficacy and reduce avoidance could therefore be clinically meaningful in this population.

The broader concept of dialectical coping may also help explain why DBT-informed strategies could be useful beyond psychiatric disorders. Recent research among Hong Kong Chinese adults found that dialectical coping was associated with mental health outcomes through the mediating role of perceived stress (17). This finding supports the proposition that the ability to hold seemingly contradictory experiences, tolerate uncertainty, and respond flexibly to stress may be beneficial in a variety of contexts. For patients with HPV, dialectical coping may involve simultaneously accepting the reality of the diagnosis while engaging in constructive health behaviors, acknowledging fear while continuing medical follow-up, or recognizing uncertainty without becoming behaviorally immobilized.

Mindfulness-oriented psychological approaches may also be relevant in medical settings. In patients with breast cancer, mindfulness-based cognitive therapy has been associated with improvements in mental pain, distress tolerance, and psychological hardiness (18). Although mindfulness-based cognitive therapy differs from DBT and breast cancer differs fundamentally from HPV infection, this evidence supports the broader proposition that psychological skills targeting awareness, distress tolerance, and emotional processing can be beneficial in populations facing significant health-related stress. Because DBT incorporates mindfulness as one of its central skill modules, it may offer a structured means of applying similar principles while also addressing emotion regulation, acceptance, problem solving, and effective behavioral responses.

Despite these theoretical and empirical foundations, there remains an important gap in the literature concerning psychological and behavioral interventions specifically for adults with HPV infection. Existing HPV studies have largely emphasized education, screening, vaccination, sexual health, and self-care, while relatively little attention has been directed toward structured psychological skills interventions that explicitly target dysfunctional cognitions and emotional regulation. Furthermore, general lifestyle education and DBT may operate through different pathways. Lifestyle education primarily aims to increase knowledge, motivation, self-monitoring, healthy habits, problem-solving capacity, and confidence in health-related behavior. DBT, in contrast, places greater emphasis on mindfulness, acceptance, emotion regulation, distress tolerance, and adaptive responses to emotionally charged situations. Comparing these two approaches may therefore help clarify whether providing intensive emotional and behavioral regulation skills offers additional benefits beyond general lifestyle-oriented education.

Such a comparison is particularly important because dysfunctional attitudes and health-promoting lifestyle represent distinct but interconnected outcomes. Maladaptive beliefs may interfere with effective self-care, while poor health-related routines may reinforce feelings of helplessness or lack of control. Conversely, cognitive flexibility may facilitate healthier behavioral choices, and successful engagement in self-care may strengthen perceived competence and psychological adjustment. An intervention capable of simultaneously reducing dysfunctional attitudes and improving health-promoting lifestyle could therefore have practical value in multidisciplinary care for patients with HPV. At the same time, comparative research

is necessary to determine whether a psychologically intensive intervention such as DBT produces greater improvements than a more general educational program.

Accordingly, the aim of this study was to compare the effectiveness of general lifestyle education and dialectical behavior therapy in reducing dysfunctional attitudes and improving health-promoting lifestyle among adults with human papillomavirus infection.

Methods and Materials

Study Design and Participants

The present study employed a three-group quasi-experimental design with pretest, posttest, and follow-up assessments to compare the effectiveness of general lifestyle education and dialectical behavior therapy (DBT) in changing dysfunctional attitudes and health-promoting lifestyle among adults diagnosed with human papillomavirus (HPV) infection. The study was conducted during the Iranian calendar year 1403, corresponding approximately to March 2024 through March 2025, among patients attending Lolagar Center in Tehran, Iran. The target population consisted of adult patients with a documented diagnosis of HPV who were receiving services at the study setting during the recruitment period. Participants were initially identified using convenience sampling based on their accessibility and eligibility for participation. A sample-size calculation was reported on the basis of an anticipated effect size of 0.40, statistical power of 80%, a 95% confidence level, and consideration of possible participant attrition. Ultimately, 45 eligible individuals were enrolled in the study. Following recruitment, the participants were allocated to three study conditions comprising a general lifestyle education group, a dialectical behavior therapy group, and a wait-list control group, with 15 participants assigned to each group. Although allocation to the three conditions was reported to have been conducted randomly, the specific randomization procedure, allocation concealment method, and masking of outcome assessors were not documented. Participants assigned to the wait-list control condition received no psychological or educational intervention during the active study period and were scheduled to be offered an intervention after the completion of the study.

Eligibility for participation was determined according to predefined inclusion and exclusion criteria. The inclusion criteria comprised documented HPV infection, an age between 18 and 40 years, willingness and voluntary consent to participate in the study, adequate mental capacity as documented in the patients' medical records, possession of at least a high-school diploma, and absence of concurrent or previous participation in a similar psychological or educational intervention. Participants could be excluded or withdrawn if they revoked consent to continue participation, did not meet the required mental or educational qualifications, or received another comparable intervention during the study period. Outcome measurements were performed at three time points: before the commencement of the interventions, immediately following completion of the intervention period, and at follow-up. All 45 enrolled participants were included in the reported statistical analyses, and no missing observations were reported for the two principal outcomes across the three assessment occasions. Participation was voluntary, verbal information concerning the study procedures was provided before participation, identifying names were not recorded on the research questionnaires, and confidentiality of the collected information for research purposes was emphasized. The manuscript did not specify the exact duration between posttest and follow-up assessment, the ethics committee approval code, or prospective trial registration information.

Data Collection Tools

Dysfunctional Attitude Scale. Dysfunctional attitudes were assessed using a questionnaire derived from the Dysfunctional Attitude Scale originally developed by Weissman and Beck (1978). The instrument was designed to assess relatively stable maladaptive beliefs and cognitive assumptions concerning personal worth, perfectionism, social approval, performance, vulnerability, and dependence on the evaluations of others. In the present study, four conceptual domains were identified, including perfectionism, need for approval, need to please others, and vulnerability or performance-related evaluation. Higher total scores on the measure represented greater levels of dysfunctional attitudes and, consequently, greater cognitive vulnerability. The documentation available for the present investigation contained an inconsistency regarding the precise version of the scale employed, because the instrument was described in different sections as both the DAS-26 and a 40-item form. Therefore, the exact number of items administered to participants cannot be established with certainty from the available study record. The Iranian 26-item version of the Dysfunctional Attitude Scale has previously been validated by Ebrahimi et al. (2013); however, because the present manuscript also refers to a 40-item version, psychometric characteristics established specifically for the DAS-26 should not automatically be attributed to the instrument used in this study. No sample-specific Cronbach's alpha coefficient was reported for the dysfunctional-attitudes measure. The questionnaire was administered to participants at the pretest, posttest, and follow-up stages to assess changes in maladaptive cognitive attitudes over time.

Health-Promoting Lifestyle Profile II. Health-promoting lifestyle was measured using the Health-Promoting Lifestyle Profile II (HPLP-II), developed by Walker et al. (1995). The HPLP-II is a 52-item self-report instrument designed to assess the extent to which individuals engage in behaviors associated with the maintenance and improvement of physical and psychosocial health. The instrument evaluates six major dimensions of health-promoting behavior: health responsibility, nutrition, physical activity, interpersonal relationships, stress management, and spiritual growth. Each item is rated on a four-point frequency scale indicating the extent to which the respondent engages in the behavior described by the item. The total score can range from 52 to 208, with higher scores representing more frequent engagement in health-promoting practices and a healthier overall lifestyle pattern. The multidimensional nature of the questionnaire allows it to capture a broad range of everyday behaviors relevant to self-care, health maintenance, stress regulation, physical well-being, and interpersonal functioning. In the present study, the HPLP-II was administered at pretest, posttest, and follow-up to identify changes in health-promoting behaviors resulting from the interventions. Internal consistency of the instrument in the current sample was reported to be acceptable, with a Cronbach's alpha coefficient of .79.

Interventions

Participants assigned to the general lifestyle education condition received a six-session structured educational intervention emphasizing the development and maintenance of healthier behavioral patterns, self-regulation skills, and adaptive cognitive strategies. The initial phase of the program focused on orientation to the intervention, clarification of treatment goals, education regarding the relationship between lifestyle and health, relaxation techniques, self-monitoring, and the identification of existing health-related behavioral patterns. Participants were encouraged to become increasingly aware of their

routine behaviors and to identify habits that could interfere with effective health management. The middle phase of the intervention emphasized behavioral modification, motivation enhancement, systematic goal setting and goal tracking, problem solving, and strategies for replacing unhealthy habits with more adaptive behaviors. Modeling, motivational reinforcement, and the use of incentives were incorporated to facilitate the acquisition and maintenance of healthier behavioral routines. Participants were also taught to identify obstacles to lifestyle modification and to develop practical solutions for overcoming these barriers. The later phase of the intervention focused on strengthening self-efficacy, identifying automatic thoughts and cognitive distortions that could interfere with health-promoting behaviors, consolidating newly acquired habits, and developing strategies for relapse prevention. Participants were encouraged to recognize maladaptive thought patterns, evaluate their effects on behavior, and replace ineffective reactions with more constructive responses. Between-session practice was incorporated to promote the transfer of skills from intervention sessions to participants' everyday lives. Thus, the lifestyle education program integrated educational, behavioral, motivational, and cognitive-behavioral components aimed at improving self-care and reducing dysfunctional cognitive patterns among patients with HPV infection. The available study documentation did not specify the duration of individual sessions, the frequency with which sessions were delivered, the professional qualifications of the facilitator, or formal procedures used to assess treatment fidelity.

Participants assigned to the dialectical behavior therapy condition completed a twelve-session skills-based intervention adapted from Linehan's DBT framework (Linehan, 2015). The program was designed to develop mindfulness, emotional awareness, distress tolerance, emotion regulation, acceptance, and effective problem-solving abilities. During the initial sessions, participants were introduced to the rationale and objectives of treatment and were trained in emotional self-awareness, self-soothing strategies, wise-mind skills, nonjudgmental observation of internal experiences, and radical acceptance. These components were intended to assist participants in recognizing emotional responses to their illness while reducing automatic judgment, avoidance, or ineffective reactions to distressing thoughts and feelings. Subsequent sessions emphasized attention redirection, observing and describing emotions, practicing mindfulness in everyday situations, developing adaptive coping self-statements, and applying structured problem-solving strategies to emotionally challenging circumstances. Participants were encouraged to observe their internal experiences without immediately reacting to them and to distinguish between emotional responses and effective behavioral choices. In the middle phase of the program, greater attention was devoted to reducing emotional vulnerability through planning related to sleep, physical activity, nutrition, and other aspects of daily self-care. Participants were also encouraged to identify personally meaningful values, schedule positive activities and experiences, and strengthen behavioral patterns consistent with those values. The final sessions emphasized accurate labeling of emotional states, development of effective responses to distress, use of opposite-action strategies when emotional urges were maladaptive, further practice of problem-solving skills, and integration and review of the skills acquired throughout the intervention. Between-session exercises were incorporated to encourage repeated practice and application of DBT skills in real-life situations. The treatment therefore combined acceptance-oriented strategies with behavior-change procedures, with particular emphasis on helping individuals manage distress, shame, fear, uncertainty, and other potentially difficult emotional responses associated with HPV diagnosis and health-related behaviors.

The DBT program consisted of twelve sessions and was therefore twice as long as the six-session general lifestyle education intervention. Consequently, treatment exposure and contact time were not equivalent between the two active intervention conditions. The available documentation did not specify individual session duration, session frequency, facilitator qualifications, formal treatment-fidelity procedures, or whether participants received standardized written DBT materials.

Data Analysis

Data analysis was conducted using IBM SPSS Statistics version 22. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to characterize participants and summarize the distributions of the study variables at the pretest, posttest, and follow-up assessments. Because the study involved three independent groups measured repeatedly across three occasions, repeated-measures analysis of variance was employed to evaluate changes in dysfunctional attitudes and health-promoting lifestyle over time and to determine whether patterns of change differed among the general lifestyle education, DBT, and wait-list control groups. The principal inferential effect of interest was the group-by-time interaction, which indicated whether the trajectories of outcome scores across the three measurements differed significantly according to study condition. Prior to conducting the repeated-measures analyses, relevant statistical assumptions were evaluated. Normality was examined using the Shapiro–Wilk test, with reported p values greater than .05 across study groups and assessment occasions. Homogeneity of variance was assessed using Levene's test, for which the reported results were also nonsignificant. The assumption of sphericity was examined using Mauchly's test. The sphericity assumption was not violated for dysfunctional attitudes, $W = .91$, $p = .15$, or for health-promoting lifestyle, $W = .89$, $p = .11$, thereby supporting interpretation of the uncorrected repeated-measures effects. Following significant omnibus effects, Bonferroni-adjusted pairwise comparisons were performed to examine changes between pretest and posttest, pretest and follow-up, and posttest and follow-up within the intervention groups and to evaluate differences between the active treatment conditions. Statistical significance was determined using a two-sided alpha level of .05. Effect sizes for the repeated-measures analyses were expressed as partial eta squared (ηp^2) to indicate the proportion of outcome variance associated with the respective effects. For the present investigation, inferential analyses focused specifically on dysfunctional attitudes and health-promoting lifestyle.

Findings and Results

All 45 participants were included in the analyses, and no missing observations were reported for dysfunctional attitudes or health-promoting lifestyle at any of the three assessment points. Of the participants, 26 were men (57.8%) and 19 were women (42.2%). The general lifestyle education and dialectical behavior therapy groups each included 9 men and 6 women, whereas the wait-list control group included 8 men and 7 women. Regarding age, 12 participants (26.7%) were between 18 and 25 years, 18 participants (40.0%) were between 26 and 32 years, and 15 participants (33.3%) were between 33 and 40 years. In terms of marital status, 25 participants (55.6%) were married, 16 (35.6%) were single, and 4 (8.9%) were divorced or widowed. All participants had at least a high-school diploma. Regarding duration of awareness of the HPV diagnosis, 16 participants (35.6%) had been aware of their diagnosis for less than 6 months, 18 (40.0%) for 6–12 months, and 11 (24.4%) for more than 12 months.

Table 1. Descriptive Statistics for Dysfunctional Attitudes and Health-Promoting Lifestyle by Group and Assessment Time

Outcome	Study Group	Pretest M (SD)	Posttest M (SD)	Follow-up M (SD)
Dysfunctional attitudes	Lifestyle education	141.20 (11.65)	119.40 (10.28)	121.60 (10.74)
	DBT	142.13 (12.04)	108.73 (9.62)	110.26 (9.98)
	Wait-list control	140.46 (10.91)	138.93 (11.20)	139.80 (11.47)
Health-promoting lifestyle	Lifestyle education	121.33 (13.42)	150.26 (12.18)	147.80 (12.66)
	DBT	122.06 (12.95)	158.40 (11.74)	156.26 (12.05)
	Wait-list control	123.13 (13.08)	126.20 (12.84)	125.46 (13.10)

As shown in Table 1, the three groups had relatively similar mean scores at pretest for both dysfunctional attitudes and health-promoting lifestyle. Following the interventions, dysfunctional-attitude scores decreased substantially in both active intervention groups, whereas only a small change was observed in the control group. Specifically, the mean dysfunctional-attitude score decreased from 141.20 at pretest to 119.40 at posttest in the lifestyle education group and from 142.13 to 108.73 in the DBT group, whereas the control group changed only from 140.46 to 138.93. At follow-up, the improvements were largely maintained, with mean scores of 121.60 in the lifestyle education group and 110.26 in the DBT group. A similar pattern was observed for health-promoting lifestyle. Mean scores increased from 121.33 to 150.26 in the lifestyle education group and from 122.06 to 158.40 in the DBT group, while the control group increased only from 123.13 to 126.20. At follow-up, scores remained higher than baseline in both intervention groups, indicating maintenance of the observed improvements. Across both outcomes, the magnitude of change was greater in the DBT group than in the lifestyle education group.

Table 2. Repeated-Measures Analysis of Variance for the Group-by-Time Interaction

Dependent Variable	df	F	p	Partial η^2
Dysfunctional attitudes	4, 84	18.64	.001	.47
Health-promoting lifestyle	4, 84	22.38	.001	.52

Preliminary assumption testing supported the use of repeated-measures analysis of variance. Shapiro–Wilk tests produced p values greater than .05 across groups and assessment occasions, and Levene's tests were also nonsignificant, indicating no reported violation of normality or homogeneity of variance. Mauchly's tests further indicated that the assumption of sphericity was satisfied for dysfunctional attitudes, $W = .91$, $p = .15$, and health-promoting lifestyle, $W = .89$, $p = .11$. As presented in Table 2, the group-by-time interaction was statistically significant for dysfunctional attitudes, $F(4, 84) = 18.64$, $p = .001$, partial $\eta^2 = .47$, indicating that changes in dysfunctional attitudes over the three measurement occasions differed significantly among the groups. The corresponding interaction was also significant for health-promoting lifestyle, $F(4, 84) = 22.38$, $p = .001$, partial $\eta^2 = .52$. These effect sizes indicated substantial differences in change trajectories across the three conditions, with the intervention groups demonstrating considerably greater improvements than the wait-list control group. The larger partial eta-squared value observed for health-promoting lifestyle indicated that the group-by-time effect accounted for a greater proportion of variance in this outcome than in dysfunctional attitudes.

Table 3. Bonferroni-Adjusted Post-Hoc Comparisons for Dysfunctional Attitudes and Health-Promoting Lifestyle

Outcome	Comparison	Mean Difference	p
Dysfunctional attitudes	Lifestyle education: Pretest–Posttest	−21.80	.001
	Lifestyle education: Pretest–Follow-up	−19.60	.001
	Lifestyle education: Posttest–Follow-up	—	.28
	DBT: Pretest–Posttest	−33.40	.001
	DBT: Pretest–Follow-up	−31.87	.001
	DBT: Posttest–Follow-up	—	.35
	Control: Pretest–Posttest	−1.53	.46
	Control: Pretest–Follow-up	−0.66	.71
	Lifestyle education vs. DBT at Posttest	+10.67	.002
	Lifestyle education vs. DBT at Follow-up	+11.34	.001
Health-promoting lifestyle	Lifestyle education: Pretest–Posttest	+28.93	.001
	Lifestyle education: Pretest–Follow-up	+26.47	.001
	Lifestyle education: Posttest–Follow-up	—	.24
	DBT: Pretest–Posttest	+36.34	.001
	DBT: Pretest–Follow-up	+34.20	.001
	DBT: Posttest–Follow-up	—	.31
	Control: Pretest–Posttest	+3.07	.28
	Control: Pretest–Follow-up	+2.33	.39
	Lifestyle education vs. DBT at Posttest	−8.14	.030
	Lifestyle education vs. DBT at Follow-up	−8.46	.020

Bonferroni-adjusted post-hoc comparisons indicated significant improvements from pretest to posttest and from pretest to follow-up in both active intervention groups for both dependent variables. For dysfunctional attitudes, the lifestyle education group showed a significant reduction of 21.80 points from pretest to posttest and 19.60 points from pretest to follow-up, both $p = .001$. The DBT group demonstrated larger reductions of 33.40 and 31.87 points, respectively, both $p = .001$. In contrast, the control group showed no significant changes from pretest to posttest, $p = .46$, or from pretest to follow-up, $p = .71$. For health-promoting lifestyle, significant increases were observed in the lifestyle education group from pretest to posttest, $\Delta = 28.93$, $p = .001$, and from pretest to follow-up, $\Delta = 26.47$, $p = .001$. The DBT group again showed larger improvements, with increases of 36.34 points at posttest and 34.20 points at follow-up relative to pretest, both $p = .001$. No significant changes were observed in the control group. Posttest-to-follow-up differences were nonsignificant in both intervention groups for dysfunctional attitudes and health-promoting lifestyle, indicating that the intervention-related gains were generally maintained during follow-up. Direct comparisons between the two active treatments further showed that DBT produced significantly lower dysfunctional-attitude scores than lifestyle education at posttest, mean difference = 10.67, $p = .002$, and at follow-up, mean difference = 11.34, $p = .001$. DBT also produced significantly higher health-promoting lifestyle scores at posttest, mean difference = 8.14, $p = .030$, and follow-up, mean difference = 8.46, $p = .020$. Overall, the post-hoc findings indicated that both interventions were effective, but DBT produced consistently greater improvements across both outcomes.

Discussion and Conclusion

The present study compared the effectiveness of general lifestyle education and dialectical behavior therapy (DBT) in reducing dysfunctional attitudes and improving health-promoting lifestyle among adults with human papillomavirus (HPV) infection. The findings showed that both active interventions produced

significant improvements from pretest to posttest and from pretest to follow-up, whereas the wait-list control group demonstrated no statistically significant changes. For dysfunctional attitudes, the group-by-time interaction was significant, $F(4, 84) = 18.64$, $p = .001$, partial $\eta^2 = .47$, indicating that the pattern of cognitive change differed meaningfully across the three groups. Likewise, the group-by-time interaction for health-promoting lifestyle was significant, $F(4, 84) = 22.38$, $p = .001$, partial $\eta^2 = .52$. Post-hoc analyses further showed that DBT was significantly more effective than general lifestyle education at both posttest and follow-up for both outcomes. Moreover, the lack of significant posttest-to-follow-up changes in the two intervention groups suggests that the gains achieved during treatment were largely maintained over the follow-up period. Taken together, these results indicate that both educational and psychological skills-based interventions can positively influence cognitive and behavioral outcomes in individuals with HPV, while DBT appears to provide a stronger effect.

The significant reduction in dysfunctional attitudes following general lifestyle education can first be explained through the cognitive and behavioral mechanisms embedded in the program. Dysfunctional attitudes are rigid beliefs concerning self-worth, approval, failure, perfectionism, and vulnerability that can become activated when individuals encounter stressful events (5). An HPV diagnosis may function as such a stressor because it can provoke concerns regarding personal responsibility, perceived stigma, relationship stability, disclosure, and future health. Individuals who interpret the diagnosis through rigid or self-critical beliefs may experience heightened distress and may be more likely to engage in avoidance or maladaptive coping. Lifestyle education in the present study included self-monitoring, goal setting, problem solving, self-efficacy enhancement, identification of automatic thoughts, and recognition of cognitive errors. These components may have encouraged participants to reassess overly negative beliefs and develop more flexible interpretations of their health condition. The relevance of dysfunctional attitudes in the Iranian context is also supported by psychometric work identifying perfectionism, need for approval, need to please others, and vulnerability as meaningful cognitive dimensions (6). Therefore, the reduction observed in the lifestyle education group may reflect the combined effects of health education, cognitive restructuring, and increased perceived control over health-related behavior.

The greater reduction in dysfunctional attitudes observed in the DBT group may be explained by the more intensive focus of DBT on emotional awareness, mindfulness, acceptance, and behavioral regulation. DBT teaches individuals to observe thoughts and feelings without immediately evaluating them as facts and to tolerate distress while selecting more adaptive responses (8). For patients living with HPV, this approach may be particularly relevant because distressing cognitions often emerge in emotionally charged contexts involving fear of judgment, anticipated rejection, disclosure concerns, and uncertainty about health. Rather than attempting to suppress such thoughts, DBT provides skills that can weaken the automatic link between distressing cognition and maladaptive behavioral response. This interpretation is consistent with theoretical work emphasizing emotion regulation as a central mechanism in DBT and related therapeutic approaches (9). By improving the capacity to identify emotions, tolerate distress, and respond nonjudgmentally, DBT may reduce the extent to which rigid dysfunctional beliefs dominate the individual's appraisal of the illness.

This explanation is also compatible with findings from previous DBT research. Studies have shown that DBT can produce improvements in emotion dysregulation and interpersonal functioning, both of which are strongly connected to maladaptive cognitive and behavioral patterns (12). Similarly, research among

adolescents with borderline personality disorder has emphasized that reductions in emotional dysregulation are closely associated with therapeutic improvement during DBT (13). Although these populations differ clinically from adults with HPV, the underlying process is relevant because emotional dysregulation can intensify rigid thinking, rumination, interpersonal sensitivity, and avoidance across diagnostic groups. In the context of HPV, improved emotion regulation may reduce the emotional intensity associated with thoughts about stigma, disclosure, or future health, thereby making these thoughts less cognitively dominant.

The present findings regarding dysfunctional attitudes are also supported indirectly by studies examining positive self-related outcomes following DBT. Sadeghian-Lemraski et al. found that DBT improved self-compassion and integrative self-knowledge in individuals with borderline personality disorder (15). Such outcomes are conceptually relevant to dysfunctional attitudes because greater self-compassion and integrative self-understanding are inconsistent with rigid self-criticism, excessive dependence on approval, and harsh perfectionistic standards. Similarly, DBT has been associated with reductions in self-concealment and fear of compassion and with improved emotion efficacy among adolescents with suicidal ideation (16). These findings are particularly relevant to HPV because self-concealment and fear of judgment may occur when individuals experience shame or anticipate negative social reactions to their diagnosis. Thus, the greater reduction in dysfunctional attitudes in the DBT group may reflect the intervention's capacity to address not only maladaptive thoughts but also the emotional processes that maintain those thoughts.

The second major finding of the study was the significant improvement in health-promoting lifestyle in both intervention groups. This result is consistent with the premise that structured education and psychological skills training can support healthier daily behavior. General lifestyle education directly targeted self-monitoring, goal setting, habit modification, problem solving, relaxation, and relapse prevention, all of which are relevant to the development and maintenance of health-related routines. In individuals with HPV, improvement in health-promoting lifestyle may include greater attention to nutrition, physical activity, stress management, health responsibility, and interpersonal well-being. Previous HPV-specific evidence supports the value of structured educational interventions. Akhondzadeh et al. reported that health-belief-model-based education improved sexual self-care among HPV-positive women (7). This finding aligns with the present results by showing that appropriately structured education can increase engagement in health-supportive behaviors among patients living with HPV.

The improvement in health-promoting lifestyle may also be understood within a biopsychosocial framework. Contemporary healthcare increasingly recognizes that successful management of health conditions is influenced not only by medical treatment but also by psychological adaptation, behavior, and social functioning (4). Individuals who perceive greater control over their health and who possess effective coping strategies may be more likely to engage in health-promoting activities. General lifestyle education may have strengthened participants' knowledge and confidence, whereas DBT may have helped participants manage emotional barriers that interfere with the translation of knowledge into action. In this sense, both interventions may support health behavior through different but complementary pathways.

The stronger effect of DBT on health-promoting lifestyle is especially noteworthy. One possible explanation is that DBT addresses emotional obstacles that can interfere with sustained self-care. Individuals may know which behaviors are beneficial yet fail to maintain them when distressed, anxious,

ashamed, or discouraged. DBT incorporates emotion regulation, distress tolerance, mindfulness, opposite action, problem solving, and positive activity scheduling, which can facilitate adaptive behavior even under emotionally challenging conditions (8). Therefore, its benefits may extend beyond symptom management to broader patterns of everyday functioning. This interpretation is consistent with longitudinal evidence showing that DBT may improve multiple domains of functioning over time (11). The present findings therefore support the idea that emotion-regulation skills may contribute to more stable health behavior by improving the individual's ability to persist with adaptive routines despite distress.

The role of mindfulness and distress tolerance may also help explain the superior lifestyle outcomes in the DBT group. Psychological interventions involving mindfulness have previously been associated with improvements in distress tolerance and psychological hardiness among patients facing serious medical conditions (18). Although mindfulness-based cognitive therapy differs from DBT, both approaches emphasize awareness of internal experiences and reduction of automatic emotional reactivity. For HPV-positive individuals, these skills may facilitate continued engagement in health behaviors even when medical uncertainty or interpersonal concerns are present. Thus, improvement in health-promoting lifestyle may partially reflect better emotional management rather than health knowledge alone.

The greater benefits of DBT are also compatible with evidence concerning dialectical coping. Recent research has shown that dialectical coping is associated with better mental health outcomes through reductions in perceived stress (17). From this perspective, patients may benefit from learning to accept difficult realities while simultaneously engaging in constructive change. This dual process is highly relevant to HPV, where individuals must often accept uncertainty regarding infection status or future medical monitoring while still taking active steps to protect their health. The ability to hold acceptance and change together may reduce helplessness and support more consistent self-care.

The maintenance of intervention effects from posttest to follow-up is another important finding. Neither the lifestyle education group nor the DBT group showed significant deterioration between posttest and follow-up for either outcome. This suggests that participants may have continued to use the acquired skills after formal intervention ended. Such maintenance is particularly meaningful for behavioral outcomes because sustainable lifestyle change requires continued application beyond the treatment setting. Previous DBT research has shown that skills-based approaches can produce benefits that extend beyond immediate treatment, particularly when participants internalize strategies for regulating emotions and solving problems (11). Similarly, qualitative evidence concerning adapted DBT skills programs has indicated that participants can perceive the skills as acceptable and applicable to everyday situations (14). These findings support the interpretation that the skills learned in the present study may have continued to influence participants' cognitive and behavioral functioning after treatment completion.

The clinical relevance of the present findings is further strengthened by existing evidence regarding the psychosocial burden of HPV. Patients with HPV may experience shame, fear of disclosure, relationship concerns, and uncertainty about the meaning of their diagnosis (2). Among women with preexisting mental health difficulties, an HPV diagnosis has also been associated with emotional shutdown, distress, and difficulty coping with the implications of infection (3). These experiences illustrate why purely informational approaches may sometimes be insufficient. A patient may understand the medical facts about HPV yet remain overwhelmed by the emotional and interpersonal meaning of the diagnosis. Under such

circumstances, DBT skills may help individuals tolerate distress, communicate more effectively, and maintain adaptive behaviors despite emotionally difficult circumstances.

At the same time, the effectiveness of general lifestyle education should not be underestimated. The present findings showed significant improvement in both major outcomes in this group, indicating that a relatively focused educational intervention can yield substantial cognitive and behavioral benefits. This is clinically important because educational programs may be easier to implement in routine healthcare settings and may require fewer sessions than more intensive psychotherapeutic interventions. Given that HPV management already involves medical education concerning screening, transmission, and prevention (1), integrating structured lifestyle and cognitive-behavioral content into routine services may provide an efficient method of supporting patients who do not require intensive psychological treatment.

Overall, the findings indicate that both general lifestyle education and DBT can contribute to reduced dysfunctional attitudes and improved health-promoting lifestyle among adults with HPV infection, but DBT produced larger changes across both outcomes. The superiority of DBT may reflect its broader therapeutic focus on mindfulness, emotion regulation, distress tolerance, acceptance, and adaptive action. Previous research has shown the efficacy of DBT across populations characterized by emotional and behavioral dysregulation (10), and the present results extend the potential relevance of these mechanisms to adults coping with HPV. Nevertheless, the findings should be interpreted as evidence of differential treatment-associated change rather than as definitive proof that DBT is intrinsically superior in all respects, particularly because the two active interventions differed in treatment duration and intensity.

Several limitations should be considered when interpreting the findings. First, the sample was small and consisted of only 45 participants recruited through convenience sampling from a single center in Tehran, which limits the generalizability of the results to the broader population of individuals with HPV. Second, the study used a quasi-experimental design, and although participants were reported to have been allocated randomly to the three conditions, the specific randomization procedure, allocation concealment, and assessor blinding were not documented. Third, the two interventions were unequal in length, with the lifestyle education program consisting of six sessions and the DBT program consisting of twelve sessions; therefore, the greater improvement observed in the DBT group may partly reflect greater therapist contact and treatment exposure. Fourth, both outcomes were assessed through self-report questionnaires, which may be affected by social desirability, recall bias, or participants' expectations regarding treatment. Fifth, the exact follow-up interval was not specified, preventing a precise assessment of the durability of intervention effects. Finally, the documentation of the dysfunctional-attitudes instrument was inconsistent regarding whether a 26-item or 40-item version was administered, and this ambiguity may affect reproducibility and interpretation of the measurement procedure.

Future studies should recruit larger and more diverse samples from multiple healthcare centers and geographic regions to enhance statistical power and external validity. Randomized controlled trials with clearly documented sequence generation, allocation concealment, blinded outcome assessment, and preregistration would provide stronger evidence regarding causal effects. It would also be important to compare DBT and lifestyle education under equivalent treatment dosages so that differences in outcome can be attributed more confidently to therapeutic content rather than contact time. Future research should include clearly defined follow-up periods of three, six, and twelve months to determine the long-term

sustainability of treatment effects. Studies could also examine potential mediating mechanisms such as emotion regulation, perceived stress, mindfulness, self-efficacy, illness perception, stigma, and distress tolerance. Including objective or clinician-rated indicators of health behavior, treatment adherence, screening attendance, or medical follow-up would further strengthen the evidence. Future investigations may also examine whether baseline psychological distress, duration of HPV diagnosis, gender, relationship status, or perceived stigma moderates responsiveness to different intervention approaches.

Healthcare services working with individuals diagnosed with HPV should consider integrating psychological and lifestyle support into routine medical care. General lifestyle education may be a practical first-line approach for improving self-care, health responsibility, and adaptive daily habits, particularly in settings with limited psychological resources. DBT-informed skills training may be especially useful for patients who experience intense shame, emotional distress, fear of disclosure, persistent negative thoughts, or difficulty maintaining health-promoting behaviors under stress. Clinicians could incorporate brief mindfulness, distress-tolerance, emotion-regulation, and problem-solving exercises into supportive care while maintaining clear boundaries between psychological support and medical treatment. Screening patients for dysfunctional beliefs, emotional distress, and difficulties in self-care may help identify those who would benefit most from more intensive psychological intervention. Multidisciplinary collaboration among physicians, nurses, health educators, and mental health professionals may therefore provide a more comprehensive model of care for people living with HPV.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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